Telegraph and Telephone Age

No. 1 NEW YORK, JANUARY 1, 1913. Thirty-First Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Quick-Acting Repeaters.

A correspondent asks what particular factor contributes most toward quick action in certain types of repeaters, usually referred to as quick-acting repeaters, and desires an illustration of such a repeater.

In the first place it should be understood that there is no individual type of repeater bearing the distinctive title of "Quick-Acting Repeater." The words "quick-acting" are used as an adjective, and apply to any repeater. As the aim of all inventors of repeaters has been to accelerate the action of the instruments, it is evident that each may appropriate the term for his own method.

The repeater most deserving of the term, however, is really the one which possesses the least mechanical and electric inertia. Early types were not always constructed with this end in view, and for that reason they often operated with sluggish action. Hence, small movable parts and short laminated cores ensure quick action, and are therefore essential contributing factors thereto.

In the improved Toye half-repeater, as modified by the late W. E. Athearn, is found an arrangement which seems to embrace all the necessary requirements for maximum quick action. The accompanying diagram shows, roughly, the principle involved, and, in part, Mr. Athearn's arrangement of a Condenser Locking Half-Repeater, originally devised for a special purpose, but also available for ordinary side-line operation.

As will be seen in the diagram, two condensers are used with connections as shown. The purpose of the ¼ mf. condenser is merely to minimize the spark which develops when the transmitter points open, while the 4 mf. condenser is used to lock the relay points during the period the transmitter lever is crossing the air-gap, *i. e.*, not touching either front or back stop. The action is as follows:

When the lever of the transmitter is on the front stop, as is the case when the single line and duplex relay points are closed, the 4 mf. condenser is primarily charged by battery MB with an e.m.f. of

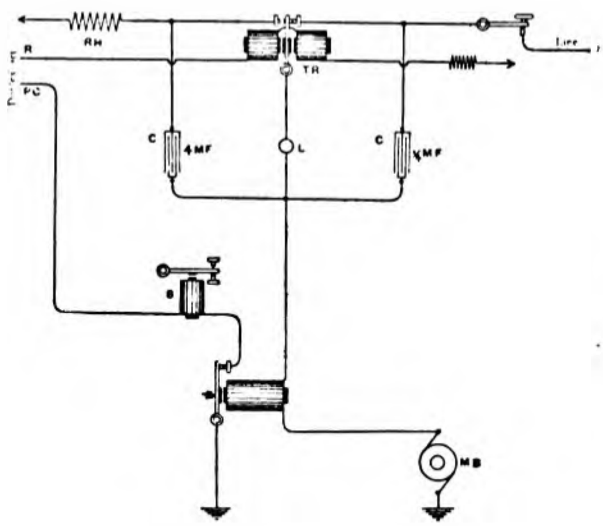

DIAGRAM OF QUICK-ACTING REPEATER.

somewhat less value than that of its initial pressure, owing to the drop caused by the relay coils and battery-lamp resistance; but when the line opens and the transmitter lever leaves the front stop, the ratio of the "drop" resistance to that in the condenser path is so small that the effective e.m.f. of MB rises instantly to practically its full value. Consequently, at this critical moment the condenser takes on an additional charge, and while it is absorbing such charge, current, of course, flows through the relay coils and locks the armature.

When the transmitter lever reaches the back stop, the condenser becomes short-circuited, and, consequently, partially discharges through the rheostat without exerting any harmful effect on line or instrument and is again ready to repeat the operation.

A MICROFARAD.—One microfarad is the average capacity of 70 miles of 100-lb. copper wire erected on poles, and about three miles of underground telegraph circuit.

Telegraph and Telephone Patents.

ISSUED DECEMBER 3, 1912.

1,045,845. Telephone System. To E. R. Hobbs, Buhl, Idaho.

1,045,953. Multiplex-Telegraph System. To M. M. Davis and A. J. Eaves, New York, N. Y.

1,045,968 and 1,045,969. Telephone Transmitter. To F. Gottschalk, New York, N. Y.

ISSUED DECEMBER 10.

1,046,554. Telephone Receiver. To C. L. Chisholm, Marysville, N. B., Can.

1,046,714. Telegraphy. To M. O. Anthony, Englewood, N. J.

1,046,952. Automatic Telephone System. To E. Blos, Schoneberg, Germany.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, December 26:

American Telephone and Telegraph Co.	140¾
Mackay Companies	84
Mackay Companies, preferred	68
Western Union Telegraph Co.	75

Personal.

MR. H. P. TRAINOR has been appointed divisional plant superintendent of the Orange Free State and Northern Cape Colony, with headquarters at Bloemfontein, Orange Free State, South Africa.

The Cable.

HUGH HUGHES, aged 65 years, for sixteen years outdoor foreman of the Commercial Cable Company at Hazel Hill, Canso, N. S., died December 13 from prostatitis.

MR. F. H. DENNIS, superintendent of the clearing house of the Commercial Cable Company, New York, who for several weeks past has been in a critical condition suffering from pneumonia, is now considered out of danger.

MR. G. GODFROY, electrical engineer of the French Cable Company, Paris, France, who has been in the United States about two years studying American methods, expects to return to Paris soon. Mr. Godfroy is a son of Mr. F. J. Godfroy, a director of the company.

F. A. HAMILTON, formerly electrician on the cable steamer *Minia* and latterly electrician on the Commercial Cable Company's steamer *Mackay-Bennett*, died at Halifax, N. S., December 19. In the interim he served in the Signal Corps in the Philippines. Deceased was ranked as one of the foremost telegraph-cable engineers, and was co-inventor with Captain Samuel Trott of a type of deep-sea cable.

H. NEARING, boatswain of the cable ship *Mackay-Bennett*, died in St. John's, N. F., December 21, from injuries received when a heavy sea swept over the side of the ship as she was rounding Cape Race on the night of December 17.

THE CABLE STEAMER, *Mackay-Bennett*, belonging to the Commercial Cable Company, has succeeded in repairing the Halifax and Bermuda cable, which was interrupted three weeks ago.

PERNAMBUCO AS A CABLE STATION.—Pernambuco, Brazil, is an important station for three cable companies—the Western Telegraph Company, the South American Cable Company and the Deutsch Sud-Amerikanische Telegraph Gesellschaft. The latter has been recently completed and is now working. It runs from Pernambuco to Emden, via Dakar, on the West Coast of Africa.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. EDWARD REYNOLDS, vice-president and auditor of this company, has been relieved of the duties of the auditor's office and has been advanced to the position of assistant to the president, the new position being in addition to his office as vice-president. Mr. Felix J. Kernan has been appointed acting auditor.

MR. E. J. NALLY, vice-president and general manager, and Mr. W. I. Capen, vice-president in charge of construction, have returned from Chicago.

MR. J. J. ALMONTE, of the general manager's office, New York, has returned from Switzerland, where he was hastily called on account of the serious illness of his mother.

MR. F. W. SPRONG, manager of the Cincinnati, Ohio, office, has been appointed superintendent of the second district, Western Division, with headquarters at Chicago, vice H. G. McGill, deceased.

MR. J. J. MCDERMOTT has been appointed manager of the receiving and delivery department of the main office, New York, vice L. P. Cole, transferred to the 239 Greenwich street office.

MR. F. MINNING has been appointed manager of the Cincinnati, Ohio, office, vice F. W. Sprong promoted to be superintendent.

ARRANGEMENTS are in progress to install up-to-date dynamo plants at Oil City, Pa., and Olean, N. Y.

THE HARRISBURG, PA., OFFICE, C. E. Diehl, manager, has been remodeled and refitted, bringing it up to date.

THE MAIN OFFICE at Washington, D. C., has been rearranged and refitted, bringing it up to date. It is now a very handsome home for the company in the capital, and Manager G. M. Foote is proud of his surroundings. The work was finished under the direction of Mr. J. P. O'Donohue, division electrical engineer, New York.

AS AN EVIDENCE of quick work in restoring communication after a serious fire, the Dock street office in Philadelphia, C. E. Stump, manager, is a noteworthy example. The office was entirely destroyed by fire on a recent Sunday night, and by Monday morning a temporary office was established, including the installation of the call circuits, and business was resumed without a moment's delay. Superintendent C. E. Bagley is certainly to be congratulated on this splendid result.

MR. W. Y. NOLLEY, manager, Mackay Telegraph and Cable Company, Dallas, Tex., in renewing his subscription, writes: "Thanks for keeping my name on your list. I would not be without TELEGRAPH AND TELEPHONE AGE."

Western Union Telegraph Company.

EXECUTIVE OFFICES.

Mr. Theo. N. Vail, president of the company, who has undergone two operations within the past month, is making very satisfactory progress, and it is expected that he will be able to leave the hospital within the next week or two.

Mr. H. C. Worthen, general superintendent of the Southern Division, Atlanta, Ga., has been advanced to the newly-created position of general manager of the Southern Division, with headquarters at Atlanta.

Mr. E. M. Mulford, division commercial superintendent, New York, has been appointed general manager of the Gulf Division, with headquarters at Dallas, Tex., vice L. McKisick transferred to New York as assistant general superintendent of traffic.

Mr. G. M. Yorke, engineer, has been appointed general superintendent of plant, with headquarters in New York.

Mr. W. N. Fashbaugh, traffic manager, New York, had been appointed general superintendent of traffic, with headquarters in the same city.

Mr. Edward Everett, secretary to vice-president Newcomb Carlton, has been appointed manager time service department, in charge of commercial relations of the time service.

Mr. S. J. Goddard, formerly general manager of the National Telephone Company of England, has been appointed European representative of the Western Union Cable System, with headquarters in London.

Mr. Shirley M. English, president and general manager of the Postal Telegraph-Cable Company of Texas, Dallas, Tex., was a New York and Boston business visitor on December 16 to 20.

A Conference of plant officials was held with Mr. G. M. Yorke, general superintendent of plant, December 16-20. In addition to Mr. Yorke, the following division plant superintendents were present: R. W. Whitehead, Western Division, Chicago, Ill.; L. H. Beck, Southern Division, Atlanta, Ga.; W. C. Titley, Mountain Division, Denver, Col.; M. B. Wyrick, Gulf Division, Dallas, Tex.; and M. C. Allen, Eastern Division, New York; R. E. Chetwood, engineer of construction, and J. C. Hubbard, general supervisor of construction, New York.

A Conference of division traffic superintendents was held in the office of general superintendent of traffic, Mr. W. N. Fashbaugh, December 16-21. Among those present, besides Mr. Fashbaugh, were the following division traffic superintendents: Messrs. S. B. Haig, New York; T. W. Carroll, Chicago, Ill.; H. C. Chase, San Francisco, Cal.; B. L. Brooks, Denver, Col., and J. P. Edwards and B. P. Hancock, division traffic superintendents at Atlanta, Ga., and Dallas. Tex., respectively.

Mr. J. H. Hopkins, chief operator of the Laredo, Tex., office, has been promoted to the managership of the office in place of G. C. Felton, deceased. Mr. R. Gonzalez has been made chief operator.

Mr. E. R. Auter has been appointed manager of the Mobile, Ala., office. Mr. Auter is a native of Vicksburg, Miss., where he was born July 7, 1878. He entered the telegraph service in that city as messenger in 1894, and successively filled the positions of collector, bookkeeper, clerk and cashier.

Mr. Leslie J. Jennett, manager of this company's office at Nashua, N. H., has been appointed to a position in the office of Mr. C. F. Ames, commercial superintendent, Boston, Mass.

The Telephone.

Mr. Thos. D. Lockwood, general patent attorney of the American Telephone and Telegraph Company, Boston, Mass., was a New York visitor, on December 19.

Mr. W. K. Boardman, division superintendent of the Cumberland Telephone and Telegraph Company, Knoxville, Tenn., has been promoted to be division commercial superintendent, with headquarters at Nashville, Tenn.

The Southwestern Telegraph and Telephone Company will expend $4,500,000 in Texas during the year in improvements in its facilities.

New Organization in St. Louis.—The Southwestern Telegraph and Telephone Company has been organized at St. Louis, Mo., to take over the properties of the Bell Telephone Company of Missouri, the Southwestern Telephone Company, and the Missouri and Kansas Telephone Company. Mr. H. J. Pettengill is president, with headquarters at St. Louis.

Uniform Accounting for Telephone Companies.—The Interstate Commerce Commission, Washington, D. C., on January 1, promulgated a uniform system of accounts for telephone companies subject to the Act to Regulate Commerce, having annual operating revenues exceeding $50,000. The commission has under consideration the promulgation of a system of accounts for smaller companies, to be issued later.

Suit Against Metropolitan Telephone and Telegraph Company.—Suit was begun December 26, in the Supreme Court, New York, by the Metropolitan Telephone and Telegraph Company and the New York Telephone Company against the Metropolitan Telephone and Telegraph Company of New York and the Metropolitan Telephone and Telegraph Company of Delaware, alleging that the defendant companies have conspired to deceive the public as to their identity, in inducing the belief that they are the old Metropolitan company, acquired by the New York Telephone Company, and getting investors to buy stock under the impression that they are getting stock in the original Metropolitan company.

Mr. S. M. English, president and general manager of the Postal Telegraph-Cable Company of Texas, Dallas, Tex., in a recent circular letter to the managers of his company, highly commends Telegraph and Telephone Age to their careful consideration. He refers to the December 16 issue as a "strong number," and states that it is one of the most interesting he recalls ever having read.

Revised Conditions and Rates for Cable Letters, Week-End Letters and Deferred Cable Messages.

A circular has been issued by the Western Union Telegraph Company giving revised conditions and rates for cable letters, week-end letters and deferred cable messages, taking effect January 1. In regard to cable letters, the conditions are that the letters CLP must be written immediately before the address if to be mailed beyond London, or CLT if to be wired beyond London. London and Liverpool messages will be prefixed CLT. These prefixes in the minimum number of words count as one word and will be included charged for (13). Former designations "Letter-mail" and "Letter-wire" will be discontinued.

Must be written in plain language of country of origin or destination.

The use of more than one language in same message is not permitted.

Code addresses may be employed.

Each word of fifteen letters or less is counted as a word. Ch. counts as one letter. (The three latter provisions also apply to week-end letters and deferred cable messages.)

Figures when not used as cipher are counted each group of five or less as a word.

Will be delivered within twenty-four hours in London or Liverpool or elsewhere if telegraphic delivery is provided for. Cable letters which are to be posted beyond London will be placed in the mails as early as the deferred character of the service will admit, with a view to securing their mail delivery within twenty-four hours as nearly as practicable.

May be mailed to Central Cable office, New York, or to the Boston office, for transmission, in which case they take the New York City and Boston rates, but their delivery will be proportionately delayed.

Subject to a minimum charge for twelve words (thirteen including the prefix).

All cable letters not destined to London or Liverpool will be mailed beyond London unless otherwise arranged by sender.

A reply to a cable letter may be prepaid, but the instruction must be expressed in terms of full rates. For example: If the sender of the cable letter wishes to prepay a cable letter reply of twelve words at the 75 cent rate, the instructions to be written before the name and address should be RP 3. The indication RP, including the number of words paid for at full rates, should be counted and charged for as one word.

In regard to week-end letters the letters WLP must be written immediately before the address if to be mailed beyond London, or WLT if to be wired beyond London. London and Liverpool messages will be prefixed WLT. The prefixes count as one word and will be included in the minimum number of words charged for (25). Former designations "Week-mail" and Week-wire" will be discontinued.

Week-end letters must be filed before midnight Saturday. Deliverable in London or Liverpool, or elsewhere if telegraphic delivery is provided for, on Monday forenoon. Week-end letters which are to be posted beyond London will be placed in the mails as early as the deferred character of the service will admit, with a view to securing their mail delivery on Monday morning as nearly as practicable.

May be mailed to Central Cable office, New York, for transmission, but must reach that office by midnight Saturday.

Subject to a minimum charge for twenty-four words (25 including the prefix).

A reply to a week-end letter may be prepaid, as in the case of cable letters.

Deferred cable messages must be prefixed LCO, LCD or LCF (written immediately before the address), the prefix to be counted as one word and to be charged for.

Must be written in plain language of country of origin or destination or in French as a universal language.

Numbers, except in addresses, must be written in words spelled out.

Subject to the transmission at the convenience of the company when the cables are free of full-paid traffic.

Tariff one-half the regular rates, except that on messages destined to points in Great Britain and Ireland it is three cents per word less than half regular rates. From points having a twenty-five cent tariff to London the deferred rate to Great Britain and Ireland is nine cents per word.

A reply to a deferred plain language message may be prepaid, but the instruction must be expressed in terms of full rates, as per example given.

The deferred half-rate service is now in operation with most countries.

The circular contains tables of rates from every state in the Union and Canada to various European countries for the different classes of service.

Telephone Pioneers' Executive Committee Meeting.

On December 19, the executive committee of the Telephone Pioneers of America met in New York The following members were present: F. H. Bethell, Henry W. Pope, J. J. Carty, C. R. Truex, of New York, and Thos. D. Lockwood, of Boston.

The secretary was directed to prepare a system and routine to be followed in the admission of members. The chairman of the executive committee, Mr. T. D. Lockwood, was empowered by the executive committee to appoint a committee of such number of members as necessary to consider what changes, if any, are necessary in the constitution and by-laws. The secretary was given discretion to invest the surplus funds for the association, and a vote of thanks was given to the general committee of the American Telephone and Telegraph Company, the New York Telephone Company, the Western Electric Company, and the New York Telephone Society, who entertained the Pioneers and their wives, daughters, etc., during the second convention, which was held in New York, November 14, 15 and 16, 1912. Thanks were also tendered to John Donelly, acting mayor of Newark, N. J., who is also a member of the Pioneer Association (1880), for his invitation to the members to inspect the public buildings in that city.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

How is evaporation sometimes prevented?

Is this an entirely satisfactory expedient?

How is the zinc sulphate solution diluted?

What care is required in the case of the zinc pole of the battery?

Should a gravity cell be kept on open or closed circuit?

In renewing cells what treatment is given to the zinc sulphate solution?

What is "battery mud"?

Can it be utilized?

What term is applied to the copper deposit?

Is it of value?

What is the proper method of keeping zinc and copper plates which have been used.

Is it possible to increase the yield of electricity on the part of a given gravity cell above a certain point?

What is the principal advantage of the Lockwood cell?

What is the time limit of efficiency of the Lockwood cell?

What is the principal point of difference between the Daniell cell and the ordinary type of gravity cell?

Is the Daniell cell largely employed at the present time for telegraphic work?

Which of the two cells above mentioned is the more economical?

Is the gravity cell injured by cold?

What are the elements used in the Edison-Lalande cell?

What is the composition of the solution used in its renewal?

What are the active elements of the Grove and the Bunsen cells?

Are they extensively used at the present time?

What is the principal feature of the construction of the "wasteless battery zinc"?

What are the essential component parts of the magneto?

What is the distinguishing property of a magnet?

What is a lodestone?

What is an artificial magnet?

What is the difference in the magnetic quality of soft iron and that of steel?

What is a bar magnet?

What is the "magnetic meridian"?

If a bar magnet is suspended on a pivot, what position will be assumed by it with regard to the magnetic meridian?

Is it possible to impart magnetism from a magnet to other pieces of iron?

(To be Continued.)

Twelve Thousand Miles by Telephone.

BY ANDREW PLECHER, LAS ANIMAS, COL.

A circuit, 12,000 miles long, will make it possible to talk to any one on earth by telephone. The circumference of the globe is 24,000 miles; therefore, the maximum distance any one can be away from you is half of that, or 12,000 miles. Travel north or south, east or west, it will either be at a distance of 12,000 miles or less from a given point; there is no getting away from the globe.

A man in Massachusetts still doubts that the earth is round, but the time will come when he can send his voice out in one direction, and it will come back to him in the other, opposite direction, clear around our planet, like an echo. There are many men, not only in Massachusetts, but everywhere else, who doubt that such a time will come during this period of our short lives, and yet it should not be so difficult to reach six times farther than we do at present, with the help of a few dry cells, a little carbon-powder box and an old telegraph magnet.

Yes, you may wait forever if you expect to encircle the globe with these childish devices, and, please, do not wait for the man in the ranks to produce anything better; he has no time for big things; he has only time for big money. It always has been that way, and it always will be; the amateur makes the discoveries and the professional reaps the benefits.

"What about load coils repeated every two and a half miles in the circuit, or what about a continuously loaded circuit?" asks the professional, and the practical man replies: "They have not accomplished anything remarkable; they give clearness at the expense of loudness, and how can the circuit contribute to transmission when the transmitter is incapable of giving the circuit more than one thousandth-millionth of one-sixtieth of an ampere?" "Ah, so much the better for the receiver," retorts the professional. "But, my friend, place a dozen of your receivers in series into a circuit and see what happens. Twelve of your receivers are more than equal to a circuit of 12,000 miles."

Recently, high-frequency waves have been invoked to carry the infinitesimal telephone current to its destination. Attenuation of the vanishingly small telephone current is confessed to be greater for a given distance, when using high-frequency waves, than without them. A bright ray of hope, however, sets our nerves a-tingling, when in a footnote we learn that a new telephone relay has been discovered. Yes, indeed, new instruments are the only hope to reach the goal—12,000 miles.

Electricity in Municipalities as Applied to Fire Alarm, Police Signalling, Etc.*

BY JOHN W. KELLY, JR., PRESIDENT INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS.

No single department of municipal service has such responsibility upon it as that which has charge of the supervision of electrical matters, for enormous property losses and loss of life may, at any time, occur as the result of any defect in the varied and complicated electrical wiring and appliances in use.

Every day the fact is emphasized that the chief of the electrical bureau of today, in the large city, is much more than a signal engineer who has to provide means of signalling to the police and fire departments. He must supervise and advise, not only as to the municipal lighting of his city, but also see that the lighting for the city generally is done well and safely; he has problems to solve in all branches of electrical engineering; he must know many things that were never thought of a few years ago. He can be the means of saving thousands of dollars for his city, as has been instanced in Philadelphia in the last few days, where we must credit the chief of the electrical bureau with saving for the city $43,000 for the arc lighting alone for the coming year.

It goes without saying that your police department must be in telephone connection with your citizens on the one hand and with the policemen on the other. You must also supply means by which headquarters can talk to the policemen and give them necessary instructions in emergencies. It is also necessary that the department shall be in a position to notify the policemen at times when they are not reporting that they are needed, and that they must report at once.

Any appliance that will fulfill these requirements most rapidly, surely and easily, is the demand of progress. In our great cities of today, the good citizen must get his hand into action with the smallest loss of time possible. That is the function of the modern police signalling system.

The best system is a combination of mechanical signals, telephones and flashlights. The policemen report once every hour by pulling the mechanical signal. This is recorded automatically on a tape at headquarters, giving the box number, with the date, hour and minute the call is made. If headquarters do not need to call the policemen for anything special, the whole force can report for a year without a word having been said. The operator on duty not only gets the report, but the policeman knows that he is getting credit for his call by the bell in the box tapping back in response to the register. If he does not get his taps back, he knows that something is wrong with the signal circuit. He can then use the telephone, which brings up a red light in front of the operator, and make his report by telephone. If he cannot get the operator by telephone, he knows that both circuits are in trouble, and he must use the ordinary telephone service for his report.

While the officer has the door of the box open, headquarters can get him by tapping the bell in the box, but the shutting of the door cuts out the box, and the officer would be out of touch for an hour. Here is where the flashlight signals become available. Distributed around the city are red lamps, suspended from twenty-two to twenty-five feet in the air. When an officer is needed, these lights are turned on, and the officer at once calls up for instruction. During the day, audible signals are used—either bells or horns.

A fire alarm telegraph must be reliable, prompt and efficient. It must be easily accessible; so simple that anyone discovering a fire will know how to use it; so perfect that mistakes in starting an alarm or interference with it, when once started, will be impossible, and the alarm apparatus must be loud enough to awaken men if asleep. Portions of the apparatus may stand unused for months, but when needed it must respond quickly and correctly. A single failure might result in a loss far beyond the cost of the best system, and it is poor economy which regards cheapness as more important than reliability.

In connection with the municipal fire-alarm system, there should be an auxiliary fire alarm and drill system for the public schools. School architects throughout the country are vieing with one another in drawing plans and specifications for school buildings, prepared especially with a view of providing adequate facilities for the prompt departure of the scholars in case of fire. The best authorities are agreed that no better plan for safeguarding the lives of pupils has been devised than that of a carefully planned and conscientiously observed system of fire drills. The fire drills, in order to be effective, should occur in response to the same signal which is used to transmit an alarm of fire. It is evident that the pupils and teachers should not know when the alarm is sounded whether it is for a drill or for fire. Being an emergency signal, it should have a loud and distinctive sound and be used for no other purpose.

Much has been said relative to the use of the telephone for sending in fire alarms. At the conventions of the International Association of Municipal Electricians the use of the telephone even as an adjunct of the fire-alarm system has been questioned. Investigations have shown that municipalities in which a large percentage of fire alarms are received by telephone, either have an antiquated or inadequate fire-alarm system. The use of the telephone in sending in fire alarms has resulted in the loss of life and property. A valuable side-light on the question is given by the telephone companies themselves. In a number of the larger cities they have equipped their exchanges with auxiliary outfits connected with the regular city fire-alarm system.

A fire-alarm system consists of four elements: namely, street boxes, circuits, central office equipment and alarm apparatus. Boxes may be divided

*Extract from paper read before Philadelphia Section American Institute of Electrical Engineers, December 10, 1912.

into three general types—successive, non-interfering and plain (or interfering). The successive type of box makes possible the transmission of definite independent signals from a number of boxes when operated at or about the same time without the loss of a signal from any of the boxes. The non-interfering type enables two or more boxes to be pulled at or near the same time on the same circuit without confusion of signals. The plain type is used for the sake of economy and does not contain either the successive or non-interfering features. The successive and non-interfering combined type is the latest and best, and is rapidly replacing all other types for municipal service, both in this country and abroad. The circuits are either overhead or underground, preferably underground. If overhead, they should be constructed of No. 10 B. & S. hard-drawn copper wire, insulated where necessary; if underground, of No. 14 B. & S. copper, rubber and lead covered.

The central office is the heart of the fire-alarm system and contains the apparatus for receiving, recording and transmitting signals and alarms of fire, as well as the batteries, and the apparatus to charge the batteries. Central offices are of three types: automatic, semi-automatic and manual. The automatic type transmits the signals from the street boxes, through the central office directly to the fire department without manual intervention. In the semi-automatic type the first round of a signal is received at the central office, and the operator then switches on the fire house circuits and allows the remaining three rounds to be transmitted directly to the fire department. In the manual type all signals are received at the central office and transmitted by a manually operated instrument.

Alarm apparatus is divided into public alarm apparatus and fire house apparatus. Public alarm apparatus consists of tower bells, steam whistles and compressed air horns. Fire house apparatus consists of gongs, indicators, registers, stall trips and electric light switches.

I will now describe what happens when a box is pulled. We will take, for example, a successive, non-interfering box with attached key under glass guard, the street circuit being connected to a central office of the automatic type. You break the glass, the cover of which flies down, clearing out the broken glass; you unlock and open the door and pull down the hook once. This starts the clockwork mechanism in the box, which at once transmits the signal to the central office, repeating the number of the box four times. Should another box have been previously pulled that had not completed sending in its signal, your box would have tried to get in on the circuit, but finding the circuit busy would have kept out. and after running four rounds would have tried again to get the circuit and send in its alarm. If the circuit is still busy it will go four more rounds and try again, the box running for sixteen rounds if necessary, but stopping as soon as it succeeds in sending in its signal. The instant the first signal reaches the central office an indicator on the automatic repeater drops into view, showing the circuit over which the alarm is coming, at the same time the non-interference switches on the repeater operate and lock out any signals that might try to come in. A blow is struck on the office gong; a hole is punched in the register tape; the cylinder of the repeater turns over and opens all the circuits, street, gong and register, thus sending the impulse that operates all the alarm apparatus. This is repeated for each signal until the number of the box is completed and repeated for four rounds of the box number. Each round of the box is stamped on the central office register tape with the year, month, day, hour and minute that it came in. All this is done automatically, without the aid of any person except the one pulling the box. Should the repeater run down while an alarm is coming in, it will wind itself and stop when it is wound sufficiently. If for any reason the motor should not operate, the repeater runs for one alarm more and then rings a special alarm bell that keeps on ringing until repeater is wound.

Review of the Progress Made by the New York Telephone Company Since 1892.*

BY J. A. STEWART, GENERAL MANAGER.

When we go back as far as twenty years, we must consider the New York Telephone Company—or, as it was then called, the Metropolitan Telephone and Telegraph Company—as operating only in Manhattan and the Bronx. A general view of the company at the beginning of this period would be about as follows:

There were about 9,000 stations, seven central offices in Manhattan and one in the Bronx—the latter was about the size of a private branch exchange switchboard. The lines were largely grounded circuit. The equipment was entirely magneto and the distributing plant mostly overhead wire strung over housetops.

The business in New York did not begin to expand until the adoption of the message rate system in about 1895. Its introduction by Mr. U. N. Bethell after he became general manager marked the beginning of a new era. When you realize that in 1893 it cost a subscriber $240 per year to belong, and when you consider the scope and quality of the service he received for this payment, you begin to wonder that we had as many as 9,000 subscribers. Up to that date telephony in New York had been more or less of an experiment; after that, it became a business.

About 1893, the general principles had been established and the equipment, such as it was, standardized at least to some extent. Those in control at that time, therefore, saw some hope of a reasonable stability in the engineering features and had sufficient imagination to foresee the possibilities of telephony as a commercial enterprise. It only required the impetus of a reasonable rate plan to start the wonderful development which has since taken place.

The adoption of the message rate system, of

* Extracts from paper read before The Telephone Society of New York October 15, 1912.

course, complicated the commercial, accounting and adjustment work, and necessitated changes in the methods of handling such work.

I made my advent in the telephone business through the engineering department. Mr. J. J. Carty was chief engineer; Mr. H. K. Thurber was assistant chief engineer. The department did everything from designing circuits and door knobs to submarine cable crossings. It had lately been reorganized, and about fifteen men recently out of college, and I am afraid with very much exaggerated ideas of their knowledge and value to the business, were turned over to Mr. Thurber to carry on the work. As I look back now and realize how little we knew, I often wonder how the "Boss" accomplished any really useful work with us.

I remember that one of the first jobs handed out to several of us was to locate and map all the steam pipes in the boiler room of the present Franklin Building, in which a new office was about to be located. As this was about the middle of July, and the boiler in service, we immediately changed some of our preconceived notions of engineering.

One of the men was considerably older than the rest of us, and I presume for this reason was made a sort of "straw boss." The department just at that time was designing central office equipment for several new offices which were urgently needed. This man was extremely ingenious. Novel designs of power switches, unique arrangements of power boards and battery racks planned to work on hinges, and operating rooms with mezzanine galleries, were some of his specialties. After we had worked for several months at high pressure, getting out the details of these creations, only to see most of them suppressed by Mr. Thurber, we came to the conclusion that what the business needed was less ingenuity and more sanity. I might add that the intervening years of experience has not altered this conviction.

Another important part of our work was the testing of underground cable at the Bridge Yard. This cable was generally delivered in bunches, and the construction department usually wanted it forthwith. Whenever there was any delay, we received from that department very frank estimates of our worth individually and collectively. The testing apparatus had to be set up in a dark, dirty hallway in one of the Brooklyn Bridge arches back of the room used by the construction department as a shop, and flanked on one side by another used by tin roofers as a storeroom, and incidentally as a place to loaf. Whenever the roofers would shift a box of tin, the reflecting galvanometer would give a convulsive shiver and go out of business. The number of these tests and the speed with which they had to be made, together with the conditions under which the work had to be done, came as a distinct shock to us, who had been accustomed to consider that such tests required plenty of time and much scientific knowledge.

Thus one by one we lost the illusions we had accumulated with so much effort at college, and had it borne in upon us that the world is not a laboratory, but a workshop, and that a large percentage of all useful work, whether it is done by the president or by the individual lineman, is routine, after all.

Much of the work we did then is now done more efficiently by the American Telephone and Telegraph Company, the Western Electric Company and by various contractors, or is not done at all.

Mr. Carty, either directly or through the assistance of Mr. Thurber, taught us other things besides the mere technique of telephone engineering. For example, we learned something about writing letters and reports. After reading some of our productions, he laid down a few principles. One was that a letter or report should contain what you considered to be all the facts, presented in logical order. After having done this, you were to place yourself in your correspondent's place and say to yourself: "If I did not know any more about the details of this proposition than he, could I, on the basis of the information contained in this letter or report, determine what action to take?" We also learned what constituted a case on an estimate calling for an expenditure of money. It at least had to answer three questions:

1. Why do the work proposed at all?

2. Why do it this way rather than some other way?

3. Why do it now?

The time is too short to enumerate the many similar lessons we received. Only those who worked under his direction or were associated with him in those early days, will appreciate how much the New York Company owes to the scientific imagination and general sanity of Mr. John J. Carty.

Another Phase of the Telephone's Versatility.

The entertainment which was presented at the Telephone Pioneers' Convention at the Hotel Astor, New York, November 14, 1912, by the New York Telephone Society, and participated in by members of the American Telephone and Telegraph, New York Telephone and Western Electric Companies, was a satirical musical hodge-podge, entitled "Examinations," a travesty of an examining board inviting applications for positions in the telephone business. The part of the Western Electric Company, was portrayed by W. D. Lindsey, of its advertising department, who was assisted by a wooden dummy, designated as "the very latest product of the factory."

The dummy not only talked well, but moved his arms, head and jaws in such a manner that the act seemed to be a perfect marvel of ventriloquism. What no one suspected, however, was the fact that concealed ingeniously in the body of the dummy was a loud-speaking telephone, which was connected to a transmitter behind the scenes by means of wires running down the feet of the chair to contact sockets on the floor of the stage. The telephone end of the "ventriloquial" conversation was conducted by Mr. P. M. Rainey, the designer of the dummy, and a further feature of the act was the rendering of songs by means of a phonographic attachment.

Method of Calling on Telephone Party Lines.*

Many different kinds of telephone service are offered to the public by the telephone companies. One of the important classifications is based on the number of parties that will have common use of the line. Private line service permits of the exclusive use of the line. Two-party line service permits of two subscribers being connected to the same line, which they must share in common. In a similar way, four-party line service means that four subscribers are connected to the same line. There is another class of service, which is commonly used in rural districts. It is known as "bridging" line service. In this system any number of subscribers from five to twenty-five, or even forty, may be connected to the same line.

The value of the service to a subscriber depends upon the number of telephones connected to his line and, also, upon whether the calling of the subscriber by the operator is effected by means of "code ringing" or by means of "selective ringing."

The calling of a desired party on a bridging line is done by means of "code ringing." With this system, each subscriber is assigned a definite ringing code, consisting of a combination of long and short rings. Thus, when a certain subscriber on any line is desired, all of the bells on that line will be rung with his combination of long and short rings. Of course, only the particular subscriber whose code of signals is rung should answer the telephone.

The calling of a desired party on a two and four party line is generally done by means of "selective ringing"; that is, only the bell of the desired subscriber will be rung and all other bells on the line will not be disturbed. There are several different kinds of "selective ringing" in use, but in this article we will only treat of one of the later types, known as "harmonic selective ringing."

In order better to understand the operation of this method of selective ringing, let us take the case of a four-party line where the subscribers on that line will be known as A, B, C and D, Fig. 1.

The operator at the central office has available four different kinds of alternating current, which are obtained from four separate generators or vibrators. Any one of these four kinds of current can be sent out over any line as desired by the operator.

It will first be necessary to understand the meaning of the term "alternating current." An alternating current, as its name implies, is a current that vibrates, or alternates, in its direction when passing through a wire. We can see an analogy of this in the piston rod of a steam engine in motion. The piston rod alternates back and forth in its direction of travel.

While all of these four different currents are of an alternating character, yet they differ from each other in that they alternate at a different rate. For example, one of them will alternate approximately sixteen times a second; another, thirty-three; another, fifty; and another, sixty-six times a second.

In each of the four telephones on the party line is located a ringer, or bell, that will respond to only one of these four kinds of current. Thus the ringer at party "A" will respond to the current that alter-

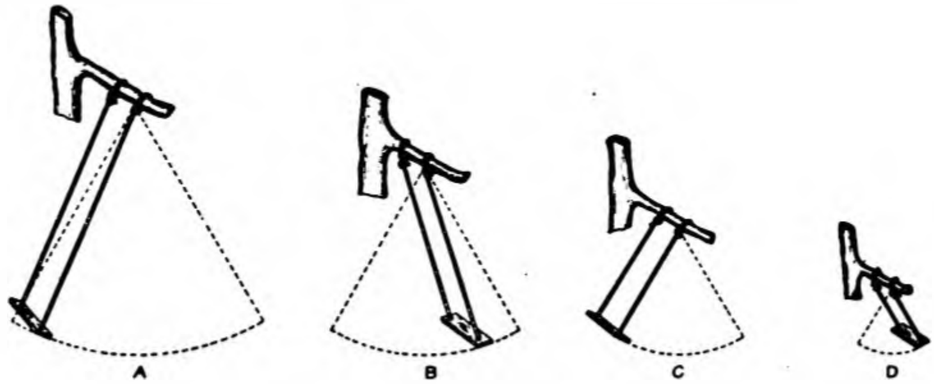

FIG. 1.—THE FOUR SWINGS VIBRATE IN INVERSE PROPORTION TO THEIR LENGTH—I.E., THE LONGEST SWING VIBRATES THE SLOWEST

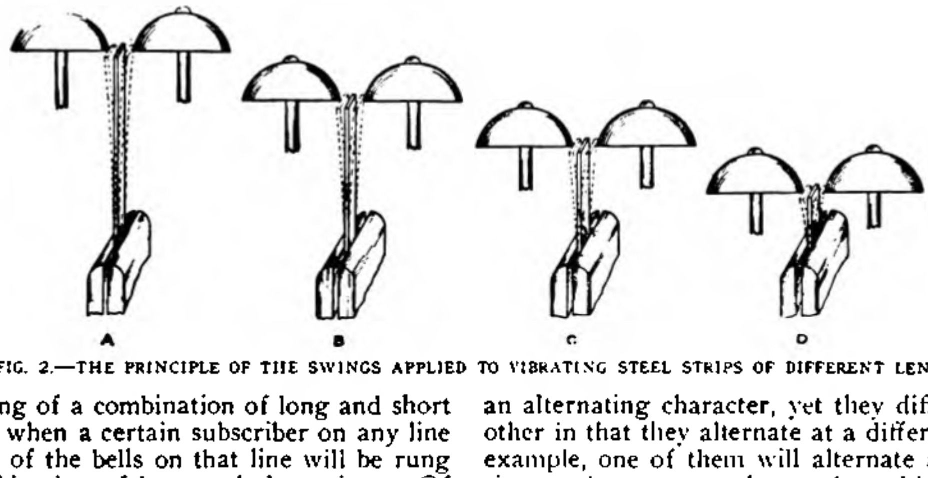

FIG. 2.—THE PRINCIPLE OF THE SWINGS APPLIED TO VIBRATING STEEL STRIPS OF DIFFERENT LENGTHS

*From Western Electric News.

nates sixteen times a second and not to the other three kinds. In a similar way, each of the other three ringers will respond to its particular current only.

The fundamental principle on which these ringers operate is, that every pendulum and every vibrating reed as well, has a natural period of vibration, and can be made to swing or vibrate by the action of a succession of impulses occurring in the same frequency as that natural vibration period. To illustrate this principle let us take the case of a swing, which can be made to vibrate to and fro by the gentle push of the hands if applied at proper intervals. Now, to make the analogy more complete, let us further assume that we have four swings, each with a different length of rope. It is a well-known fact that the shorter the rope the faster will be the natural period of vibration. Thus we would have four swings that are capable of vibrating to and fro in different lengths of time, as illustrated in Fig. 1.

The proper frequency of impulses required to make any one of the swings vibrate is different from that required for any of the other three swings. Now, suppose that swing "A" requires an impulse every eight seconds and swing "D" every two seconds; it is apparent that if we applied the eight-second impulses to swing "D" its vibration would practically die down from the effects of one impulse before the next was applied. Thus swing "D" could not be made to vibrate strongly from impulses that were just right for swing "A." Likewise swings "B" and "C" could not be made to vibrate from those same impulses.

Another good illustration of this same principle is seen in the case of four strips of steel fastened in a vise, each having either a different length or a different weight, as shown in Fig. 2.

They would each have a different period of vibration, the same as the swings above mentioned. The frequency of impulses that would cause one bar to vibrate would not cause the others to vibrate freely. If we placed bell gongs near the ends of each of these vibrating strips of steel, as shown, we would have mechanical ringers, each of which would respond to a certain frequency of vibration but not to any other frequency.

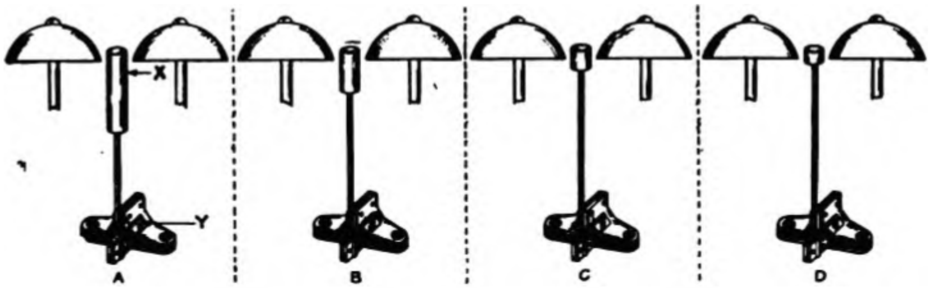

FIG. 3.—DIFFERENT PERIODS OF VIBRATION SECURED BY VARYING THE WEIGHTS (X)

Fig. 3 shows the actual vibrating reeds of our four harmonic ringers.

In this case the length of the four different reeds is the same, but the different periods of vibrations are secured by varying the weight at the top (x) of the reed and, also, by varying the strength of the steel spring at the bottom (y) of the reed. By the addition of an electro-magnet we have a complete harmonic ringer, as shown in Fig. 4.

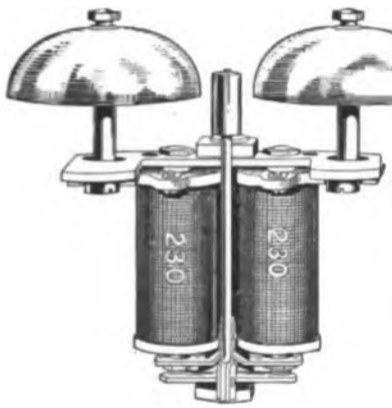

FIG. 4.—HARMONIC RINGER

Static Charges on Wires.

When a quantity of electricity flows into a telegraph wire, the initial portion of the current being prevented by the resistance of the current from instantaneously recombining is accumulated on the surface of the wire. The quantity of this electricity so accumulated depends upon the superficial area of the wire, its distance from other conductors or from the earth, and upon the efficiency of the insulation. Thus not all of the current generated by the batteries is available, but a portion of it always remains on the line as a static charge. So serious is this current loss that, on a long line and with current of short duration, the entire current supplied may be so absorbed by the line and produce no action at the other end. Since this static charge constitutes the initial portion of every current, the effect is the same as if there were an actual retardation of the current. On the other hand, the initial rush of the current through the relay produces upon the magnets a much greater effect than the permanent one which flows after the conductor has been fully charged. This momentary effect is known to operators as the "kick," and it varies with the electrostatic capacity of the line.

Mr. F. B. Bradley, manager of the Western Union Telegraph Company at Muncie, Ind., writes: "Thank you very much for renewing my subscription to your valuable paper. It certainly contains the latest and most useful articles pertaining to the telegraph and telephone in all branches."

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - Publisher

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

B. B. SHERBURNE, Advertising Manager.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, JANUARY 1, 1913.

Happy New Year to All.

Telegraph and Telephone Age extends its heartiest good wishes to its many readers and friends, individually and collectively, for a happy and prosperous New Year. Naturally we all wish for good things to come to us, but we also know that in order to realize our wishes we must work with that object in view. We can all make a pleasure of our work if we approach it in the proper frame of mind, and by so doing we get more satisfaction out of life.

The new year is full of promise and we hope that each one of our friends will realize in a large measure the blessings he wishes for. We are sure he will if he makes himself worthy of them. It will be the constant endeavor of Telegraph and Telephone Age to aid him in the attainment of his best desires.

The Year 1912.

The year 1912 was one of steady progress in telegraph and telephone development. True, there have been no startling inventions, but there has been a steady unfolding of the possibilities in both, and the progress has been substantial.

In telegraphy much has been accomplished, and the public now enjoys better telegraph facilities than ever before. The business, both in administration and operation, has been placed on a more scientific basis, and improvement as a whole is noted all along the line. A healthy and constructive competition between both the great telegraph companies has been maintained. There has been no violent warfare, which is a good sign and evidence of wise administration of these large interests. Both companies have extensive and costly plants to maintain, a great part of which is exposed to the ravages of the weather. Reconstruction has been widely carried on under improved methods, and while heavily-wired lines may not be entirely storm proof, they are of a much more substantial character now than ever before. The pole problem still engages the attention of telegraph and telephone engineers and inventors, and much progress has been made in the development of concrete poles. The growing scarcity of pole timber is one that is giving pole-using companies some concern, and the time will come when they will be compelled to take up more seriously the concrete-pole proposition.

Wireless telegraphy has largely occupied the attention of the people during the year. While its possibilities are far from being known or exhausted, it has made steady progress in development and application. The new wireless law, which went into effect on December 13, will have a wholesome effect on the business at large, since, no doubt, it will harmonize conflicting interests to a very large extent, and have a tendency to ameliorate the conditions arising from the amateur nuisance. Much progress has been made in the development of the various systems. The apparatus has been substantially improved, resulting in greater operating range and more reliable operation. High-speed systems came prominently to the front during the year, and it is stated that records of 200 to 250 words per minute have been made. When the difficulties attending daylight operation have been satisfactorily overcome, wireless telegraphy will take its place as a factor in the electrical transmission of intelligence that can be depended upon. Its extreme usefulness in times of distress of ships at sea has been emphasized many times during the year, notably that of the *Titanic* disaster in April. Progress has been made in overland wireless, and this use promises to become an important adjunct to wire systems. The leading nations of the world, including the United States, England, Germany, France and others, have taken up in earnest the development of national over-sea systems whereby they are enabled to reach their colonial possessions direct. High-power stations are being erected for this purpose, but as the work is still in a somewhat experimental stage, it is perhaps rather early to predicate the ultimate possibilities of the idea. The radio-conference in London early in the summer brought about a better understanding among the nations in regard to the international use of wireless, and the results of the deliberations will unquestionably prove of the highest benefit to all civilized nations who are interested in the world's progress.

Wireless telephony is still largely in an experimental stage and many minds are at work on this interesting problem. Progress is reported in many directions, and there is no doubt that wireless telephony will become an actuality in due time. It was reported in December that the operator on a steamer on the Pacific Ocean, 150 miles from the point where wireless telephone experiments were being conducted, distinctly heard conversation and the notes from a phonograph. The conditions probably were just right for such a result, and it was likely a "freak," which, in the present state of knowledge, would be difficult or impossible to reproduce.

In cable telegraphy, the chief event was the extension of the cable letter, week-end letter and deferred cable services, and although there was some criticism as to the wisdom of these special services from a commercial and financial standpoint, it has passed away and is forgotten, and the business has grown at a reasonably satisfactory rate. Improvements have been made in apparatus and operation, and on the whole the cable interests appear to be in a healthy condition. The passing of the Anglo-American and Direct Cable companies into the control of the Western Union Telegraph Company practically leaves the trans-Atlantic business in the hands of three companies, viz.: the Western Union system, the Commercial Cable Company (including the German Cable) and the French Cable Company. They are all doing a satisfactory business, and no unfavorable results occurred on account of the removal of the competition of the two companies named, as was feared in some quarters at the time.

Government ownership of the telegraphs came in for some attention early in the year. The postmaster-general, in his annual report, favored the undertaking, and the subject gave rise to considerable discussion for a time, but it has been lost sight of or forgotten in the press of other more sensible matters.

In the telephone field no startling discoveries or developments have been made. Activity has been mostly along the line of improving present facilities. The engineering staff is constantly at work on problems calculated to further increase the utility of the telephone service. The possibility of conversing between points so far distant as New York and Denver having become an accomplished fact, the engineers are giving their attention to conquering greater distances, with San Francisco as their goal. No doubt success will crown their efforts sooner or later. Apart from the engineering questions, reorganization and closer affiliation between the parent and subsidiary companies have been given much attention. It is recognized that in order to give the public the best service the entire business should be conducted practically under one management, and the organization changes that have been made have been with this object in view. There has been some misconception regarding the relations of the principal telegraph and the telephone companies. This Mr. Vail endeavored to set to rights in his last annual report and in a subsequent statement. The two interests are so closely related in their functions that cooperation is one of the most obvious results. The practical operation of such an arrangement has necessarily led to the development of unforeseen difficulties of a minor nature, but these are being met in a satisfactory manner.

In the railroad telegraph field the use of the telephone as a means of dispatching trains and transacting other railroad business has steadily increased, and a large percentage of the railroads now depend principally upon the telephone for this service, and some altogether. The special apparatus called for in telephone train dispatching has undergone refinement, and all the problems arising in practical service have been met by experts engaged in this work. Of special interest to the railway telegraph service was the dedication in May, at Harriman, N. Y. (formerly named Turner), of a monument on the site of the original station from which the first telegraphic train order was sent. It was a noteworthy event and many prominent railroad and telegraph men were present.

Among the events affecting telegraph and telephone interests the pension and insurance scheme for the benefit of the employes announced by President Vail is of the first rank. It is most liberal in its provisions and will no doubt react favorably upon the service, as it is a self-evident truth that one whose mind is at ease and free from worry as to his future welfare can do better work than one who is weighed down by fear and apprehension. Telegraph and telephone employes alike are entitled to the benefits.

Now, as we stand at the threshold of the new year, it is natural to wonder what the year has in store for us. Every individual is, perhaps, a little selfish in asking this question, and thinks more of his own welfare rather than that of his fellow men. What is good for all is good for the individual, and we should therefore turn our thoughts toward the general good rather than make it a personal affair. The year is full of promise and it is for us to work for a realization of its possibilities. We have learned much from the past; the present is with us, teeming with opportunities, and the future is before us with undreamed-of blessings waiting for the knowledge of man to bring them to fruition.

Enforcement of Wireless Law Not Postponed.

It was announced in many of the daily papers recently that the enforcement of the new wireless law had been postponed. This, however, was erroneous. Commissioner E. R. Chamberlain, of the Department of Commerce, Washington, D. C., in reply to an inquiry regarding the matter, writes: "The Act to Regulate Radio Communication took effect December 13, 1912, and its provisions are being enforced as rapidly as practicable, as it applies not only to commercial and ship stations, but to special, experimental, technical and amateur stations as well.

"The inspection is proceeding steadily with the means available."

The Louisville and Nashville Pole Case.—Judge Evans, in the Federal Court at Louisville, Ky., on December 17, held that the Western Union Telegraph Company had the right to condemn and to select a location for its pole line along the right of way of the Louisville and Nashville Railroad in the State of Kentucky.

Night Lettergrams in Salvador.—A night lettergram service has been inaugurated in the Republic of Salvador. The rates are 22.5 cents for the first fifty words, and 4.5 cents for each additional ten words or fraction thereof.

Course of Instruction in the Elements of Technical Telegraphy—XXX.

(Copyrighted.)

(Continued from page 820, December 16, 1912.)

[We began in our issue for October 16, 1911, the publication of a course of instruction in technical telegraphy. The course, which was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, is published for the benefit of those of our readers who desire to fit themselves for better positions in their vocation. It is elementary throughout and is divided into chapters, following each other in logical order.

The course has received the hearty commendation of telegraph officials and experts for its scope and accuracy and its sound practicability. In each chapter examples are presented in order to illustrate the application of the rules to practical cases, and each chapter is followed by a series of questions pertaining to the subject of the chapter, to be worked out by the student in order to review his progress. Back numbers containing these valuable articles can be obtained, on application, at 10 cents per copy.]

STATIC INDUCTION.

Static induction is the term applied to the influence which electricity possesses of inducing in neighboring bodies a peculiar electrical condition without being itself in actual contact with them.

When friction is applied to a glass rod, the rod acquires the power of attracting light substances; in other words, it has become electrically excited. and manifests its condition by causing attraction.

A clear proof of the existence of static induction may be obtained by the use of an electroscope, which consists essentially of a glass jar in which is

FIG. 23

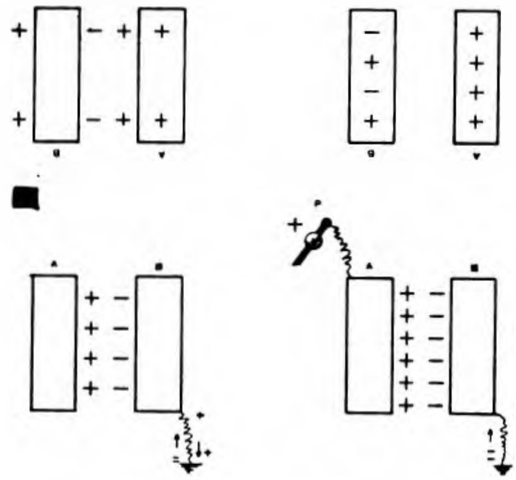
inserted a metallic rod supporting two gold leaves, as shown in Fig. 23.

Suppose the excited body in the figure to be a stick of sealing-wax, electrified by having been rubbed briskly with woolen cloth, or on the coat sleeve. The sealing-wax is now charged with, in this case, negative electricity, and if it be brought near the metallic rod of the electroscope the leaves will immediately diverge.

This repulsion exhibited by the gold leaves might be explained by the two-fluid theory as follows: all bodies are supposed when in a natural state to possess equal quantites of + and — electricity. When the electrically excited sealing-wax is brought near the metallic rod it separates the electric fluids in the latter, attracting the + and repelling the — to the most remote point, and as the law governing the attraction and repulsion of charged bodies is similar to that of magnet poles, the gold leaves, having become charged with — electricity, repel each other.

The electroscope is now in an electrified condition, caused by the inductive influence of the sealing-wax, and will remain so until the inductive influence is withdrawn, when the + and — electricities of the electroscope become free, and, combining, reassume their natural state.

Following out this two-fluid theory, let Fig. 24



FIGS. 24, 25 (UPPER), 26 AND 27 (LOWER).

represent two bodies, A and B, the former charged positively, while the latter is in its natural state.

Bring A close to B (Fig. 25), and A, acting by induction, will attract the unlike or — electricity of B towards it, and repel the like or + to the farther side. Now connect the farther side with earth (Fig. 26), and the + electricity being repelled will flow from B to the earth, an equal quantity of — electricity taking its place owing to the attractive influence of A. The charge on B, having thus been increased, exerts a greater attractive force on A than before, and the greater part of the positive charge of the latter is attracted to the side nearest B. The potential of the opposite side of A has in consequence become less than it was when originally charged, and therefore less than that of the source from which its charge was derived, so that if this low-potential side of A be again put into communication with the source (represented at P, Fig. 27), it will receive an additional charge, which in its turn will attract a further — charge from the earth to B. This in turn, reacting on A, again lowers the potential of its remote side, enabling it to take another charge, and so on, until no part of A has a potential smaller than that of the charging source.

We thus see how, by the action of static induction between A and B, a much greater charge has been accumulated or condensed on A than could possibly have been obtained from the charging source alone.

This condensation may be increased by enlarging the surfaces of A and B, or by bringing them nearer together, or by substituting for the air space between them some other insulating material of higher inductive power.

Each insulating substance or dielectric, as it is called, has a natural property of facilitating induction, and to the relative powers possessed by each substance, as compared with the air, the term "specific inductive capacity" is applied.

The "specific inductive capacity" of air is taken as unity, and all other insulating substances are compared with it.

For example, the induction through gutta-percha is found to be about 4.25 times greater than through air; the specific inductive capacity of the former is therefore 4.25.

The following table of specific inductive capacities is approximately correct:

Air	1.
Shellac	1.95
Paraffin	1.98
Gutta-percha	4.25
Mica	6.

It is evident from the foregoing that a certain amount of static induction must take place in a telegraph circuit.

(To be Continued.)

Wireless Development.

In his inaugural address delivered in London, November 14, President William Duddell, of the Institution of Electrical Engineers, made some interesting remarks on recent progress in wireless telegraphy.

Another development of great engineering interest, he said, is the construction of alternators of sufficiently high frequency for direct connection to the aerial. In this case the wireless station becomes very much like an ordinary generating station only that, instead of producing alternating current at fifty frequency, alternating current of, say, 50,000 frequency is generated and is supplied straight to the aerial. This, of course, does away with all questions of sparks and arcs, and I must say that, from an engineer's point of view, it is a very attractive solution. In spite of the difficulties, a number of machines have been made by the General Electric Company of America which will produce one kw. at 100,000 frequency. They are of the inductor type. Another most ingenious alternator is that designed by Dr. R. Goldschmidt, of Berlin, in which advantage is taken of the reaction of the stator current on the rotor and the rotor current on the stator to step up the frequency of the machine. By this method Dr. Goldschmidt has reached frequencies of 50,000 with several kilowatts output, and he is now engaged in building some very much larger machines to give over 100 kw. each.

The present position is that we have in the field three systems actually at work—the loosely coupled spark system, the shock excitation system, and the arc system. Within a very short time we shall, no doubt, have high-frequency alternators at work, and it is probable that at least one other system will be under practical test.

Turning to the receiver, the changes that have been made are not so striking. The coherer has become practically obsolete. The magnetic detector which replaced the coherer about ten years ago still holds its own, although it is not very sensitive. Its reliability in action, and the fact that it is almost fool-proof, are, for many purposes, convincing arguments in its favor.

The electrolytic detector has been but little used in this country. The Fleming valve and the crystal detector have come into considerable use. They are both highly sensitive; the property which makes them useful as detectors is in each case their unilateral conductivity. The high-frequency currents induced in the receiving aerial by the incoming waves are not generally sufficiently strong to affect any of our ordinary alternating-current measuring instruments. If, however, they can be rectified and converted into continuous currents, then it is easy to detect them, for it is common knowledge that direct-current measuring instruments are in general hundreds, if not thousands, of times more sensitive than alternating-current ones.

Corresponding to each spark at the transmitter a train of oscillations is received, and these trains of oscillations are rectified by the detector, and in general are passed through a telephone as an indicator. At each spark a click is heard in the telephone, so that with 600 sparks a second the diaphragm is attracted 600 times, producing a somewhat musical note.

Herein lies one of the great advantages of high spark frequency. There seems no doubt that the combination of the human ear and a telephone is much more sensitive for high-frequency notes than for low ones. In some tests I have made, using an alternating current to determine the minimum power required to produce an audible signal in a telephone receiver at different frequencies, I found in one case that the power was reduced from 430 micro-microwatts at 300 frequency to 7.7 micro-microwatts at 900 frequency. At higher frequencies it increased again.

Due to atmospheric causes, there are generally audible in the telephone receiver clicks and noises commonly spoken of as atmospherics or strays. With high spark frequencies the human ear easily distinguishes the musical note from these atmospherics; this enables the operators to read through a large amount of extraneous interference. The elimination or compensation of these atmospherics is one of the most important outstanding problems in wireless telegraphy.

When operating with continuous waves, practically no note is heard in the receiver telephone unless the currents are chopped up into rapidly recurring groups of waves either at the transmitter (tone sender) or at the receiving end (ticker).

In order to make a permanent record of the signals, and to allow of high-speed working, the rectified current from the detector may be passed through a galvanometer or a relay, and here we come to one of the difficult problems which requires solution, namely, the construction of a relay or recording instrument which will make a record of the very small received currents at high speeds. The Einthoven, or string galvanometer, which is at present used for this purpose, is delicate and gives a photographic record. Although the difficulties may be minimized, I do not feel at this moment that the photographic method of recording with the attendant chemicals, and the necessity of handling moist slip, can be looked upon as the final solution from the point of view of commercial telegraphy.

The problem of constructing a relay for this purpose is a very difficult one. The mean current strength of the signals, after rectification by a high-resistance detector, is of the order of 1-10th to 1-100th of a micro-ampere, and the amount of power available to work the instrument is only of the order of a few micro-microwatts. For high-speed reception, the number of contacts to be made and broken per second may be anything up to fifty. The problem before our instrument makers is to construct a relay or recorder which will operate with a power not exceeding a few micro-microwatts at the rate of fifty signals per second.

Recent experiments by Kiebitz have drawn attention to the fact that quite good reception of the long waves from distant stations can be obtained without high aerials. A single wire supported on insulators near the ground, or even resting on it, gives quite good results. Whether similar antennæ can be efficiently employed for transmission is a matter for further experiment.

I have for some time felt that it would be of very great interest if some authority like the Post Office, which has available many miles of overhead wires, would make some experiments at comparatively low frequencies. We know that Mr. Marconi, in his trans-Atlantic work, is working with frequencies as low as 50,000; high from the station engineer's point of view, but low from the wireless point of view. Now, an alternator for 10,000 or 15,000 frequency is not at all impracticable. Supposing an ordinary telegraph land line on fairly high poles, four or five miles long, was used as an antenna, and fed from a 10,000-frequency alternator, how would it behave as a wireless transmitter? There are reasons which make one think it might be satisfactory.

The radiation in wireless telegraphy is similar to light, therefore it is of interest to compare the human receiver of this radiation, namely, the eye, with the receiver of a wireless station.

According to some recent experiments by Messrs. Paterson and Duddell a light of 1-10th of a candle at a distance of a kilometer is near the limit of visibility. Assuming the square law, this corresponds to a candle-power of 2,560 at 100 miles. With our present incandescent lamps this would require 2½ kw. In wireless, to cover the same distance, it is usual to install what is nominally a 1½-kw. station.

Wireless time signals are regularly sent out each day from the Eiffel Tower and other stations for the use of ships at sea. In view of the fact that wireless signals are received practically simultaneously everywhere on the globe, they form, in conjunction with transit observations, a ready means for the determination of differences of longitude, to a high degree of accuracy. It is claimed that, in recent tests, using the signals sent out by the Eiffel Tower, differences of time were determined to an accuracy of 1-100th of a second, which corresponds to an uncertainty in position of only five yards at the equator. The surveying of difficult country may be expected to be greatly facilitated by this new means of determining the difference of time.

Of the sister science, namely, wireless telephony, there is not so much to relate. A certain amount of progress has been made, but the details of the methods used have not been made public. The difficulties are mainly in the transmitter. First, we require a perfectly steady source of continuous oscillations, and, secondly, a microphone capable of modulating the large powers required to transmit any distance. Over short distances of a few miles there are no difficulties. It is only when we come to distances of fifty to 100 miles that the engineering problems become troublesome. In view of the progress that is being made in the high-frequency alternator, and of how much more easy it is to modify the power given out by an alternator, it will not be surprising if as soon as high-frequency alternators are in use wireless telephony over comparatively long distance becomes a working possibility.

Retirement of Mr. T. J. Bishop.

The retirement of Mr. Thomas J. Bishop, operator for the *Baltimore Sun*, Baltimore, Md., which was briefly announced in our issue for December 16, 1912, revives many recollections among his former associates of his fame and achievements. He was one of the most brilliant and popular operators twenty or thirty years ago, when skill was counted for what it was worth. There were no typewriters and sending machines in those days, and an operator's skill was measured by his ability to transmit by hand clearly at a high rate of speed and copy received matter by hand in a like manner. Mr. Bishop was an expert at both.

He began his telegraphic career in 1861, in Baltimore, Md., and afterwards went to New York, at the old 145 Broadway Western Union office, where he soon became classed with such experts as P. V. De Graw, now Fourth Assistant Postmaster General at Washington, Walter D. Phillips, H. A. Wells, Fred. N. Bassett, E. A. Leslie, and many others who achieved national fame.

Mr. Bishop was one of the original eight operators who were selected on account of their skill to man the first leased wire of the Associated Press, which ran between New York and Washington. He was sent to the Baltimore office and has been in that city ever since.

Mr. Bishop has always been a hard worker, and his rest is well earned, after being in harness so many years. He worked alongside of Mr. Thomas A. Edison in New York for a long time.

Mr. Bishop feels that he has earned a rest, and says: "I'm going to loaf, and when I get tired of loafing, I am going to loaf some more."

Western Union Bridge Duplex.

(Continued from page 837, December 16, 1912.)

Each condenser used for this purpose consists essentially of two conductors of such form as to have very large superficial areas, separated from each other by a very thin insulating material; the two conductors are usually of tinfoil, the insulator being paraffin paper. By rolling or piling up a large number of sheets of these substances in the proper order, and connecting together the alternate sheets of tinfoil to form the two terminals of the condenser, it is possible to build up in a small box a capacity equal to that of many miles of line wire. The condensers connected to the artificial line must not only accumulate a quantity of electricity corresponding to the static charge of the main line, but must accept this charge at the same rate as the similar charge passes into the main line, and in discharging, must also act in unison with the main line capacity. To ensure this, each of the two condensers of the artificial line is connected to it through an adjustable resistance, generally termed a "retarding" or "timing" resistance. By varying these resistances, the speed with which the condensers are charged and discharged can be regulated to correspond with line conditions. The arrangement of the entire artificial line is shown in the theoretical diagram, Fig. 10.

LOCAL CIRCUITS. It is, of course, necessary to apply a local circuit containing a sounder to the contacts of each of the polar relays shown in Figs. 6, 7, 8 and 9, in order that the receiving operators may read the signals. It has also been found impracticable to have the sending operators' keys connected directly to the main circuit and generators, as shown in those figures; instead, the keys are connected in local circuits where each controls the operation of an electro-magnetic "pole-changer," which, as its name implies, connects the proper generator to the circuit in response to the signals made upon the key. The arrangement of the local circuits of a duplex set is shown in Fig. 11. It will be seen that these circuits are not wired directly from the duplex set to the keys and sounders of the operating sets mentioned, but instead are terminated in a "Loop Switchboard." This permits any operating set or duplex loop to be connected to any duplex set, which facilitates the handling of varying amounts of traffic under the many different circuit conditions that arise in everyday service.

BRIDGE COILS. One of the greatest advantages of the duplex system described lies in the arrangement of the bridge coils, or arms, marked BC_1, BC_2, etc., in Figs. 1 to 9. Instead of being ordinary non-inductive resistances, the two 500-ohm coils for each duplex set are wound upon a ring-shaped core of soft iron wires, the entire 1,000-ohm combination being known as a WE-5-U retardation coil. Because of its closed magnetic circuit, this coil offers great impedance to any current passing through it from one outer terminal to the other, e. g., from the point T to the point U in Fig. 8. The effect of inductance in a circuit is to slow down the rise and fall of current in that circuit; consequently, in this case, a current coming in over the line wire ML in the figure referred to at first meets with great opposition in its attempt to flow through the bridge coil BC_1, and as a result almost all of the incoming current rushes into the polar relay. This effect lasts only for a small fraction of a second, during which time the opposition to the current in BC_1-BC_2 gradually disappears and the currents in the various branches reach their steady values as given in Fig. 8. The brief initial rush of current through the polar relay is, however, sufficient to throw the armature of that instrument over, with a speed and precision out of all proportion to the smaller steady current passing through the relay during the remainder of the signal.

On outgoing currents, also, the WE-5-U retardation coil has a marked effect. The impedance offered to equal currents entering at the middle terminal of the coil (point S in Fig. 9) and passing out through the outer terminals (points T and U, Fig. 9) is very small, since the magnetic effect set up by the current in each half-winding tends to neutralize that of the other half-winding. It will be noticed, however, that in practice more current flows through one half-winding than through the other; the resulting impedance, while small as compared with that of the whole coil, as described in the preceding paragraph, is great enough to so graduate the rise and fall of the current sent to the line, that the inductive effects on neighboring circuits are considerably reduced.

USE OF EXISTING APPARATUS. For economical reasons it is desirable to utilize as much apparatus of the older types as may be available, wherever this can be done without sacrificing the efficiency of the circuit. Thus, for most circuits, the older types of polar relays are entirely satisfactory, and when such instruments are available, the new polar relays, 6-A, shall be ordered only for direct-repeating service and for terminal sets on long or otherwise difficult circuits. In the same way, the old style 3-mf. adjustable condenser, now known as 2-A, shall generally be retained and supplemented with the 1-mf. spark condenser. Where old-style condensers are not available, or where their use is seriously objectionable, because of limited space, the new-style combination condensers, 3-A, shall be used. Each of these combination condensers, as shown in Fig. 12, fulfils the same requirements as two 2-A condensers and 1-mf. spark condenser.

At repeater stations, where the pole-changers are operated only by the attendants' keys, the old-style "Walking Beam" pole-changers may be retained, but in most other cases the new-style pole-changers, 3-A or 3-B, are necessary.

MAIN POTENTIAL LEADS. For telegraph circuits the voltage selected should be sufficient to develop a working current of from sixty to ninety milliamperes in the main line under normal working conditions, when the pole-changer armature of one set is on its positive contact and that of the other set on its negative contact. In a well-balanced circuit this condition will be indicated by the mil-ammeter on each set showing a reading of eight to fourteen milliamperes.

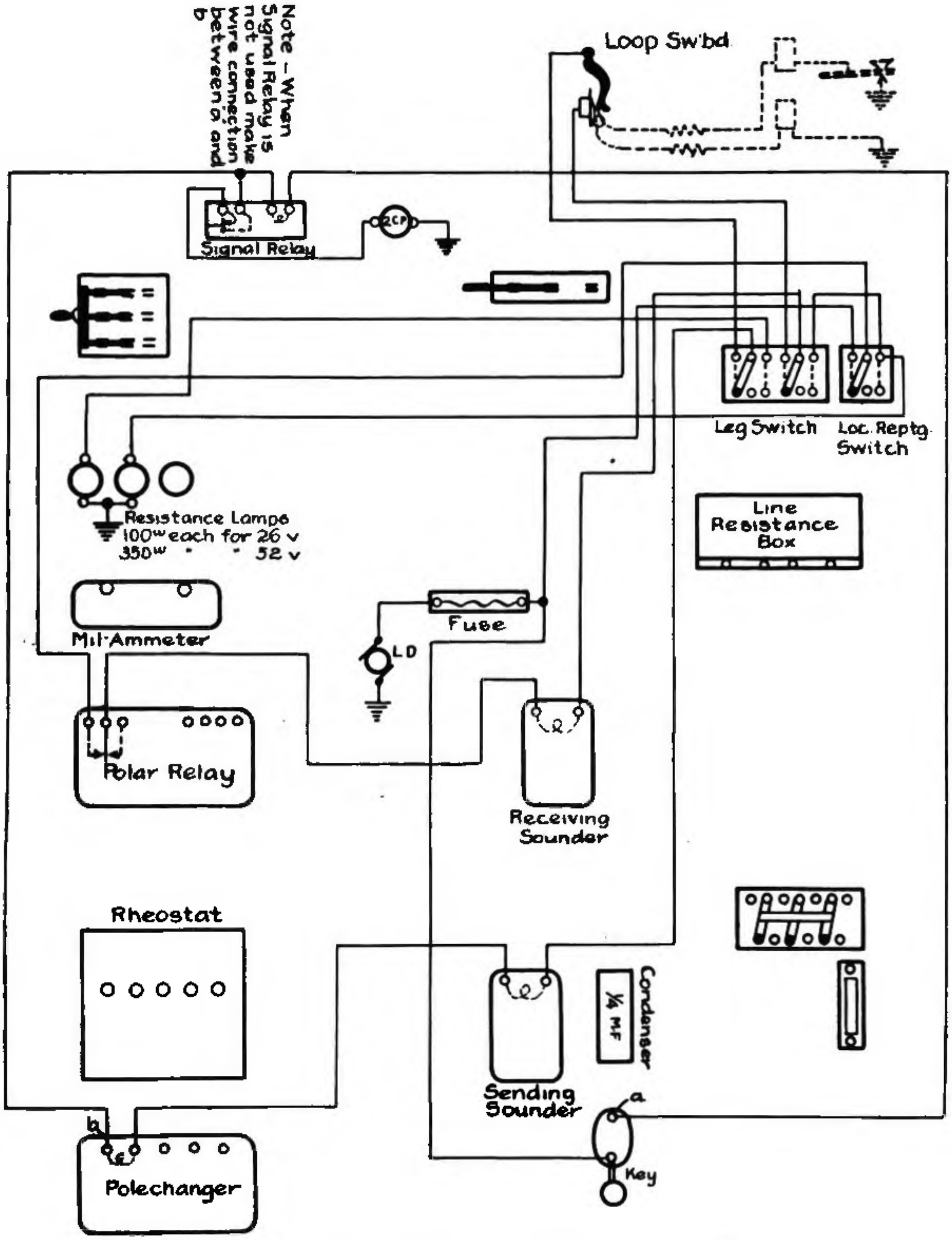


FIG. 11.—WIRING OF LOCAL CIRCUITS.

For telephone circuits—The potential shall in no case exceed 160 volts, this limitation being necessary as a precautionary measure against possible injury to the telephone plant.

RESISTANCE IN MAIN POTENTIAL LEADS. For telegraph circuits—The lamp resistance in the dynamo or storage-battery leads should approximate the value of two ohms per volt of the potential required, the lamp selections being made from the nearest resistances in the regular standard values.

For telephone circuits—One 180-ohm resistance lamp and a 3/10 ampere fuse in a W. B. G. fuse block shall be inserted in each of the dynamo leads.

WIRING. No. 16 B. & S. gauge rubber-covered braided office wire shall be used in the installation of duplex sets.

The unexposed wiring beneath the table shall be run loosely enough to permit each wire being traced by hand when necessary. Smooth holes in the woodwork, and enameled iron bridle rings, if required, shall be used to support such wiring. Where the wires must run together in an exposed location, they shall be neatly formed into a cable and either sewed together with waxed cable sewing twine or carefully taped. If such exposed runs exceed one foot in length the cable shall also be firmly strapped or tied in place on the supporting structure.

In general, it is undesirable to make any splices in wires; if such splices cannot be avoided the joints shall be carefully soldered, using a rosin flux, and thoroughly taped.

ARRANGEMENTS FOR VARIOUS LOCAL CIRCUIT VOLTAGES. The accompanying drawings of local circuit wiring are based upon the use of eight-ohm pole-changers and four-ohm sounders, in connection with a local dynamo or battery of twenty-two to thirty volts.

The same instruments may be used with voltages below twenty-two or above thirty, if the operating current in each case is maintained at about .25 ampere by substituting suitable resistance lamps for the ones shown in the drawings. These low-resistance instruments shall also be used generally without resistance lamps where the local circuits are operated by "gravity" or other primary batteries.

Under some conditions, however, it is more satisfactory and economical to operate the local apparatus on a current of approximately .11 ampere. Twenty-six-ohm pole-changers, fifty-ohm sounders, and resistance lamps of various values are provided to meet these conditions, which are summarized as follows:

(a) Where the voltage of the local circuit is between eighteen and forty, and the only apparatus used is that contained in the multiplex set; that is, no additional legs or sounders are ever cut in at the loop switchboard or elsewhere. This condition often prevails at small stations having very few multiplex sets, and at branch or railroad offices remote from the generating plant.

It may be noted that 180-ohm resistance lamps should be used with the apparatus referred to on twenty-six-volt locals, and the signaling relay, etc., should be omitted.

(b) Where the voltage of the local circuit is forty or over, whether loop switching is done or not. For this case, the 1-ohm signal relay shown in the local circuit diagrams herewith, may be replaced with a four-ohm signal relay of the same type; and the twenty-six-volt signal lamp with a similar lamp of the proper voltage.

OPERATION.

THE POLE-CHANGER. The object of this instrument, as its name indicates, is to reverse the direction of the current, as may be required for sending signals. Almost any relay having an armature playing between two contacts might be used as a pole-changer, the electromagnet being connected in a local circuit with the sending operator's key, and the contact points connected to the positive and negative generators as per Fig. 10. It is necessary, however, that the interval during which the pole-changer armature passes from one contact to the other shall be as brief as possible. In addition to making the space through which the armature travels at this time as small as is practicable, it is therefore desirable that the speed of travel shall be very high. In the 3-B pole-changer, as shown in Fig. 12, this is accomplished as follows: Two electromagnets are provided, one on each side of the armature, and both are connected in series in the local circuit. The cores of the front magnet, however, are carefully laminated, which makes that magnet "quick acting," while solid cores, surrounded by copper sleeves, are used in the rear magnet to make it slow acting. A light retractile spring is attached to the armature to hold it on the back contact when the local circuit is open. When the local circuit is closed by the operator depressing his key, current flows through both the magnets of the pole-changer, but the front magnet exerts its attraction slightly in advance of the rear magnet and thus pulls up the armature to the front contact. Soon afterwards, the rear magnet becomes fully energized, but cannot pull back the armature because the latter is now much closer to the front magnet. When the local circuit is opened, however, the magnetism in the front magnet falls very rapidly, while that in the rear magnet dies away quite gradually; as a result, the front magnet releases the armature while the rear magnet is still capable of pulling it back, and the armature is thrown over to its back contact much more swiftly than if the retractile spring alone were depended upon for this action. In adjusting this instrument, an air-gap of about 1/64 inch should be left between the armature and the front magnet cores when the former is in the closed position. The rear magnet is arranged to move backward and forward under the control of a thumb-screw, and should be adjusted to such a point that, with current in the magnets, the armature will have a slight bias toward the front contact when centered by the finger. The retractile spring will still prevent any shivering of the armature lever on its back contact when it has been pulled over there by the opening of the local circuit. The play of the armature lever between its contact points should be as small as practicable. It

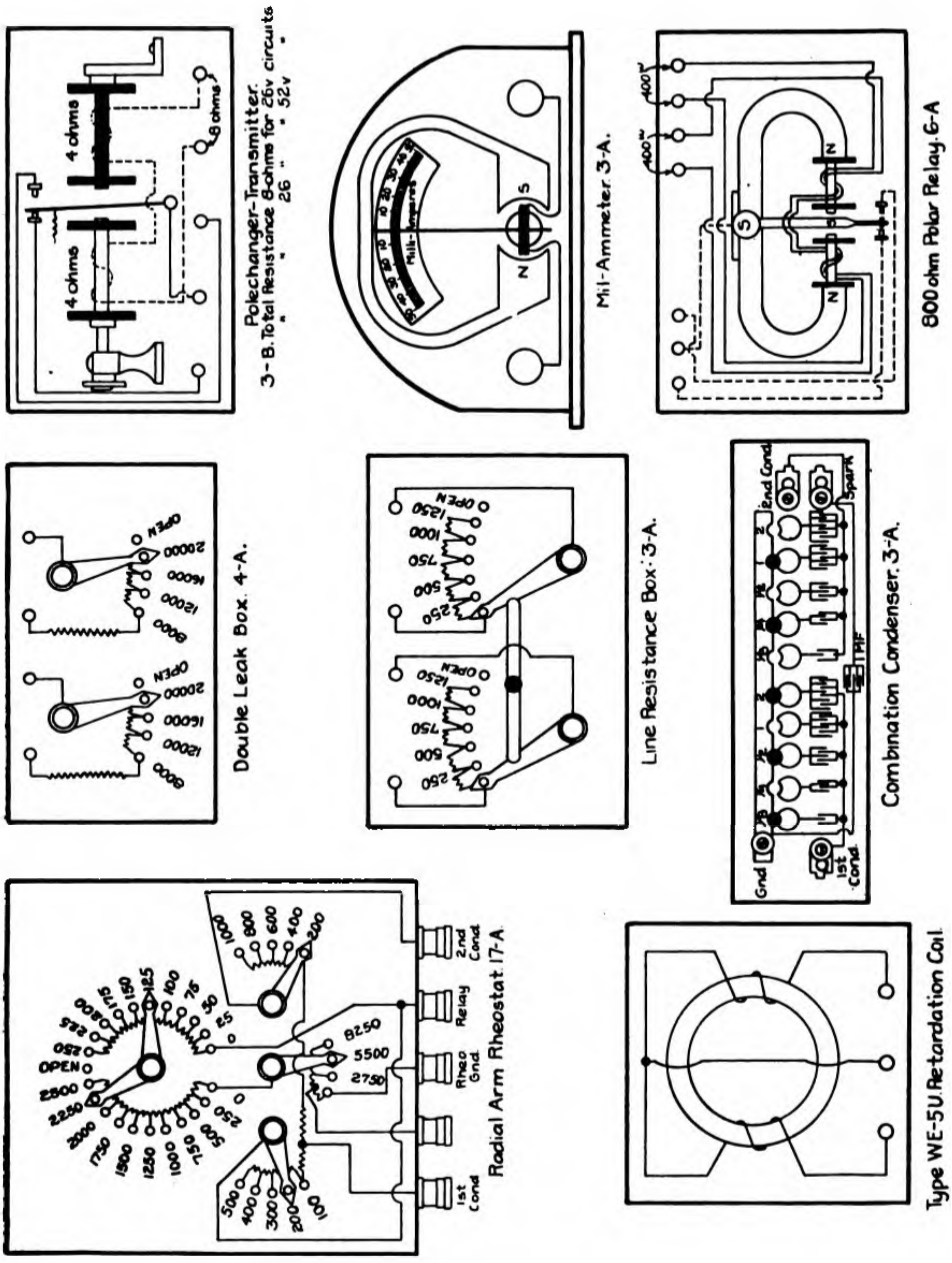


FIG. 12.—BRIDGE DUPLEX APPARATUS

should be noted that, because of the construction of this type of pole-changer, the firmness of the contact between the armature lever and its front stop cannot be as easily gauged by the finger as with some other types; for when an attempt is made to pull the armature back, the attraction of the rear magnet assists in the attempt, and this sometimes gives the false impression that the marking signals are not being firmly made.

(To be Continued.)

Automatic High-Speed Wireless Transmission.

"A demonstration of high-speed automatic transmission was recently given at the Marconi Works, at Chelmsford, England, to representatives of the British Post Office, the Admiralty, the War Office, Colonial Office and the Crown Agents for the Colonies," says *The Marconigraph*. The speed signals were transmitted from Poldhu, Cornwall, where other representatives of the government were present, and these were received and recorded at Chelmsford both by means of a recorder on the principle of a gramophone, and printed on tape. It was demonstrated that by this means signals could be received at a high rate of speed on a recording cylinder—the cylinder being afterwards caused to repeat the messages at a rate of speed sufficiently slow to enable the operators to read them; while by the other method a printed tape left the receiver, recording the messages as they were received.

Transmitting was done at Poldhu with the new synchronous disc discharger, which was worked from the Wheatstone automatic transmitter through a special relay. No troubles were found in working the transmitter at speeds of over fifty words per minute. At Chelmsford, where a single wire aerial was used for receiving, the maximum signals were very strong on ordinary wireless receivers, but for the purpose of the demonstration they were reduced to medium signals.

The photographic reproducing apparatus consists of a string galvanometer, and an optional arrangement for projecting the shadow of the string on to a narrow slit behind which sensitized paper is passed at a speed which is determined by the rate of working required. The effect of the signals on the galvanometer is to move the string, and throw a shadow more or less to one side, while the signals are actually coming through. A white line is produced on the dark ground of the sensitized paper, and the deflection of this line shows the signals.

Another type of tape was obtained by screening the slit from all light, with the exception of the place normally occupied by the shadow of the string. The effect of the signals is to move this shadow and allow a small point of light to fall on the sensitized paper, which brings out the Morse signals as black dots and dashes on a white ground. The string galvanometer can be operated direct from the receiving circuits, but it is preferable to operate the galvanometer through a special relay, which gives steadier signals and a better speed. On emerging from the slit the sensitized paper passes through a series of developing, fixing and washing baths, and is delivered outside the machine one minute after being exposed, when working at a speed of fifty words per minute. The sensitized paper is put in the machine on spools of 1,000 feet each, which is sufficient for 5,000 words. At the demonstration perfect signals were shown with both kinds of tape at a speed of fifty-five words per minute.

Another method of recording signals received was based upon the gramophone principle. For recording by this method the signals are magnified and caused to act on a loud-speaking telephone. The effect of this is that signals which are only of medium strength on the usual wireless circuits are heard with ease on the special telephone at a distance of fifty feet away, and on the occasion of the demonstration the signals were heard by everybody in the room. The signals were recorded on a cylinder at the rate of fifty-five words per minute. When the cylinder is full, all that is necessary is to place it on another machine, which can be set to run at a slower speed, so that the signals can be read with ease.

Boston Western Union Chapter.

The regular monthly meeting of the Western Union Chapter of the Telephone and Telegraph Society of New England was held in Edison Hall, Boston, Mass., Thursday evening, December 5, over one hundred persons being in attendance.

The principal speaker of the evening was Mr. A. C. Kaufman, division cable manager, New York, who outlined the progress made by the company in the past two years. He dwelt especially upon the cooperation shown by the commercial, traffic and plant departments, and dwelt at length upon the pension plan which went into effect January 1. His remarks were enthusiastically received, and a rising vote of thanks was tendered to him at the conclusion of his address.

Other speakers of the evening were Mr. Allan Woodle, of the New York office, former manager of the Boston office; Mr. W. S. Barker, district plant superintendent, Mr. C. F. Ames, district commercial superintendent, and Mr. L. D. Wilbourn, district traffic superintendent, Boston, and Mr. F. W. Barth, manager. An entertainment followed the addresses.

Mr. C. R. Sollero is secretary of the chapter.

MILITARY TELEGRAPH CORPS.—The minutes of the thirty-first reunion and fifty-first anniversary of the Society of the United States Military Telegraph Corps, held at Jacksonville, Fla., October 22-24, have been issued in pamphlet form. Portraits of the officers, members of the executive committee and honorary members are given. The pamphlet is well gotten up, being printed on coated paper and provided with a neat cover. Mr. David Homer Bates, 658 Broadway, New York, is secretary.

The Influence of the Telephone.

At the second convention of the Telephone Pioneers of America, held at the Hotel Astor, New York, November 14, 1912, Mr. S. G. McMeen, the well-known inventor and author, of Chicago, made an address that was full of interest.

Speaking of the solidarity of the telephone business, he said: "I have seen, and you have all seen, examined and talked to other people about why they did not leave the telephone business, why they staid in it, and always you got the same answer, more or less crudely expressed, that 'we went into it because it was so extraordinarily interesting, and staid in it for the same reason.'"

"It was all prophesied for us long before, when Bacon said, 'First there be three things that make a nation great, fertile soil, busy workshops and quick and easy means of transportation of men and goods from place to place.' And I think that Sir Francis Bacon was not at all wrong in connection with that thought, but the ripening of his mind caused him to say it; and I think that, the alphabet and printing alone excepted, those inventions have done most for civilization which have tended to abridge distance, and in the latter definition he includes all the former, and yet carried it much farther forward. Little had men done to abridge distance other than in transportation at that time. The most that has been done to abridge distance is represented by our own allied arts, by the consummation of the efforts of those people who saw visions and got a whisper of the unknown things and reached out into the unknown and brought that back into concrete form and gave it to us; and so we went on, great and humble, to make our individual contributions to that art. There was one who might be called a pioneer now, a gentleman by the name of Swanson, who followed his avocation in our art over on the other side of the river, and he became a very great expert in it, and showing what the power of the human mind in the way of interest will do, his great expertness lay in his ability to superintend a small shed in Menlo Park, in which shed was located a considerable battery of kerosene lamps, of which the wicks were turned quite high, so that they smoked profusely on the inside of the chimney, collecting that wonderful substance which, when pressed into cakes, became the buttons of Edison's carbon transmitter. These lamps in time became heated and, with more or less regularity, some one of them would catch fire, and Swanson carried the record for a considerable time of being able to locate the flaming lamp and cast it forth in less time than anybody else who had charge of that shop. So, from him on, there have been interested ones who have made their contributions to an art which is so complex that it is a problem to condense the names of telephone subscribers into a directory small enough to be usable, and yet there are people who try to memorize the contents of those great volumes. We had a lady who was in the habit of depending on her memory, and she wanted to go to a formal function, and, after calling the number by memory, she said, 'Doctor, I know I have been ill, but I am considerably better, and I want to go to a function to-night and wear a low-cut gown,' and the answer came, 'Madam, we don't care what you wear; this is the Lake Shore Freight Yards.' (Laughter.) I only cite that and the next one I shall cite, as mere examples. I would not for worlds be frivolous upon this subject, but the next instance shows that new burdens are brought upon mankind by an increase in the conveniences of life, and I sometimes seriously question whether the contribution we have made, to which we were attracted as a scientific thing, not a social thing, the marvel or the toy which all the world admitted it was at the outset, we didn't see far enough forward to see what a profound influence this was going to have upon humanity. The influence has been profound, however, whether for good or not, and it has speeded up everything. They used to say pretty generally, 'while there is life there is hope,' but in Chicago they have revised it and say 'while there is life there is haste, and what is between us is in the way.' The next one indicates how the multiplication of a good thing may be harmful, and I submit it for your serious consideration. As the vice-president has read to you, I had the fortune to join forces with Dr. Kempster B. Miller, who is an author on this subject and a somewhat serious-minded person, and there we found ourselves early in that work in need of a third person's assistance in the way of a small boy who would do various things, and we advertised, and among the responses was one which attracted us, the mental picture, as we read it, being a small boy with red hair. It read like this: 'Gentlemen, I am an orphan and need the money, and it beats the devil how hard times is.' So we wrote him, and he came and turned out to be just what we thought, and we instructed him carefully and seriously. There were two telephones in the office at that time, both upon the wall, leading through different systems to a larger or smaller group of possible correspondents. To him we said, "When anyone calls, there are two things to be investigated and reported; first, who is wanted; and second, upon which telephone shall the person respond?' as there was a journey to make and one of them to answer upon. So the boy put that down on a tablet of his memory, and presently came to Mr. Miller, saying, 'A lady wants you on the telephone.' Seeing his instructions forgotten so soon, Mr. Miller turned and said to the boy with some show of resentment, 'Which one?' To which the boy responded, 'I don't know, sir, but I think it's your wife.' (Laughter.) And that is what makes me think that, perhaps, as we look long into the future and the expansion of these things with the inspiration we all feel carrying us forward, we may get a social condition which, when all the people of all the earth may be reached, there may be some complications and difficulties. And yet we, whose technological zeal was attracted by this marvel, as we look about in the faces of our acquaintances, see very many who came to this art not because it was of such great social benefit. We are all perfectly willing to benefit others and ourselves along with it, but the art was not born for the purpose, as far as we were concerned, of the social benefit it conferred on humanity, but rather because it was useful to others and interesting to ourselves, but that led to the point of social usefulness, as latterly we are beginning to see, and I never felt how great a thing it was that was done until having gone to Boston with more or less hopefulness to that meeting from which most of us expected relatively little when we went on—we were going to fraternize and meet each other. And yet no man or woman went away from that marvelous meeting a year ago without a feeling of inspiration that a great number of good people were doing the same sort of thing and thinking the same thoughts, and after we heard the wonderful speeches that we heard, and which will be handed down to posterity—I'm making one of them now (laughter)—and yet, as we look back on our performances, we must not forget what is to be done; I feel that there are more marvellous things to be performed in the future than have been done since the first great thing was done, and we can talk hope and see hope; there's no use thinking that the great things have all been done, and when we look back on what has been done we can be modest in the face of the things to come.

Christmas and New Year's Greetings.

We have received Christmas and New Year's greetings from many friends in all parts of the world.

The London staff of the French Cable Company sent us a photograph showing the members of the force. It is reproduced herewith. The names of the gentlemen shown are as follows, from left to right:

LONDON STAFF OF FRENCH CABLE COMPANY.

Messrs. Faulkner, Goodman, Gerhold, Julia, Mullin, Penny, Meyrick, Sims, Hall, Blower, West and Lamble (in the doorway). Mr. W. W. Howell, the company's representative, is shown in the vignette on the column.

MR. JOHN W. KELLY, JR., chief of electrical bureau, Camden, N. J., and president of the International Association of Municipal Electricians, sent a photograph of himself with his holiday greetings.

MAJOR JOHN EGAN, the well-known old-timer, of San Francisco, Cal., extends through us to all readers of TELEGRAPH AND TELEPHONE AGE his best wishes for a happy New Year.

Other greetings came from Mr. H. A. Tuttle, president and general manager of the North American Telegraph Company, Minneapolis, Minn.; Mr. and Mrs. F. W. Jones, West Palm Beach, Fla.; W. P. Cline, superintendent of telegraph, Atlantic Coast Line, Wilmington, N. C.; J. W. Freeland, a former military telegrapher, Marion, Ohio; G. W. Swan, representative in Buffalo, N. Y., of John A. Roebling's Sons Company, of New York; R. W. A. Horner, Western Union Telegraph Company, Lynchburg, Va.; Commercial Cable Company, New York; G. E. Sornberger, Williamsport, Pa.; Mr. and Mrs. W. C. Marshall, Toronto, Ont.; S. M. English, president and general manager, Postal Telegraph-Cable Company of Texas, Dallas, Tex.; J. B. Dillon, Western Union Telegraph Company, Dallas, Tex.; L. C. McIntosh, Southern Pacific Railway Company, Los Angeles, Cal.; Louis Caspar, superintendent of equipment, Western Union Telegraph Company, Dallas, Tex.

BROKER TELEGRAPHERS.—The Association of Broker Telegraphers of New York will hold its annual meeting at the Astor House, January 10. Mr. Chester L. Hall, 52 New street, New York, is secretary.

MILITARY TELEGRAPH CORPS.—The statement of Colonel William Bender Wilson, president of the Society of the United States Military Telegraph Corps, before the United States Senate committee on pensions, Washington, D. C., in support of the Senate military telegraph pension bill, has been printed in regular form by the committee.

TELEGRAPHIC KISSES PROHIBITED IN RUSSIA.—The Russian Ministry of Posts and Telegraph has promulgated the new law against code messages by an order commanding all the employes of the telegraph department to take unusual vigilance in receiving dispatches which may seem to contain code words. A young woman, in sending a telegram to her husband, finished it with "10000 x"—the x meaning kisses. The censor, suspecting it to be part of a plot against the government, suppressed the "10000 x."

MR. H. SCRIVENS, superintendent of the Postal Telegraph-Cable Company, Pittsburgh, Pa., in renewing his subscription, writes: "I am very much interested in your publication, and it is always a welcome visitor. I shall be pleased to do everything I can to increase its circulation."

The Railroad.

Mr. W. W. Ashald, superintendent of telegraph, Grand Trunk Railway System, Montreal, Que., was a New York business visitor on December 18, 19 and 20.

Death of A. R. Swift.—Asa R. Swift, aged 73 years, formerly superintendent of telegraph of the Chicago, Rock Island and Pacific Railway, Chicago, Ill., died in that city December 12. Deceased was born in Phelps, N. Y., in 1839. In 1858, he entered the service of the Chicago, Rock Island and Pacific Railway Company, in Chicago, as clerk and operator to the president. He was appointed superintendent of telegraph of that road in August, 1867, and retained this position until his retirement a few years ago. Mr. Swift was president of the Association of Railway Telegraph Superintendents during the years 1886-1887.

Wireless Experiments on Union Pacific.—The Union Pacific Railroad Company on December 23 applied to the Department of Commerce and Labor at Washington for a license to operate and maintain a wireless telegraph system along its lines. The company wishes to install an experiment station, and the Government is requested to give permission for such a station. Several wireless stations, it is stated, will be constructed when the license is issued.

Municipal License Tax on Telegraph Companies.—The right of municipalities to impose a license tax upon telegraph companies was denied by the Supreme Court of the United States, December 23, in the case of D. G. Williams, manager for the Western Union Telegraph Company at Talladega, Ala., against that city.

Telephone Dispatching on Grand Trunk System.—The Grand Trunk Railway System is stringing five telephone train-dispatching circuits between Montreal and Chicago by way of the Fifteenth District, between Toronto and Sarnia. The circuits are metallic throughout and consist of No. 9 copper wire, Western Electric apparatus being used. Circuit No. 1, from Montreal to Brockville, 125 miles, has twenty-six selectors on the line; the train dispatchers will be located at Montreal. Circuit No. 2, Brockville to Toronto, 210 miles, with thirty selectors, and train dispatchers at Belleville. Circuit No. 3, Toronto to Sarnia, 169 miles, thirty selectors, with train dispatchers at Stratford. Circuit No. 4, Port Huron to Battle Creek, 160 miles, thirty selectors, with dispatchers at Battle Creek. Circuit No. 5, Battle Creek to Chicago, 172 miles, thirty-nine selectors, with dispatchers at Battle Creek. It is expected that these circuits will be ready for operation not later than February 15. The Grand Trunk Railway Company also contemplates adding materially to the telephone train-dispatching system, and expects to begin the installation of telephone message circuits during the year 1913. It is the intention to simplex the telephone circuits and use them for telegraph purposes. The company has just installed a terminal selective telephone-dispatching system in the Montreal yards, with nineteen way stations. Mr. W. W. Ashald, Montreal, Que., is superintendent of telegraph.

Radio-Telegraphy.

Wireless on the Lakes.—A wireless telegraph station is to be established at Oswego, N. Y. It will be ready for operation next summer.

Cadet Classes in Wireless.—Wireless equipment is being installed on the Massachusetts training ship *Ranger*, for the instruction of cadets in wireless telegraphy.

Wireless Operator Killed.—The operator in the wireless station at Norddeich, Germany, was killed December 24, it is supposed, by the high-tension voltage used at that station. This is believed to be the first case on record of a wireless operator being killed while on duty.

Wireless in Brazil.—Wireless stations have been installed by a French company at Fernando de Noronha, the Brazilian convict island, situated about 350 miles northwest of Pernambuco, and also at Olinda, a suburb of Pernambuco. The latter station has a range of about 500 miles or more.

Long-Distance Wireless.—The Sayville, L. I., station of the Atlantic Communication Company is in daily communication with steamers passing between America, Europe and South American ports. Communication has been had with a steamer at the Strait of Gibraltar, the wave length being 2800 meters.

Canadian Wireless Law.—A bill has been introduced in the House of Commons at Ottawa, Ont., requiring all Canadian and foreign vessels carrying fifty or more passengers and plying between ports 200 miles apart to be equipped with wireless telegraph apparatus. The bill applies to Lake and St. Lawrence River vessels, and will take effect April 1, 1913.

Government to Handle Commercial Wireless at Key West.—The first Government wireless station for the regular receipt of commercial messages is now open at Key West, Fla. It practically covers the Gulf and Caribbean Sea and the West Indian Islands, and will be the main point of wireless communication with the steamships bound to and from Cuba, Panama, Central and South America.

Jurisdiction of Inter-State Commerce Commission over Wireless Messages.—The Inter-State Commerce Commission at Washington, D. C., on December 13, ruled that under the act making telegraph and telephone companies common carriers, it had jurisdiction over wireless messages from a commercial station in the United States to a ship at sea, whether a United States or a foreign ship, but that it had no jurisdiction over messages between two American ships at sea.

Wireless Telephony.—Experiments have been carried out at Rome by the Minister of War with new types of transmitter and water microphone, the inventions of Profs. Moretti and Vanni respectively, with a view to opening telephonic communication with Tripoli. Various wireless stations were telephoned to, and communication, it is stated, was successfully established. The results of the experiments have decided the War Department to appropriate the inventions for exclusive military use.

THE WORLD'S WIRELESS STATIONS.—According to the statistics of the International Wireless Bureau, the wireless stations established in the different countries of the world, up to July 15, 1912, numbered 1,188 on warships, 1,262 on merchant ships, 371 on land for public service, and 114 on land for military purposes. Of these, Great Britain had 455 stations on merchant vessels, and 43 public land stations; Germany, 206 and 22; United States, 253 and 142. To these must be added 58 stations in various colonial possessions.

DR. LEON CHAFFEE, of Harvard University, Cambridge, Mass., has devised a new type of wireless telephone, presenting many points of practical simplicity and efficiency. In a recent test, conducted at the laboratory of Mr. John Hays Hammond, jr., at Gloucester, Mass., Professor G. W. Pierce, of Harvard University, carried on a satisfactory conversation with the Harvard laboratory for a long period of time. The distance was about thirty-five miles, and the power used in transmitting from the Harvard laboratory amounted to only six watts in the antenna. In spite of this small power, the articulation and strength of sound received at the Hammond laboratory exceeded expectations. The whole apparatus is so compact that it was brought to Gloucester in a hand-bag and was set up and operating within fifteen minutes.

Obituary.

JAMES M. DARLEY, aged 50 years, formerly an operator at Augusta, Ga., died December 6.

GEO. H. WHEELOCK, aged 62 years, formerly manager at Ottumwa, Iowa, for the Western Union Telegraph Company, died at Sawtelle, Cal., November 10.

DR. S. C. OOBORNE, age 70 years, identified with the main office of the Western Union Telegraph Company, New York, for many years past, and who was recently retired on a pension, died on December 11.

DENNIS NUNAN, aged 54 years, died at his home in Morristown, N. J., on December 22. Mr. Nunan was well known to the telegraph and telephone interests, having supplied them with much of their hardware during the past twenty-five years.

PROF. ANDREW JAMIESON, aged 63 years, a well-known English electrical engineer, author and educator, died in Glasgow, Scotland, December 4. He assisted in the laying of the submarine telegraph cables on the coast of Brazil, and was afterward chief electrician of the Eastern Telegraph Company under Sir John Pender and Sir James Anderson.

JAMES F. GORMLEY, aged 76 years, a well-known old-time printer-operator at Boston, died at Canton, Mass., on December 11. He was one of the best known of the printing operators in the Western Union service. He was retired on a pension ten years ago. Mr. Gormley was well known in New York, Philadelphia, Baltimore and Washington, at which points he worked during his fifty years of active telegraph service.

UNDERGROUND TELEGRAPHS IN SCOTLAND.—Efforts are being made to have the underground system of telegraphs extended from Edinburgh to Dundee and Aberdeen, Scotland.

Telegraph and Telephone Age Subscription Contest.

The subscription contest for TELEGRAPH AND TELEPHONE AGE, started in November, is growing in interest, and subscriptions on this account are coming in rapidly. It is open to our regular agents, and any one else who wishes to become an agent and join in the contest can do so by applying for an agency where we are not at the present time represented.

According to the original offer, sixty dollars in cash will be distributed to those of our regular agents who send us the largest number of new subscriptions and renewals during the months of November, December and January. The prizes are as follows: First, $25; second, $15; third, $10; fourth and fifth, $5 each.

The contest is limited to new subscriptions and renewals only, and does not include orders for books or merchandise.

The contest to date stands as follows: Mr. H. H. Dengler, Postal, Chicago, Ill., $57; Miss M. Wright, Western Union, Chicago, Ill., $30; Mr. C. F. Bartlett, Postal, St. Louis, Mo., $27.75; Miss G. G. Amber, Western Union, Philadelphia, Pa., $26.25; Messrs. W. C. Hair, Western Union, Atlanta, Ga., $17.75; L. A. Ott, Postal Company of Texas, Dallas, Tex., $13.50; J. A. Vogt, Postal, Baltimore, Md., $13.50; W. W. Umsted, Western Union, Omaha, Neb., $10.50; C. W. Alexander, Western Union, Kansas City, Mo., $9.75; R. J. Ramsey, Michigan Central R.R. Co., Jackson, Mich., $9.25; P. G. Galbraith, Canadian Pacific Railway, Toronto, Ont., $8; A. E. Krumling, Western Union, Toledo, Ohio, $7.50; W. E. Brooks, Western Union, Portland, Ore., $6.90; D. F. Brown, Western Union, Washington, D. C., $6; A. Watkins, Western Union, Richmond, Va., $6; R. W. Wells, Western Union, San Francisco, Cal., $6; J. F. Marshall, Western Union, San Antonio, Tex., $5.45; J. Rathbone, 195 Broadway, New York, $5.25; M. Ruberg, American Telephone and Telegraph Company, Philadelphia, Pa., $5; E. F. Kelley, Western Union, Duluth, Minn., $5; C. S. Rindfleisch, Postal, Cleveland, Ohio, $5; Chas. Weydman, Postal, Buffalo, N. Y., $4.50; B. A. Harris, Western Union, Memphis, Tenn., $3.75.

Write to J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, for fuller particulars.

IMPROVED ENGLISH TELEGRAPHIC APPARATUS.—Mr. Herbert Samuel, postmaster-general of England, recently stated that his department was experimenting between London and Liverpool with new machines which would send telegrams both ways simultaneously at the rate of 150 words a minute and transmit 1,000 telegrams an hour.

MR. W. C. LLOYD, superintendent of the Postal Telegraph-Cable Company, Atlanta, Ga., in renewing his subscription, writes: "TELEGRAPH AND TELEPHONE AGE gets better and better all the time. Being an old friend, I cannot afford to miss even one issue."

Telephone Pioneers of America.

P. T. REILLY.

Peter Thomas Reilly, special inspector of plant and station equipment of the New Jersey Division of the New York Telephone Company, with headquarters at Newark, N. J., entered the telephone service in April, 1887, as instrument installer and inspector for the Domestic Telephone and Telegraph Company, at Newark. Afterwards he became manager of repair shop, supplies and shipping for the New

P. T. REILLY, NEWARK, N. J. (1887)

Jersey Division of the New York and New Jersey Telephone Company at Jersey City, N. J., and later was appointed chief of the central office equipment and maintenance force, and then special pay-station inspector for the same company. Subsequently he was appointed supervising foreman of instrument installers, changing magneto equipment at sub-stations to the common battery system. His wide experience in practical equipment and installation work eminently fits him for his present position.

Mr. Reilly is a brother of the late J. C. Reilly, of Brooklyn, N. Y., who was vice-president and general manager of the New York and New Jersey Telephone Company.

Wireless in the Navy.

Wireless telegraph matters were given considerable attention in the recent annual report of Secretary of the Navy, Hon. George von L. Meyer.

"Improvements in the radio equipment of the fleet and shore stations as regards increased range and prevention of interference during the past fiscal year," he states, "have been made as rapidly as the appropriations permitted. The purchase of new radio apparatus conforming to the latest requirements is expensive, but the marked gain in efficiency makes such changes imperative.

"The high-power station at Arlington, Va., is now in operation, and messages have been exchanged with Key West and Colon. It is the first of the proposed chain of high-powered radio stations, the others to be erected on the Isthmus of Panama, on the coast of California, in Hawaii, Guam, the Philippines and Samoa. Valuable results as regards the control of the fleet at sea and widespread dissemination of time signals and storm warnings can be obtained when these stations are erected.

"The Navy Department is maintaining forty-one shore stations and six stations on light vessels. An expedition is now in Alaska modernizing and improving the older stations there and erecting a new station on the island of Unalga. The chain of Alaskan coast stations is, in conjunction with the inland army stations, of great importance commercially as an alternative means of communication in case of breakdown of the cable or land telegraph lines.

"As Congress has enacted legislation regulating radio-telegraphy and making obligatory the opening of certain designated naval radio stations to paid commercial business, the radio work and expenses of the department will be largely increased. It will be necessary to modernize and improve the apparatus of coast stations so that the commercial work may be successfully handled. But the added work will undoubtedly prove an incentive to increased efficiency and will bring the naval stations into closer touch with commercial companies and their methods of operation, which, it is hoped, will mean a better appreciation of each other's work and cordial co-operation in regulation and the minimization of interference.

"With the assignment of two officers for the administration of this rapidly expanding branch it becomes possible for the first time to foresee a time when other and intrinsically more important features of this activity will be upon a satisfactory basis. These features relate to the development of radio for tactical purposes, experimentation in connection with purely naval needs, proper supervision and training of operators, and the standardization of material and operating methods."

LONG-DISTANCE WIRELESS TELEPHONE AT SEA.—During a recent trip of the steamer *San Jose* from Panama to San Francisco, Cal., the wireless operator, it is stated, distinctly heard conversation while he was taking a message. The ship was at the time off the Lower California coast. The conversation, it is thought, came from a test of a wireless telephone system between Catalina Island and the mainland of California, 150 miles distant. Music from a phonograph was also heard, and it is stated that some of the passengers on the steamer danced around the deck to the tunes.

Mr. J. J. Cochrane, manager of the Postal Telegraph-Cable Company, Produce Exchange office, New York, writes: "I do not know what your present politics may be, but, judging by your journal, you are in the front rank of the progressives, and the great success you have made of it is a matter of personal pride to those of us who were in at the birth of the paper, and I am sure the profession in general shares equally in this opinion."

Messrs. O'Brien, Foley and Hill Before the Northern Pennsylvania Telephone Society.

At the November meeting of the Northern Pennsylvania Telephone Society, at Wilkes-Barre, Pa., addresses were made by Mr. Richard O'Brien, traffic supervisor, Western Union Telegraph Company, Scranton, Pa.; Mr. L. B. Foley, superintendent of telegraph, Lackawanna Railroad, New York; and Mr. John A. Hill, of the general superintendent's office, Western Union Telegraph Company, New York.

In speaking of his early career, Mr. O'Brien told how he entered the telegraph service. For the privilege of practicing after 9 p. m. in the Pennsylvania Railroad Company's office at Downingtown, Pa., he swept and dusted the office before leaving it. His first position as operator was at Paoli, at a salary of $25 per month, twelve of which he paid for board, $12 were sent to his mother, and he kept one dollar for pocket money.

"The telegraph was a miracle in those days," he said, "and I had many funny experiences. I will give you just one example: At Paoli I had to remain up to report the fast line east at 11 p. m.; the office was in the waiting room of the hotel alongside of the track. One night a couple of countrymen entered the room and began quarreling because one claimed the other had left his new pair of boots on the train. I stepped out to close the shutters for the night and stumbled over a pair of boots. When I returned I told them to stop their quarreling and that I would telegraph the conductor to return the boots at once. They said, 'You cannot do it; that train does not stop until it reaches Philadelphia.' But I told them that did not make any difference to me. I pretended to send the message and then told them that the conductor had received it and had thrown the boots at the wires; that I could feel them rushing back, and if they would hurry out to where the wires entered my window they could hear them fall off. Their faith was beautiful to see. They hurried out and soon returned with the boots, swearing that they heard them drop off the wires just before they reached the window."

Referring to his telephone service, he said: "About the time that the exchange idea was assuming practical shape the Western Union Telegraph Company and The Bell Telephone Company concluded an agreement by which the telephone business would thenceforth be handled exclusively by The Bell Telephone Company.

"As soon as I heard of this agreement I took the first train for Boston and obtained an interview with Mr. Theodore N. Vail, then, as now, the guiding star of The Bell Telephone Company. He said: 'Mr. O'Brien, you have not been handling our private-line business at Scranton.'

"I replied, 'No, Mr. Vail; but now that the telephone war is over I supposed that you would want a good worker to represent you in northeastern Pennsylvania; and as I, with an inferior telephone, have built and equipped the private lines and rented 120 sets of instruments, while your agent has only rented eleven sets, don't you think that I am the man to handle your business'?

"He looked at me with a merry twinkle in his eye, as much as to say, 'Well, young man, I like your assurance.' But what he did say was, 'Excuse me a moment.' He went out, and when he returned he said, 'Mr. O'Brien, we had about decided to give the Scranton contract to Hon. George M. Beeby, of Monticello, N. Y., whom we know well and greatly esteem, but you have impressed us so favorably that I have directed it to be made out jointly to you and to him.' I returned to Scranton with a copy of the contract."

Mr. Foley spoke of the introduction of the telephone for train dispatching on his road.

"The Lackawanna Railroad Company," he said, "now has fifteen private branch exchanges, 4,000 miles of telephone circuits, 2,000 telephones in service, twelve phantom, ten simplex and two message circuits, also a telephone directory of seventy-five pages containing 1,800 names.

"Aside from the flexibility of the telephone and its efficiency in operation, its adoption has resulted in a great saving in operating expenses. The saving of time means a good deal in dollars and cents to a railroad having the density of traffic that the Lackawanna enjoys. The saving of an hour in opening the road after a wreck often means a saving of thousands of dollars. Our wreck trains are equipped with portable telephone sets, and are in communication with the dispatcher's office in five minutes after arriving at the wreck.

"The possibilities of the telephone in connection with train dispatching are now being considered favorably by all the railroads of this country, and each year shows a large increase in the number of miles of road using the telephone. On January 1, 1912, there were over 50,000 miles of road where the telephone is used exclusively for dispatching purposes.

"Since the telephone has been substituted for the telegraph in the dispatching of trains there has been a marked increase in the speed of second-class trains over the road. The dispatcher no longer waits for the operator to report the arrival of trains, but calls up the operator and asks if a train is in sight. The dispatcher has more time to watch and control the movement of trains.

"The cost of the installation of telephone circuits, which averages about $100 per mile, including selectors, may appear extravagant," he said, in conclusion, "but with us every dollar we have invested in our telephone circuits has repaid us in the reduction of yard expenses, the saving of overtime, and the prompt handling of traffic."

Mr. John A. Hill addressed the members on the handling of telegrams by telephone. He covered the period between 1892 and 1902, when he was manager at Newark, N. J., and the progress made by Mr. E. M. Mulford, the present division commercial superintendent, during and prior to 1908, when he arranged to handle certain telegrams by telephone.

"Prior to about three years ago," said Mr. Hill, "we did not handle any messages by telephone in the old Manhattan borough, principally for the reason that irresponsible persons could send telegrams and we had no means of collecting the tolls."

The speaker then showed the progress made since that date, and stated that the messages handled there by telephone have grown from nothing to 2,500 a day.

Mr. Hill gave figures showing gains over previous years of from 32 to 52 per cent. in the handling of telegrams by telephone.

"The proposition of combining the telephone and the telegraph," he said, "is a good one for both companies, their employes and the public. In this division there are now 875 independent offices in as many cities and towns, at some of which the revenue does not meet expenses or is insufficient to provide a satisfactory service. At many of the 3,444 railroad offices in this division we are unable to give satisfactory service on account of the multitudinous duties of the local agent. At many of these places the telephone company also maintains an office, exchange or agent, who has more than sufficient idle time to take care of our service, or where an assistant could be used to advantage in improving or extending the hours of telephone service, and where both companies can by a combination increase the efficiency and, in some cases, decrease the cost to both.

"It makes possible," he said, in conclusion, "the handling of telegrams to and from points where telegram offices have never been established, and we have accomplished something along the line of centralization in one or two sections by which one joint telephone-telegraph office is now handling the business for eight or ten adjoining towns."

In Defense of the Sending Machine.

BY A TELEGRAPH ENGINEER.

I was much interested in the article printed on page 814 of the issue of TELEGRAPH AND TELEPHONE AGE, dated December 16, under the caption, "Handling Messages Written in Spanish," written by a Western manager.

I can readily understand the difficulties which beset him, but I think his reference to transmitting machines is a little too severe. He speaks of the "bug fad." I do not agree with him that it is a fad, any more than a typewriter is a fad. Fads are ephemeral in their nature, but the so-called "bug" has come to stay with us, as has the typewriter.

Sending machines are all right if handled with common sense and judgment, but, like any other piece of apparatus, it may be abused, and, because it is abused by some thoughtless and over-ambitious operators, is no reason why it should be condemned. The "bug" affords much relief to the sender, but in order to get the best results from it he must use it properly. He thus not only makes the work easier for himself, but for the receiving operator as well.

Each operator using a sending machine should study it and understand it. True, it will work anyhow, but the point is to get the best work out of it, and, in order to do this, it should be thoroughly mastered. Each operator should know that when the instrument is properly weighted his sending will be firm and solid, and the receiving operator will have a sense of security that he could not enjoy if the characters came to him light and jerky, as they would if the "bug" at the other end were too lightly weighted.

A machine too lightly weighted is the exact counterpart of a "light" hand sender. The dots in each case are so light and short that they have not enough substance to carry them through to their destination, whereas firmly made characters, born of a good solid contact, reach the receiving end in good condition, and the receiving operator is not required to do any guessing.

Light characters will not pass through repeater points, and those in charge of repeaters can abundantly testify to the evils of light and jerky sending, whether by hand or by machine.

As to the origin of sending machines, Mr. Horace G. Martin, I think, is entitled to the credit for the invention and development of this useful device. It took a long time to introduce the instrument, and many hundreds of them had to be given away before its merits became known. His new direct-point Vibroplex is a great improvement in machines of this class. The dots and dashes are made on the same contact point, thereby insuring perfect signals, and they cannot be jammed together.

To sum up the whole situation, it should be remembered that the trouble is not with the sending machine, but with the man that uses it. If he does not use judgment the machine certainly cannot do it for him.

I think that if all purchasers and users of "bugs" would take the trouble to study the machine and understand its limitations and the value of maintaining the proper weights on the vibrating lever, then put this knowledge into practice, the complaints against these useful instruments would be very few, if any.

UNITED PRESS INCREASE SALARIES.—The United Press has granted another increase in the salaries of its operators, taking effect January 1. It establishes a minimum salary of $23.50 per week on all wires, with a maximum of $29.50. At the small offices the rate will be $23.50; second-class bureaus $25.00, and first-class bureaus and relay offices $29.50 for an eight-hour day. Men working long tricks, say from 8 a. m. to 6 p. m., will receive sixty cents per hour overtime, over eight hours.

MEASURING WIRE BY WEIGHT.—The custom of ordering wire by weight per 1,000 feet, or per mile, instead of by its diameter, is becoming quite common. The weight of wire in pounds per mile can be found by dividing the square of the diameter in mils by the constant 62.57; and conversely, the diameter may be found from the weight by multiplying the weight by 62.57, and extracting the square root of the number thus obtained.

MR. E. S. WILLIAMS, superintendent Postal Telegraph-Cable Company, Chicago, Ill., in renewing his subscription, writes: "I could not get along without TELEGRAPH AND TELEPHONE AGE. I have been reading it since 1884."

INDUSTRIAL.

Brach Hydro-Ground.

Good grounding means the securing of the lowest resistance contact between the conductor or ground wire and the earth itself, and it is only accomplished by a proper choice of location and method of grounding. When possible, grounds are placed in moist earth or located in soil high in mineral, having a natural advantage toward high conductivity. However, conditions like this are not easily found, and it is the usual practice to adopt a method of grounding which will make the best of the condition and afford reliable efficient conductivity.

HYDRO-GROUND.

To aid in securing the three necessary conditions to make a low-resistance contact with earth, the Brach "Hydro-Ground" is submitted. To secure the first essential, moist earth, the Hydro-Ground has three bowls, or cups, fastened to a center ground rod. This provides a means for rain-water as it seeps through the earth to be caught and retained within the grounding device itself. This water will remain in these bowls as long as the surrounding earth is moist. When, by reason of the hot sun, evaporation takes place and the earth becomes dry, there still remains for a long period a local moist area due to the water that will be given off by the bowls. To further aid in attracting and holding the water, small pieces of charcoal within the bowls are furnished with the ground and this is covered by a perforated metal screen. The perforated screen itself is intended to protect the space in the bowls from being displaced by the surrounding earth, so that ample water space may be retained.

The second feature, namely, area of contact exposed, is accomplished from the fact that these three bowls act as a layer of copper and have their upper and lower surfaces exposed toward the earth, so that for a given size hole a large area is in contact with the earth. In the case of a copper plate, the digging of a hole equal to its area would be necessary, or in the case of a cylindrical arrangement half the area would be faced toward the inside of the device itself.

The third essential, securing firm contact with the earth, is also taken care of in the design, as the gauge of copper used and the shape of the bowls are so re-enforced that the earth may be packed firmly around without bonding it or affecting it in any way.

The general construction of the "Hydro-Ground" consists of having the center rod sweated firmly to the three bowls and the rod itself being provided with a patented connector, affording easy means of joining a ground wire, and the securing of a reliable connection.

This "Hydro-Ground" is furnished by the L. S. Brach Supply Company, New York.

The Habit of Saving.

The wisdom of regularly laying aside a portion of one's earnings as a protection against possible reverses in the future is unquestioned. The same idea is practiced in all business enterprises, and, logically, it should be practiced by individuals.

Money, wealth, means, or whatever it may be called, is the power that drives the world's activities, and everyone that earns money can become wealthy in some degree, according to the manner of using his income.

Having earning capacity, the next thing is to save some of the money; second, is to place it where it will be safe; the third is to see that it works for you. Money is a willing servant; but, like all such helpers, must be treated properly. On another page will be found the advertisement of the Serial Building Loan and Savings Institution, one of the old friends of the telegraph and telephone fraternity throughout the country. It was established in 1885, and its annual dividend has never fallen below five per cent. In these days, five per cent. is very good return on money which is practically on tap, subject to the usual savings-bank rules.

Glass Insulators.—The Brookfield Glass Company has just issued a 126-page catalogue of its glass insulators, which it manufactures in a great variety. Perspective views of the different types of insulators are shown in the dark green color of the glass, and these are followed by full-size dimension diagrams, together with useful data. Tables of weights and packages are given at the back. The catalogue bears evidence of careful preparation, and the diagrams are shown full size. The variety of insulators represented will undoubtedly be a revelation to many engineers whose tendencies in late years have been toward porcelain. Glass insulators are made for line voltages as high as 50,000 volts. The pin-type high-voltage insulators are made in two or more pieces. On the suspension type much higher voltages are obtained. The Brookfield Glass Company has spent over half a century in the development and manufacture of standard insulators for every branch of the electrical industry where the support of aerial conductors is involved. Copies of this catalogue can be obtained upon application from the company's New York or Chicago office.

Kansas City Telegraph Tournament.

A telegraph tournament was held by the Kansas City Railroad Telegraphers' Club, Kansas City, Mo., on the evening of December 13, at the Coates House in that city. The tournament was open to railroad telegraphers, agents, levermen and linemen in the States of Nebraska, Iowa, Kansas and Missouri. There were one hundred persons in attendance.

The first event was for the best key sending and was won by A. S. Carver, of the Chicago, Rock Island and Pacific Railway, Topeka, Kan., who transmitted 219 words in five minutes. This, it is stated, breaks the previous world's record, which was made by Mr. D. J. Ellington, of New York, at Boston in 1906. Mr. Ellington's record was 350 words in eight minutes. The second event was for the best sending on a vibrating machine, and the first prize was captured by H. A. Ford, of the Chicago, Rock Island and Pacific Railroad, Harrington, Kan. He used a Martin Vibroplex, transmitting 192 words in five minutes.

Mr. J. Purcell, jr., of the Atchison, Topeka and Santa Fe Railway, Kansas City, Mo., won the first prize for typewriter receiving, from the sending of Mr. Carver, copying 365 1/5 words in ten minutes, He used a Remington typewriter. Mr. Purcell also entered the pen receiving contest, but as he had no competitor, he was awarded the honors. He was awarded the championship of the four States as the best all-round telegrapher.

The matter used in the contest was selected by President John Hjalmer, but was not made known before the contest, therefore no one had an opportunity to practice beforehand.

The judges were J. B. Stockton, of the Santa Fe; G. W. Hutton, of the Associated Press, and C. M. Talley, of the Missouri Pacific, and the timekeeper was J. E. Hogan, of the Chicago, Milwaukee and St. Paul, Kansas City, Mo.

The Western Electric Company furnished all of the instruments, and the various typewriter companies had several machines at the disposal of the contestants.

Mr. Alvin J. Jones is secretary of the Kansas City Railroad Telegraphers' Club.

T. M. B. A. ASSESSMENTS.—The Telegraphers' Mutual Benefit Association has levied assessments 545 and 546 to meet the claims arising from the deaths of E. A. Clark at Chicago; Levi G. Bliss at Long Branch, N. J.; C. Kendall at Brooklyn, N. Y.; N. R. Chadwick at Homewood, Ill.; G. H. Wheelock at Sawtelle, Cal.; J. B. Sabine at Brooklyn, N. Y.; F. Riley at Brooklyn, N. Y.; H. E. Riley at Jacksonville, Fla.; J. M. Darley at Washington, D. C.; W. A. Butterfield at Skillman, N. J.; A. R. Swift at Chicago; S. C. Osborne at Brooklyn, N. Y.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

Mr. T. A. McCammon, traffic superintendent, main operating room, has returned from a trip to the Southern States much improved in health.

John G. Geddes, of this department, formerly of the cable service at Glasgow, Scotland, and later of the central cable office, died suddenly on December 14, at his residence in Brooklyn, N. Y.

Abram J. Locke, aged 67 years, a well-known operator employed in this office, died at Claremont, N. H., December 25.

John J. Earle, assistant manager, and in charge of the money order department at the 1398 Broadway office, died December 20.

Miss Jane Powell has left for the Partridge Inn office, Augusta, Ga., for the winter season.

Mr. Maxwell Green, Southern wire chief, has been elected to the office of Senior Warden of Amity Lodge, F. & A. M., New York.

"Senator" Wm. L. Ives, dean of the Eastern Division, is slowly recovering from his recent illness.

Miss Anna F. McCarthy, secretary and treasurer of the "Xmas Club" in the distributing gallery, handed each of the eighteen members a check for $25. This club was started last May.

NEW YORK POSTAL.

WILLIAM A. BUTTERFIELD, aged 56 years, formerly manager of the delivery department of this company, New York, died at Skillman, N. J., December 6.

The Telegraphers' Mutual Benefit Association, 195 Broadway, New York, combines fraternalism with sound business principles; it offers to the telegraph and telephone employe an absolutely safe form of protection, at a cost within the reach of all and lower than can be found elsewhere. Membership is only open to employes in commercial or railroad telegraph or telephone service, and it is manifestly to the interest of those who are eligible and wish to obtain life insurance within their means to secure without delay a certificate for $1,000 or $500, or both, at rates based on present age.

Telegraph and Telephone Age

No. 2 NEW YORK, JANUARY 16, 1913. Thirty-First Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

The Little Wheel Within a Wheel.

After having constructed an electrical apparatus, or connected so often a number of such devices in a circuit, in strict accordance with specification drawings, that the formula has become familiar and simple, are you even then sure you understand the real function of each device? In other words, are you satisfied with the mere statement of what happens when certain instruments are combined, without inquiring why, or understanding the actual part each plays in effecting the final result? If you are you would find yourself sadly handicapped the moment you attempted to do a little electrical engineering on your own account, no matter how expert you may be in arranging and handling a system already laid out for you.

It is in the study and understanding of these finer points, too seldom brought out in the explanations usually considered ample for attendants, that fits one to work intelligently in a new direction. New achievements are almost invariably the result of watching the operation of the "little wheel within a wheel."

For example, every duplex or quadruplex attendant probably knows that a resistance lamp is connected in series with a small condenser across the battery leads of each set, to prevent sparking at the contract points of the pole-changer. As a rule he simply understands that effect is due to the condenser, and gives the lamp no particular thought, yet if the lamp were removed the condenser could not itself eliminate the spark. The reason is that without the lamp resistance the moment the contact points open both sides of the condenser become instantly charged to the full capacity of the line, and being in parallel with the contact points, it on closure generates what may be called a welding current. If, however, the current is cut down somewhat by means of a suitable non-inductive resistance, such as that of a lamp, it will absorb the entire energy of the discharge, and thus prevent sparking. Hence, the purpose of the lamp is to provide sufficient reserve condenser capacity to include the line discharge in its charge.

Again, the general impression prevailing among many students concerning the operation of a condenser is that it only acts while discharging, yet in the case just mentioned we have seen that its effective action occurs during the period it is absorbing energy. The fact is, either or both processes furnish energy, which may be utilized as best fits the requirement. For instance the large condensers used for eliminating "static" on multiplex circuits furnish compensating current in the artificial line while discharging during the period the supply of current is temporarily cut off.

Locking condensers as arranged in modified half-Toye repeaters for maintaining current in the single line relay during the period of demagnetization do their work while charging. In either case the size of condenser, amount and arrangement of the resistance are not a matter of guesswork, but are determined by well-known rules that regulate the final result of different combinations.

For instance the amount of charge a condenser receives is equal to the product of the voltage of the battery, and the rated capacity of the condenser. Thus a two mf. condenser charged by 160 volts would be 320 micro-coulombs, while a 4 mf. condenser would absorb 640. In case a condenser is partially charged at all times, as is the case in the half-Toye repeater arrangement, its effective charge is represented by the additional number of micro-coulombs it absorbs when the charging voltage is suddenly increased. Now let us suppose that a 100 micro-coulomb rate is sufficient to maintain enough current through the relay during the moment the line circuit is open. Assume that the emf. of the main battery at the brush is 160 volts, and after the current has passed through the battery lamp and relay coil it has fallen to 135 volts at the junction of the transmitter lever and the condenser. Under these conditions the 4-mf. condenser would be charged with $4 \times 135 = 540$ micro-coulombs to start with, but when the transmitter lever starts towards the backstop and opens the main line the emf. of the battery rises to full 160 volts, and adds another 000 micro-coulombs to the condenser ($4 \times 160 = 640$).

This 100 micro-coulombs will therefore maintain forty or fifty milliamperes of current through the relay coil until the lever touches the artificial line connected to the backstop, when the regular battery current again holds the relay closed. The moment the lever touches the backstop the condenser becomes short-circuited through a 350-ohm lamp, which causes a charging pressure of only twenty-six volts, hence 536 micro-coulombs have discharged through the lamp. When the lever starts back again the 160 volts will cause the condenser to recharge to an extent even greater than is actually required. It will thus be seen that the size of the lamp in this case depends in the first place upon the amount of "drop" in emf. it is desired to provide between its terminals, and in the second place to prevent a complete unnecessary amount of condenser discharge when the condenser is short-circuited.

The foregoing is, but one of the many "little wheels" encountered in daily operation, which would furnish both interesting and useful knowledge if one would not be so readily satisfied with a view of the master wheel alone.

Telegraph and Telephone Patents.

ISSUED DECEMBER 17, 1912.

1,047,293. Telephone Attachment. To M. M. Reynolds, New York.

1,047,294. Telephone Instrument. To M. M. Reynolds, New York.

1,047,334. Telegraph System. To B. F. Thompson, Arlington, Md.

1,047,788. Telephone Apparatus. To E. A. Graham, Brookley, London, Eng.

1,047,833. Apparatus for Automatically Connecting up the Subscribers of Telephone Exchanges. To J. Peticky, Prague, Austria-Hungary.

ISSUED DECEMBER 24, 1912.

1,048,200. Electrical Signaling System. To W. Noble, St. Louis, Mo.

1,048,209. Telegraph Repeater. To G. L. Rawdon, Cleveland, Ohio.

1,048,253. Telephone Transmitter. To D. H. Wilson, Chicago, Ill.

1,048,443. Telephony or Telegraphy. To S. G. Brown, London, England.

ISSUED DECEMBER 31, 1912.

1,048,505. Galvanic Battery. To Eben G. Dodge, South Orange, N. J.

1,048,561. Selective Signaling System. To Judson McFell, Chicago, Ill.

1,048,639. Telegraph System. To William E. Athearn, Brooklyn, N. Y.

1,048,849. Wireless Break Key. To Grier P. Mobley, San Antonio, Tex.

1,048,980. System of Multiple and Simultaneous Telegraphy. To Ferdinando Lori, Padua, Italy.

1,049,044. Telegraphy. To Clarence M. Breedlove, Birmingham, Ala.

1,049,066. Telegraph Instrument. To William H. Engle, Port Costa, Cal.

1,049,308. Fire-Alarm-Box Mechanism. To Christian F. Klein and Edward A. Pyles, Baltimore, Md.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, January 11:

American Telephone and Telegraph Co.	139¼
Mackay Companies	87
Mackay Companies, preferred	68¼
Western Union Telegraph Co.	75

Personal.

MR. FRED C. SIMS, of Ottawa, Ont., was a recent New York visitor.

MR. G. E. FLETCHER, a well-known old-time telegrapher, who has been engaged in outside business for many years past, is now conducting a hotel at Pilger, Neb.

MR. S. S. GARWOOD, of Philadelphia, was in New York January 8, in attendance at the executive committee of the Telegraphers' Mutual Benefit Association, of which committee he is a member.

MR. STEPHEN D. FIELD, a well-known telegraph and electrical engineer of Stockbridge, Mass., has been confined to his home on account of sickness for the past month, but he is now reported to be convalescing.

HONORABLE P. V. DE GRAW, fourth assistant postmaster-general, Washington, D. C., and a well-known old-time telegrapher, is the subject of a highly complimentary editorial article in the Atlanta, Ga., *Constitution*, for his skillful work in developing the rural free delivery system.

WILLIAM STANLEY, electrical engineer and inventor, of Great Barrington, Mass., has been awarded the fourth Edison medal "for meritorious achivement in invention and development of alternating current systems and apparatus" by the American Institute of Electrical Engineers.

MR. THOMAS A. EDISON.—The Rathenau medal for best device or process in the electrical industry for safeguarding industrial life and health, has been awarded to Mr. Thomas A. Edison, and the presentation will take place at the American Museum of Safety, New York, on the evening of January 23.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.—A meeting of the executive committee of the Telegraphers' Mutual Benefit Association was held at 195 Broadway, New York, January 8, and considerable business of importance was transacted.

THE KINETOPHONE.—Mr. Thomas A. Edison has practically perfected his talking motion-picture machine after many years of experimentation. The machine synchronizes the motion-picture and the phonograph so that the words and action in a play, etc., occur at the same moment, the one corresponding with the other.

MR. FIDEL VILLACORTA, of San Salvador, Salvador, C. A., in renewing his subscription for another year, writes: "TELEGRAPH AND TELEPHONE AGE is of great importance to me. I obtain from its columns much valuable information. I wish your paper could be read by all Spanish speaking people."

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. CLARENCE H. MACKAY, president of this company, has been elected president of the California Society of New York for the year 1913.

MR. EDWARD J. NALLY, vice-president and general manager, returned to his office a few days ago after a visit to offices in the middle western states.

MR. CHARLES C. ADAMS, vice-president, and Mr. E. B. Pillsbury, general superintendent, New York, were Philadelphia visitors on January 8, on business connected with the service.

Among recent executive office visitors were: Messrs. C. A. Richardson, superintendent, Boston; E. W. Miller, chief operator, Philadelphia; H. J. Colebrook, chief operator, Pittsburgh.

MR. EDGAR NERBURN has been appointed manager of the Oswego, N. Y., office, vice L. A. Metzger, resigned.

MR. E. R. AUTER. In our issue for January 1, the note about the appointment of Mr. E. R. Auter as manager at Mobile, Ala., was by mistake placed in the Western Union column instead of among the Postal items. Mr. Auter is manager of the Postal Company's office at Mobile.

T. M. SKINNER, aged 64 years, night chief of the St. Louis, Mo., office, died in that city January 4. Deceased had been in the employ of the company for over twenty-five years. He was at one time chief train dispatcher on the Atchison, Topeka and Santa Fe Railroad.

CHRISTMAS PRESENTATIONS IN WASHINGTON.—Christmas was celebrated in the Washington, D. C., office of the Postal Telegraph-Cable Company by presentations to the manager and chief operator by the employes. Manager G. M. Foote, who has recently been initiated into the mysteries of the Masonic order, was given a gold Masonic emblem, and chief operator C. F. Thompson was presented with a gold watch and chain. The presentation was made in the operating room on December 24, and the affair was very interesting, as it had been arranged for each to present the other with these tokens of esteem and good-will without either having previous knowledge that he was to receive such a testimonial of friendship from the staff. Each of these gentlemen responded in appropriate remarks, and the incident was much enjoyed by all present.

MAGNETIC CLUB ELECTION.—The annual meeting of the Magnetic Club was held at No. 253 Broadway, New York, on January 9. The following officers were elected: President, Charles P. Bruch; vice-presidents, Marston R. Cockey, Theodore L. Cuyler, jr., Edward B. Pillsbury, and Christopher F. Leonard; secretary, William B. Dunn; treasurer, Joseph J. Cardona. Members of the board of governors (term expiring January, 1915): Daniel F. Mallon, Frank E. McKiernan, Charles Shirley and L. Lemon. Member to serve the unexpired term of Christopher F. Leonard; T. E. Heffren. Mr. George H. Usher, of Atlanta, Ga., a past-president of the club, and Col. Robt. C. Clowry, were elected to honorary membership. Plans for the spring dinner, in celebration of the twenty-fifth anniversary of the club, were informally discussed, and it was the consensus of opinion that a banquet should be held on April 19 (the club having been organized April 19, 1888), and that invitations to attend be extended to all past members.

Mr. E. Reynolds, Assistant to the President Postal Telegraph-Cable Company, New York.

Mr. Edward Reynolds, whose appointment as assistant to the president of the Postal Telegraph-Cable Company was announced in our issue for January 1, is one of the brightest and most capable young men in the telegraph service, and has reached this high position through real merit and fidelity to the interests he represents.

Mr. Reynolds was born in Catskill, N. Y., November 11, 1866, and began his telegraphic career at the age of 18, as manager for the Baltimore and Ohio Telegraph Company, at Saugerties, N. Y., where he afterwards became assistant postmaster, in which capacity he acted for three years. His

E. REYNOLDS, ASSISTANT TO THE PRESIDENT, NEW YORK.

experience as postmaster was of great value to him in subsequent years.

Coming to New York in 1889, his service with the Postal company began on August 1 of that year as an operator. His faithfulness, intelligence and capacity met with early acknowledgment, and on April 1, 1891, he became chief clerk to superintendent E. G. Cochrane. On February 1, 1897, he was appointed to a like position in the office of the general superintendent, thence on July 1, was promoted to the chief clerkship in the office of vice-president E. C. Bradley. On January 1, 1900, he was advanced to the position of assistant auditor, and on May 1, of the same year to that of auditor.

In order to give his entire time to the important position of assistant to the president, Mr. Reynolds has been relieved of the duties of his former office as auditor, retaining however, the position of fifth vice-president to which he was appointed in May, last year.

F. J. Kernan, Acting Auditor Postal Telegraph-Cable Company.

Mr. Felix Joseph Kernan, whose appointment as acting auditor of the Postal Telegraph-Cable Company, New York, was announced in our issue for January 1, was born in Brooklyn, N. Y., May 28, 1876. He entered the Postal's service June 15, 1893, and has been with it ever since, first as clerk, afterwards becoming chief clerk. Later he became traveling auditor, and afterwards returned to the auditor's office as chief clerk, which position he held at the time of his recent appointment.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

Mr. Theo. N. Vail, president of this company and of the American Telephone and Telegraph Company, who has been in the hospital for several weeks, returned to his office January 10. After a short rest on his farm at Lyndonville, Vt., Mr. Vail will, about the middle of February, go South and to the West Indies to recuperate.

Mr. J. P. Spanier, representative of this company in Southern Europe, with headquarters in Naples, Italy, is in New York on company business.

Mr. H. C. Worthen, general manager of the Southern Division, whose appointment to this newly-created position was announced in these columns January 1, is the recipient of hearty congratulations from his many friends, and from the local press of Atlanta, Ga., which city is his home and headquarters. Mr. Worthen's successful career is an exemplification of what diligence and fidelity, together with an open mind, will do for a man. He is one of the youngest officials in the service, and his remarkable success is due entirely to innate ability and not to any favoritism or outside influence. The relationship between Mr. Worthen and the employes in his division are most cordial, and the same is true as between himself and the public with whom he deals.

Mr. M. T. Cook, division commercial superintendent at Chicago, has been appointed assistant general manager of the Western Division, with headquarters at the same point. The position of division commercial superintendent formerly filled by him has been abolished.

Mr. L. McKisick, formerly general superintendent at Dallas, Tex., has arrived in New York to assume his duties as assistant general superintendent of traffic, to which position he was recently appointed, as announced in our issue dated January 1.

Mr. R. E. Chetwood has been appointed plant engineer of the company. This appointment abolishes the positions of engineer of equipment and construction.

Mr. H. F. Dodge, division commercial superintendent at San Francisco, Cal., has been appointed assistant general manager, with headquarters at the same place.

Mr. S. E. Leonard, division commercial superintendent of this company at Denver, Col., has resigned to enter the telephone service, with headquarters at the same place. The position of division commercial superintendent has been abolished.

Mr. Chas. Friedlander, formerly division traffic chief of the Associated Press at Chicago, and for the past six months identified with the same service in New York, has been appointed supervisor of wire service of this company.

Mr. B. P. Hancock, supervisor of traffic, Atlanta, Ga., has been appointed division traffic superintendent of the Gulf Division, with headquarters at Dallas, Tex.

Mr. J. P. Edwards, special agent at Atlanta, Ga., has been advanced to the position of division traffic superintendent of the Southern Division, with headquarters at the same place.

Mr. G. H. Fearons, general attorney of the company, New York, has returned from Panama, where he spent a three weeks' vacation.

Mr. A. T. Benedict has been appointed assistant general attorney of the company, New York. Mr. Benedict has been identified with the legal department for many years, and is well known throughout the country.

Mr. Henry G. Bates, local transfer agent, New York, has been advanced to the postion of general transfer agent.

Mr. Arthur A. McNeill of the transfer service, has been promoted to be city transfer agent, New York, to succeed Mr. Henry G. Bates, who has been appointed general transfer agent.

Mr. J. C. Nelson has been appointed manager of the messenger department of the entire service of this company, with headquarters at New York.

Messrs. O. L. Turner, T. P. Cummings and A. R. Lingafelt, district superintendents at Dallas, Tex., New Orleans, La., and Oklahoma City, Okla., respectively, have been made district commercial superintendents.

Mr. J. W. Smults, chief clerk, press bureau, New York, who has been in the hospital for some weeks, is now convalescing.

A conference of district commercial managers and district solicitors of the third district, Eastern Division, was held in the office of Mr. A. C. Terry, district commercial superintendent, Pittsburgh, Pa., December 20, 1912, for the purpose of discussing cable service and the new features which went into effect January 1. Among those present besides Mr. Terry were: Messrs. E. R. Collins, district commercial manager, and W. A. Blackburn, district solicitor, Charleston, W. Va.; G. F. Stadtmiller, district commercial manager, and Richard O'Connor, district solicitor, Erie, Pa.; G. S. Walters, district commercial manager, and J. W. Kyle, district solicitor, Parkersburg, W. Va.

Mr. J. P. Spanier, continental representative of the Western Union Cable system, with headquarters at Naples, Italy, was tendered a dinner by the officers of the company at the Hotel Vanderbilt, New York, January 7. Mr. Belvidere Brooks, vice-president, presided. Besides Mr. Brooks there were present vice-presidents Newcomb Carlton, T. F. Clark and J. B. Van Every; A. R. Brewer, treasurer; A. G. Saylor, general manager Eastern Division; J. C. Willever, United States manager of cable system; E. Y. Gallaher, general auditor; G. M. Yorke, general superintendent of plant; W. N. Fashbaugh, general superintendent of traffic; H. G. Bates, general transfer agent; A. C. Kaufman, division cable manager; J. F. Nathan, district commercial superintendent; W. A. McAllister, district traffic superintendent and S. M. Williams, manager press service.

A conference of district commercial superintendents of the Eastern Division was held in the office of General Manager A. G. Saylor, January 10. Among those present were: Messrs. W. A. Sawyer, New York; A. C. Terry, Pittsburgh, Pa.; J. W. Reed, Philadelphia, Pa., and C. F. Ames, Boston Mass.

New Traffic Superintendents in Southern Division.—The following commercial superintendents in the Southern Division have been appointed district traffic superintendents by Mr. H. C. Worthen, general manager of the Southern Division: H. J. Carpenter, Nashville, Tenn., for Tennesee, Kentucky and Mississippi; S. L. Burts, Atlanta, Ga., for Georgia, Florida and Alabama; F. O. Nourse, Richmond, Va., for Virgina, North Carolina and South Carolina.

The Following Changes in the sixth district of the Western Division are announced: Mr. J. K. Morgan, manager at Saint Marys, Ohio, transferred to a similar position at Kenton, Ohio, vice Mr. F. L. Stewart, who re-enters the traffic department at Anderson, Ind.; Mr. C. A. Nichols appointed manager at Hillsboro, Ill., vice Mr. W. E. Burns, who is transferred to the traffic department at Indianapolis, Ind.

Mr. J. R. Terhune, superintendent, Nashville, Tenn., announces the following appointments in his district: Mr. J. A. Crawford, district manager, fourth district, Southern Division, with headquarters at Nashville, Tenn; Mr. W. A. Logan, chief operator, manager at Memphis, Tenn., vice W. R. Edmondson, resigned; Mr. F. E. Frazier, manager, at Natchez, Miss., vice Miss C. M. Green, resigned.

Mr. Z. A. Lash, a director of the Canadian Northern Railway and vice-president of the Quebec and Lake St. John Railway, Toronto, Ont., has been elected president of the Great North Western Telegraph Company, with headquarters in the same city. The following directors were re-elected: Adam Brown, vice-president, Hamilton; Jas. Hedley, Hon. Senator James K. Kerr, K. C.; Aemelius Jarvis, F. B. Hayes, Toronto; J. B. Van Every, Newcomb Carlton, New York, N. Y. The officials appointed are: Geo. D. Perry, general manager; A. C. McConnell, secretary and auditor; D. E. Henry, treasurer.

Telegraph on Prince Edward Island.—In the autumn of 1911 the cable and telegraph facilities of Prince Edward Island were acquired by the Western Union Telegraph Company through a 99-year lease, commencing on January 1, 1912. The system thus taken over consists of 317.5 miles of land lines on Prince Edward Island, about nine miles of cable from Cape Traverse to Cape Tormentine, and some thirty-five miles of land wires from the latter point to Sackville, in New Brunswick. There are twenty-eight telegraph offices upon the island. The system became a part of the Eastern Division January 1.

Morse Electric Club Election and Dinner.—At the annual meeting of the Morse Electric Club, which took place at 195 Broadway, New York, January 8, the following officers were elected: Mr. B. Brooks, president; W. J. Dealy and A. G. Saylor, vice-presidents; Wm. C. Merly, secretary; R. J. Murphy, treasurer. Directors, J. B. Van Every and M. J. O'Leary, to serve for three years. The hold-over directors are: Gardner Irving, M. H. Kerner, J. A. Hill and P. J. Casey. It was decided to hold the next dinner of the Club on February 1, at the Hotel Savoy, New York.

W. W. Umsted, District Commercial Manager, Omaha, Neb.

Mr. W. W. Umsted, manager of the Omaha, Neb., office for the past twenty years, has been made district commercial manager, covering the states of Nebraska and Kansas. He has also been made as-

W. W. UMSTED, DISTRICT COMMERCIAL MANAGER, OMAHA, NEB.

sistant superintendent of the American District Telegraph Company for the same states. Mr. J. R. Hyland, commercial agent for the company at Lincoln, Neb., succeeds Mr. Umsted as manager at Omaha.

The Cable.

Mr. J. H. Smart, of Eastham, Mass., formerly superintendent of the Commercial Cable Company, New York, was a recent New York visitor.

Reduced Rate for Deferred Plain Language Cablegrams.—The Commercial Cable Company announces that the rate for deferred plain language cablegrams from New York City, Brooklyn, Long Island City, Astoria, Port of New York, Staten Island and Yonkers (in New York State), Jersey City and Hoboken (in New Jersey), the New England States, New Brunswick, Nova Scotia, Ontario, Quebec and Newfoundland, to Great Britain and Ireland has been reduced to nine cents per word. The rates to other countries remain the same.

Cable Rate Reductions.—In our issue dated January 1, were printed the revised conditions and rates of the Western Union Telegraph Company, for cable letters, week-end letters and deferred cable messages, which went into effect on that date. The Postmaster-General of Great Britain, on December 30, 1912, announced corresponding reduction on westward business from England to Canada, Newfoundland and the United States. Reductions are also announced to Australia, New Zealand, South Africa, Rhodesia and British Central Africa. A service of week-end cable letters, to be dispatched on Saturday and delivered Tuesday, will be introduced in connection with Australasia, South Africa, Rhodesia and Nyasaland. The charge to Australasia will be eighteen shillings ($4.32) for twenty-four words, and to Africa fifteen shillings ($3.60) for thirty words.

Deaths of Two Prominent Cable Men.

In our issue of January 1, we printed brief notices of the deaths of Frederic A. Hamilton and Hugh Hughes of the Commercial Cable Company, the former at Halifax, N. S., December 19, and the latter at Hazel Hill, Canso, N. S., December 13, 1912. Some additional facts of interest concerning the careers of these men have been obtained.

Mr. Hamilton was born in Kent, England, seventy-two years ago. He had a varied and interesting career. In his early years he was in the British Mercantile Marine, and visited Sicily in 1869-70 when Garibaldi was organizing an army for the liberation of Rome. He joined the Garibaldians, landed in Italy and marched on Rome. The Garibaldians were defeated by the French and Pontifical troops; Hamilton was taken prisoner and held for some time in "honorable detention" by the Italian Government. He was subsequently released. On his return to England in 1870, Mr. Hamilton joined the electrical staff of the Telegraph Construction and Maintenance Company, and took part in several cable expeditions in different parts of the world. He first visited North America in the summer of 1872 in the cable ship "Vanessa" belonging to the same company, which laid cables between Placentia, N. F., and Sydney, Cape Breton Island. He afterwards joined the Anglo-American service and was chief electrician of the cable steamer "Minia" for nearly twenty years. He resigned from that company, and started as a consulting electrician at Halifax, N. S., and was employed by the United States Government for some time on its cable steamer "Burnside" in the extension and maintenance of the inter-island submarine cable system in the Philippines. After the completion of this work, he joined the service of the Commercial Cable Company, as chief electrician of that company's cable steamer "Mackay Bennett," and held that position until his death. Mr. Hamilton probably tested and repaired more broken cables than any other man in the world. He was highly respected, a general favorite, and had a host of friends. Through his residence in Italy, he had a great fondness for Italian literature. He was a man of scholarly and artistic tastes, and was conversant with several modern languages. He is survived by his wife.

Mr. Hughes was born at Intervale, Guysborough County, N. S., in 1847. In 1880, he took up the work of underground cable trenching in connection with submarine telegraph lines. In addition to other underground cable construction in Nova Scotia and New England, he assisted in the shore work at Dover Bay and Fox Bay, N. S., Coney Island, N. Y., and Cuckold Cove, N. F., for the Commercial Cable Company. He represented Hazel Hill, in the Municipal Council of Guysborough, N. S., from 1898 to 1910. Deceased is survived by his wife, two sons and two daughters.

The Telephone.

Mr. F. H. Bethell, president of the Chesapeake and Potomac Telephone Company, the Central District and Printing Telegraph Company and the Bell Telephone Company of Pennsylvania, New York, made an address on the subject "The New Chesapeake and Potomac" before the Telephone Society of Baltimore on January 8.

Mr. J. C. Hay, manager of the Cumberland Telephone and Telegraph Company's office at Vicksburg, Miss., has been promoted to be superintendent of the Southern district, with headquarters at New Orleans, La. He is succeeded at Vicksburg by Mr. A. D. Johnson district manager of the New Orleans suburban exchanges.

Mr. J. C. Symmes, division superintendent of the Cumberland Telephone and Telegraph Company, Nashville, Tenn., has been promoted to a position in the office of the general commercial superintendent at Atlanta, Ga.

Mr. P. Kerr Higgins, well-known in telephone circles in the Southwest, has been assigned to special duty for the Bell Telephone Company, with headquarters at Little Rock, Ark.

Mr. John H. Rogers, special agent for the Missouri and Kansas Telephone Company, Kansas City, Mo., has been appointed Kansas City manager of the same interests, to succeed Mr. Val. B. Mintun, whose appointment as division commercial superintendent is announced in another column in this issue.

TELEPHONE COMPANIES PURCHASED.—The New York Telephone Company has purchased the Hamilton Telephone Company, of Hamilton, N. Y., and the Citizens' Standard Telephone Company, of Kingston, N. Y.

TELEPHONE INSULATORS SALT-INCRUSTED BY WAVES.—Over 400 telephone wires were put out of commission at Newport, R. I., by the incrustation of sea salt upon the insulators which caused excessive leakage of current. The wires run close to the ocean, and the spray from the waves, following the recent storm, impaired the insulation at the poles.

THE DIAMOND STATE TELEPHONE SOCIETY has been formed by employes of the Diamond State Telephone Company at Wilmington, Del. The officers are: president, D. C. Hosfeld; vice-president, J. A. Dockety; secretary, L. M. Hearn; treasurer, R. W. E. Way.

DEVELOPMENT IN TEXAS.—The Southwestern Telegraph and Telephone Company will expend $4,500,000 in Texas this year in developing and extending telephone facilities. During the past year 21,000 new subscribers were added in the State, and several hundred miles of toll lines constructed. About 10,000 miles of copper wire for new circuits was strung. Mr. H. J. Pettengill, of St. Louis, Mo., a well-known old time telegrapher, is president of the company.

Val. B. Mintun, Division Commercial Superintendent, Missouri and Kansas Telephone Company, Kansas City, Mo.

Mr. Val. B. Mintun, Kansas City, Mo., manager of the Missouri and Kansas Telephone Company, has been advanced to the position of division commercial superintendent for the central district of the same company, with headquarters at Kansas City.

VAL. B. MINTUN, KANSAS CITY, MO.

Mr. Mintun has been with this company about eight and one-half years, and has received several promotions, the most important of which were adjuster, head canvasser, private branch exchange agent, special agent railway department, contract agent assistant manager and from October, 1910, up to the present time, has served as Kansas City manager.

During his work as special agent of the railway department, Mr. Mintun attended the annual meetings of the Association of Railway Telegraph Superintendents, and made a number of friends, and to their hearty co-operation in his business dealings he attributes much of his success.

The Reid Memorial Fund.

Increasing interest is being taken in the Reid Memorial movement, although subscriptions are not coming in as rapidly as the trustees could wish, the amount subscribed to date being still about $3500 less than the amount which the trustees require to enable them to carry out plans that have been tentatively adopted. The total of the subscriptions so far received amounts to $637.25. (A list of the subscribers will be printed in the February 1, issue.)

A number of those who have subscribed comparatively small sums have expressed their intention to increase the amounts of their respective subscriptions later. The proposed monument, however, will be a worthier tribute to Mr. Reid if a large number individuals—rather than a few—join in its erection. It is preferable, therefore, that the necessary fund be composed of many small, rather than a few large, contributions. All who wish to express appreciation of Mr. Reid's character and service should feel free to subscribe, even in limited amounts.

Col. Albert B. Chandler, 253 Broadway, New York, is the treasurer of the fund, to whom contributions should be addressed.

New Year's Greetings.

We have received New Year's greetings from the following:

The Havana office of the International Ocean Telegraph Company; Mr. J. J. Ghegan, president J. H. Bunnell & Company, New York; J. Frank Howell, New York; J. B. Dillon, district wire chief and supervisor of equipment, Western Union Telegraph Company, Dallas, Tex.; J. D. McLelland, manager Postal Telegraph-Cable Company of Texas, Houston, Tex.; T. W. Goulding, European commercial manager, Western Union Telegraph Company, London, Eng., J. B. Sheldon, superintendent of telegraph, Union Pacific Railway, Omaha, Neb.; Clarence R. George, secretary International Association of Municipal Electricians, Houston, Tex.

MR. J. FLETCHER, superintendent of traffic, Canadian Pacific Railway Company's Telegraph, Montreal, Que., in renewing his subscription writes: "TELEGRAPH AND TELEPHONE AGE is becoming an indispensable publication with telegraph men. It seems to respond to the rapid development of the service, which is a very forceful argument that while you may be aging in years, you are certainly retaining the vigor of your youth, for in these days of activity it requires an alert mind, and one not wedded too strongly to the past, to keep up with the procession."

Radio-Telegraphy.

TOY BALLOONS IN PLACE OF WIRELESS.—It is stated that the Mexican rebels release toy balloons to carry on communication in lieu of the usual wireless telegraphic method.

WIRELESS ON BALLOONS.—Wireless communication with a balloon at an altitude of four and a half miles was held from the wireless station at Norddeich, Germany, January 7.

IMPROVEMENT IN TUNING.—W. E. D. Stokes, Jr., and George M. Davis, of Galilee, N. J., have been granted a patent jointly for a device to permit closer tuning of wireless apparatus.

WIRELESS IN PORTUGAL.—The Portuguese parliament has ratified a contract with the Marconi Company for the erection of wireless stations at Lisbon, Oporto, Azores, Madeira and Cape Verde.

WIRELESS IN A PHILADELPHIA CHURCH.—The Rev. H. K. Holtzinger, pastor of a Methodist church in Philadelphia, has installed a wireless outfit on his church for the purpose of giving instruction in wireless to a class of young people which he recently organized.

CONVICTION OF WIRELESS PROMOTERS.—A. Frederick Collins, Cameron Spear and C. L. Vaughan were found guilty in the United States district court, New York, January 9, of having used the mails to defraud in promoting the stock of the Collins Wireless Telephone and Telegraph Company and the Continental Wireless Telephone and Telegraph Company.

MARCONI PATENTS IN FRANCE UPHELD.—The French court has upheld the validity of the Marconi patents, and enjoined the Société Française Radio-Electrique, and the Compagnie Generale Radio-Telegraphique, from further infringement of the patents. The court has ordered the confiscation and destruction of the apparatus owned by these two companies.

THE BRITISH MARCONI AGREEMENT.—According to a London dispatch the select committee which is considering the agreement between the government and the Marconi Company for the construction of a chain of wireless stations throughout the empire, will issue an *ad interim* report postponing the ratification of the agreement, and urging further inquiry as to the merits of rival systems of wireless telegraphy.

LONG DISTANCE WIRELESS TELEPHONE AT SEA.—In our issue for January 1 we published an item about the wireless operator on the steamer "San Jose" hearing wireless telephone conversation when at a distance of 150 miles from land during a recent trip between Panama and San Francisco. Mr. Joseph S. Chamberlin, wireless operator on the steamer "State of California," plying along the Pacific Coast, writes that for the past three months he has heard telephone conversations very distinctly at a distance of thirty or forty miles from shore. He uses a type E United tuner with carborundum detector, which seems to be better for the purpose than a galena detector.

COHERER IN WIRELESS TELEPHONY.—Mr. Edouard Branly, of Paris, France, the inventor of the coherer used in wireless telegraphy, is conducting investigations as to the action of shock upon the coherer. He has already proved that its effect is not produced by a new distribution of conducting grains in a tube of iron filings, as hitherto thought, and his most recent experiments have brought him to the conclusion that "the conductibility of a radio-conductor is the conductibility of a thin, non-conducting body between two conductors." In his experiments M. Branly has found that the tube can be used as a direct telephonic receiver, even without a battery, and to obtain the maximum telephonic sonority, the pressure on the filings necessary is quite different from that required for telegraphy.

Canadian Notes

MR. A. B. SMITH, manager of telegraphs, Grand Trunk Railway, Winnipeg, Man., has been transferred to Montreal, Que., with the same title. His jurisdiction will extend from coast to coast.

IMPROVING CANADIAN TELEGRAPH SERVICE.—The telegraph service of Prince Edward Island is being improved to meet the growth of traffic. The rate of thirty cents per fifty words for night letters has been extended to include the island offices. A new cable is to be laid across Northumberland Strait to supplement the present cable connecting Prince Edward Island with the main land. It will cost about $45,000.

CHILD'S LIFE SAVED BY USE OF TELEGRAPH.—Recently a four-year-old child visiting with its parents in London, Ont., from Brooks, Alberta, drank the contents of a bottle of cough mixture which contained a large quantity of narcotic, from the effects of which the child would have died had it not been for the prompt service of the Canadian Pacific Railway's Telegraph. The doctor called in on the case did not know how to proceed, as he could not tell what the bottle had contained. He therefore sent a telegram to the druggist in Brooks who prepared the mixture, to ascertain the ingredients, and in forty minutes the reply containing the information was received at London. Knowing then what to do, the London doctor succeeded in saving the child's life. The distance between the two points is 2,073 miles, and the message had to be relayed three times each way.

WIRELESS STATION FOR NASSAU, BAHAMAS.—An appropriation of about $10,000 has been made for the erection of a wireless station at Nassau, to have a radius of communication of not less than 400 miles by day. A contract for the erection of this station has been awarded to the Anglo-French Wireless Company of London. This will be the first wireless station in the Bahama Islands.

Determining the Size of Magnet Wire for Coil Windings.*

BY ARTHUR BESSEY SMITH.

The method which is here described has been worked out and used by the writer with satisfaction. The discussion is not intended to cover the entire theory or practice of coil winding, but to give just enough to make clear the working of the method. For instance, no corrections for temperature are provided. This is necessary when winding coils for maximum pull (ampere-turns), as the heating up of the wire will rob the coil of much of its power. Also, no corrections are made for rough winding. In the finer sizes of wire the variation in the diameter of the insulation will often offset all loss due to rough winding. In some cases it permits more wire than was calculated on the basis of smooth winding.

Electromagnets work under various conditions, but in practice most of them fall under a few classifications. These are as follows: parallel or full voltage and series in which one takes nearly the full voltage and the other must not weaken it appreciably.

The choice of cores, heads, or shape of spool will not be discussed, not being a part of the method of calculation presented. We will, therefore, assume that we have standard sizes of magnet spools as made by most manufacturers and that the problem is to select such a size of wire as will give a winding to secure any desired result.

Parallel coils—that is those designed to take the full battery voltage—may be wound for a certain current consumption, in which case the resistance becomes at once the fixed factor. If one does not care so much about economy of current, but desires great pulling ability, the winding will be for the greatest number of ampere-turns, and the method of calculation will be different.

The calculation of a coil to be used in series with a magnet, which is nominally a full voltage one, is limited by resistance. If the inserted coil has too great a resistance, it will reduce the current which the full voltage coil gets and thereby weaken it to the point of irregular and uncertain action. Hence, it is a matter of winding for resistance, which is the same as for the ordinary full voltage coil.

The sum of the matter is that there are usually two classes of calculations, one for resistance and the other for maximum ampere-turns.

Winding for Resistance.

Suppose the spool that is shown in the illustration represents the spool which it is desired to wind for certain resistance. Let the following letters stand for the quantities placed after them:

E = applied voltage.
R = resistance of coil in ohms.
D = depth of winding space in inches.
T = length of average turn in inches.
r = resistance of wire, per inch.
I = current in amperes.
d = diameter of core in inches.
L = distance between heads in inches.
N = total turns.
m = diameter of wire over insulation in inches.

*From *Telephony*.

In the illustration are shown several layers partly wound. The turns are shown lying neatly side by side and on top of each other. This is called a "smooth winding" and is not always used. "Rough winding" is more common and will deviate somewhat from what has been calculated, especially for the larger sizes of wires. The small sizes, above No. 28 B. & S. gauge, will wind about as many turns rough as smooth. All the calculations here made are based on the smooth winding.

The total resistance of a winding will be found by multiplying together the number of turns, the length of an average turn and the resistance of the wire per inch. That is,

$$R = N\,T\,r \qquad (1)$$

Notice also that the total turns, N, may be found by dividing the area of the winding space, A, by the square of the diameter of the wire, m. That is,

$$N = \frac{A}{m^2} \qquad (2)$$

This value of N may now be substituted in equation (1) giving

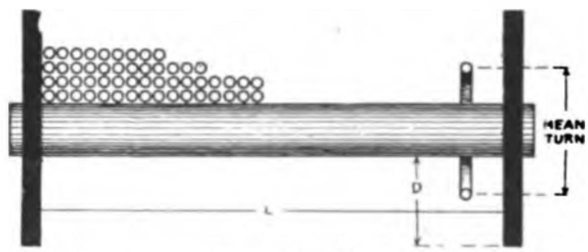
$$R = \frac{A\,T\,r}{m^2} \qquad (3)$$

This expresses the resistance of the coil in the simplest terms. Starting with the assumption that R is known, A and T can easily be calculated.

The area of the winding space equals the product of the depth of the winding space, D, and the distance between the heads, L.

$$A = L\,D \qquad (4)$$

The average or mean turn lies half way between the core and the outside of the coil. Its diameter



MAGNET WINDING

is the sum of the core diameter and the depth of the winding space. Hence, multiply their sum by 3.1416, which is called π (pi)

$$T = \pi\,(D + d) \qquad (5)$$

The purpose of equation (3) is the determination of the size of wire needed for a certain resistance and spool. Hence, it will be rearranged so as to have all the known quantities on one side and the unknown quantities on the other side. This gives

$$\frac{r}{m^2} = \frac{R}{T\,A} \qquad (3a)$$

The fraction on the left side of this equation is composed of the two characteristics of the wire which will fix its size, its resistance per inch and its diameter over insulation. This does not always vary by mathematical laws, especially for enamel covered wire. Hence, it is better to construct a table giving the values of this fraction for all sizes of wire.

The following example shows the operation of the method. Suppose that a 1,000-ohm winding is desired on a spool, the core of which is half an inch in diameter when ready to wind, two inches between the heads, and the heads one and one-half inches in diameter. The depth of the winding space is, therefore, half an inch.

$D = 0.5$ in., $L = 2$ ins., $R = 1{,}000$ ohms.

To find T, use equation (5)

$$T = 3.1416 \times (.5 + .5) = 3.1416 \times 1.0 = 3.1416 \text{ inches.}$$

Calculate A by use of equation (4)

$$A = 2 \times .5 = 1.0 \text{ square inch.}$$

Then $$\frac{r}{m^2} = \frac{1000}{3.1416 \times 1.0} = 318$$

Now, if one wants to use double silk magnet wire, it will be found in the proper table that No. 36 wire is nearest to 318.

It is interesting to notice that the properties of the coil will differ greatly with the kind of insulation chosen. This is because of the varying thickness of the insulation.

Winding for Maximum Ampere-Turns.

Next take the case in which the greatest possible magnetization is desired of the spool given, supplying the coil with current at a fixed voltage. The coil space will be wound full of whatever wire that is found will give the strongest pull. The calculations will be as follows:

$$\text{Let } M = NI = \text{ampere-turns.} \quad \ldots\ldots (6)$$

$$\text{But from Ohm's law it is known that } I = \frac{E}{R} \quad \ldots (7)$$

$$\text{But } R = rTN \text{ and } N = \frac{A}{m^2}$$

so that if these values are substituted in equation (7)

$$I = \frac{Em^2}{rTA} \quad \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Now, substituting this value of the current and of total turns in equation (6),

$$M = NI = \frac{A\,E\,m^2}{m^2 rTA} = \frac{E}{rT} \quad \ldots\ldots\ldots (9)$$

This means that the ampere-turns equal the voltage divided by the product of the resistance of the wire per inch and the length of an average turn.

The meaning of formula (9) is that the pull of the magnet may be varied by changing the resistance per inch of the wire, that is, by using larger or smaller wire. It is independent of the number of turns, provided the spool is wound full so that the length of a mean turn will be the same. Theoretically, the larger the wire the greater the ampere-turns and the stronger the magnet. There is no maximum.

There is, however, a practical limit due to the heat developed in the winding. The formula for heat is developed as follows: The power expended in the coil in watts is given by

$$W = I^2R \quad \ldots\ldots\ldots\ldots (10)$$

$$\text{From equation (3)} \qquad R = \frac{ATr}{m^2}$$

$$\text{and by Ohm's law,} \quad I = \frac{E}{R} = \frac{Em^2}{ATr} \quad \ldots\ldots (11)$$

Putting these values of resistance and current in

$$\text{equation (10) gives } W = \frac{E^2m^2}{ATr} \quad \ldots\ldots\ldots\ldots (12)$$

Arrange this equation to show the value of those quantities which fix the size of wire, thus

$$\frac{r}{m^2} = \frac{E^2}{WTA} \quad \ldots\ldots (13)$$

Hence, in order to wind a magnet for the maximum amperage-turns, first fix the greatest amount of power which it is desirable to expend in the coil, and then use formula (13) to find the size of wire which will give it.

Suppose that it is desired to wind the spool described for maximum pull, and that twenty watts is the greatest power which can be safely used. The numbers to be inserted into formula (13) are: $E = 48$ volts, $W = 20$, $T = 3.1416$, $A = 1$ square inch.

Then $$\frac{r}{m^2} = \frac{48 \times 48}{20 \times 3.1416 \times 1} = 36.7$$

If double cotton covered wire is used the number 36.7 will call for No. 32 wire. Calculating the power consumption by means of formula (12), 17.7 watts is obtained, which is sufficiently close for ordinary work.

It is of value to notice the performance of different insulations, choosing the size of wire according to the above determined constant, 36.7, and winding the spool full.

Notice, first, that the wire which most closely fulfills the power requirement, 20 watts, is that whose constant, $\frac{r}{m^2}$, is most nearly equal to the value desired. This is the single silk No. 29, whose constant is 37.0 and whose power loss for the full spool is 19.8 watts.

The wire which gives the greatest number of ampere-turns also agrees most closely in its constant with that calculated. The single silk No. 29 gives 2,240 ampere-turns, while its nearest competitor, No. 29 enamel wire, gives only 2,190 ampere-turns. This is in spite of the fact that the enamel wire gives a greater number of turns (6,890) than the single silk (5,440). The reason lies in the greater resistance of the enamel wire winding, which is 151 ohms as against only 116 ohms for the single silk. The latter allows enough more current to flow to make up for the lack of turns.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - Publisher

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

E. B. SHERBURNE, Advertising Manager.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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REMITTANCES to Telegraph and Telephone Age should be made invariably by draft on New York, postal or express money-order, and never by cash loosely enclosed in an envelope. By the latter method money is liable to be lost, and if so remitted is at the risk of the sender

NEW YORK, JANUARY 16, 1913.

Wireless Operators in Future Wars

Should there ever be another war between nations, wireless telegraphy will unquestionably play an important part in its direction and conduct. Privacy and secrecy are of course highly essential in such operations, and although it cannot be said that wireless telegraphy yet offers these advantages there is hardly any doubt that they will be attained in due time. Inventors and experimenters are giving much time and thought to the solution of these and kindred problems, and while progress may appear to be slow the main thing to know is that it is being made.

Wire telegraphy in war times is about as weak as present-day wireless as regards interference. The enemy can tap the wires and can cut them if need be. In wireless telegraphy communication may be interfered with, but the medium of communication cannot be cut.

The wireless operator will constitute an important link in war organizations of the future just as did the Morse operator during our civil war.

The essential importance of the military telegraph service in the rebellion, and later wars in other countries is universally acknowledged. Wireless operators of future wars, however, will have greater responsibilities because much more reliance will be placed upon the service. The generals and admirals will be fighting on land and sea, and the operators may have to fight through the air above. But under proper control and direction wireless communication will prove to be a valuable aid to military and naval operations, and the wireless operator will be one of the most important factors.

The development of wireless is tending, with other beneficent influences, toward abolishing war altogether as a means of settling international differences, but so long as nations regard it necessary to be prepared for defense and conflict, wireless operators will have to keep in trim, and tuned up to war pitch.

As to Transmitting Machines.

An interesting discussion regarding transmitting machines has recently taken place in these columns, the communication from a "Telegraph Engineer," published in our issue for January 1, being a sensible view of the whole situation. The troubles complained of are not chargeable to the machine at all, as some seem to believe, but to the one who uses it, or, to be more correct, abuses it. A machine of any kind will do its work well if it is properly maintained and operated, but if it is not so handled it fails to produce the best results. The ordinary Morse key is frequently improperly used, much to the discomfiture of repeater chiefs and receiving operators; but who would think of condemning the key? No amount of criticism can force the transmitting machine out of existence, because it is really a meritorious device, and efficient when used with reasonable care and judgment.

The latest design machine is equal to a hand key in its transmitting qualities. It has only one contact point instead of two, as in the old-style machines, and its speed is fixed and invariable. The objections raised against these useful instruments, therefore, do not hold good in the case of the improved instrument. Thoughtlessness, carelessness, ignorance or lack of judgment—any one or all—is the root of the evils complained of, and until operators educate themselves to do things right, the troubles cannot wholly be eradicated. It is not a question of mechanics, but of brains.

As a rule, an operator who will misuse a sending machine will misuse a key, and the only way to meet such situations is to offer the offender a little personal advice as to how to properly manipulate his machine.

The point of the whole matter is that the machine should not be condemned for faults that exist outside of it: on the other hand, too much dependence should not be placed upon it, as it is nothing but an insensate machine, operative only by the exercise of the human will. It cannot supply common sense and good judgment if these are lacking in the operator.

Boys Wanted Manager Dismissed.—A new form of trouble for telegraph companies has lifted its evil head into the limelight, and there is no telling what will be the end of this small beginning. The messengers in a large city struck work because the company would not discharge the manager of a branch office, against whom the modern Mercuries had a grievance. As the company would not discharge the manager, there was nothing for the boys to do but to make the company come to terms by striking work and striking the boys who took their places. Several of the pugnacious youngsters were arrested, and the company is still doing business.

Report of English Telegraphs and Telephones.

The report of the postmaster-general of England for the year 1911-12, which was recently issued, shows that during the year 71,716,000 ordinary telegrams were transmitted, an increase of 2.8 per cent; 4,472,000 press telegrams, and 16,931,000 foreign telegrams were also handled. The telegraph system was extended to 110 post-offices, and on March 31 there were 11,561 post-offices open for public service, as well as 2,425 offices at railway stations, etc.

A night telegraph-letter service was introduced on January 1, experimentally, and has since been extended to all offices open all night. The delivery by telephone of telegrams addressed to telephone numbers has been extended.

The use of the telephone in small offices instead of the Morse sounder has been extended, and proves very efficient both in speed and accuracy. The use of high-speed machine telegraphs has been adopted on several additional routes, and the Baudot, working between London and Birmingham, is satisfactory. Eight telegrams can now be sent over this one circuit simultaneously, and 600 have been dealt with in one hour. Murray multiplex working has been introduced between the Central Telegraph Office and Manchester, and the Murray automatic system on one of the London-Leeds wires. Baudot multiplex working has been permanently established on wires to Amsterdam and Berlin, with satisfactory results, and the system will be extended.

About 425 British ships are now equipped with wireless apparatus, as compared with 290 in the previous year; the outward radio-telegrams to ships numbered 6,680, and inward telegrams, 37,827, an increase of 11.8 per cent. In March last the Cullercoats station was purchased, and the whole of the ordinary commercial ship-and-shore business of the country is now in the hands of the post-office, apart from the long-distance Marconi stations at Clifden and Poldhu.

During the year, 153 new licenses for wireless telegraphy, covering 202 land stations, were issued. On March 31 there were eight licenses in existence for private business and 258 for experiments.

The telephone transfer is dealt with at considerable length, and the difficulties consequent on the transfer are explained in detail; it is admitted that the present position is unsatisfactory, and that the service has suffered from the effects of the transfer, but the troubles are of a temporary character and will be removed as quickly as possible.

Conversations over the trunk lines numbered 33,-499,495. The original Post-Office London exchange system included 81,339 subscribers' stations and 905 call offices; the total number of calls originated was 99,800,000, and the length of underground wires (including 49,168 miles for telegraph and 15,202 miles for trunk telephone purposes) was 552,973 miles, the net increase during the year being 41,919 miles. The number of telephone stations transferred from the National Telephone Co. was 140,947, and the total of the combined systems on March 31 was 232,000.

The total mileage of post-office wires on March 31, 1912, was, for telegrams, 313,805; for telephones, 2,234,215, and private wires, 62,630. Of these, 870,973 miles were aerial, 1,729,131 underground, and 10,546 submarine—total, 2,610,650.

The telegraph revenue of the year was $15,747,-420, a decrease of $82,615; the expenditure, including interest on the purchase money, was $21,384,385, a decrease of $379,015. The net deficit was thus $5,636,965.

The telephone revenue was $17,710,000, an increase of $8,019,000, and the expenditure $13,941,-000, an increase of $3,945,000, subject to adjustment when the purchase price of the National Company's system is known.

Book Review.

WIRELESS TELEGRAPHY AND TELEPHONY, Simply Explained. By Alfred P. Morgan. New York: Norman W. Henley Publishing Company. Price, $1.00.

The interest in radio science seems to be so widely disseminated that there is always room for one more book on the subject; and this time the addition comes in the form of a small volume by Mr. Alfred P. Morgan entitled: "Wireless Telegraphy and Telephony." As is usual with most of the writers of books on radio subjects, the author makes his appeal entirely to the amateur and to the casual reader who desires to familiarize himself with the general principles of the science. The illustrations are profuse, and include many half-tone photographic reproductions. The last chapter of the work takes a look at the future, and visualizes some of the conditions which may be expected to materialize at a time when "high potential magnifying transmitters" and "oscillatory currents that leave their conductors behind" have emerged from the laboratory experimental stage. Chances for improvement in the language used in various places lead to the impression that more care might have been used in the preparation of the book, although it will probably serve its purpose as an introduction to a subject which is in need of more serious and authoritative treatment. Mr. Morgan is also the author of an earlier book entitled "Wireless Telegraph Construction for Amateurs."

REFORM IN PROCEDURE IN PATENT CASES.—The Supreme Court of the United States has adopted a rule that will prevent long, drawn-out delays in contested patent cases brought before it. Hereafter, unless prescribed by statute, the technical forms of pleadings in equity will be abolished. It is stated that under the present system one-half of the time of American courts is taken up with consideration of the technical form of the proceedings.

MR. WANAMAKER WANTS TELEGRAPH, TELEPHONE AND PARCEL POST COMBINED.—Mr. John Wanamaker, of Philadelphia, former postmaster-general of the United States, advocates the additions of the telegraph and telephone services to the parcel post system.

Course of Instruction in the Elements of Technical Telegraphy—XXXI.

(Copyrighted.)

(Continued from page 14, January 1.)

[We began in our issue for October 16, 1911, the publication of a course of instruction in technical telegraphy. The course, which was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, is published for the benefit of those of our readers who desire to fit themselves for better positions in their vocation. It is elementary throughout and is divided into chapters, following one another in logical order.

The course has received the hearty commendation of telegraph officials and experts for its scope and accuracy and its sound practicability. In each chapter examples are presented in order to illustrate the application of the rules to practical cases, and each chapter is followed by a series of questions pertaining to the subject of the chapter, to be worked out by the student in order to review his progress. Back numbers containing these valuable articles can be obtained on application, at 10 cents per copy.]

In Fig. 28 the line is the positively charged body, the earth the neutral, and the air space between, the dielectric.

A negative charge will therefore be attracted to the surface of the earth as shown in the figure.

If the air had no inductive capacity, that is, if it did not allow induction to take place through it,

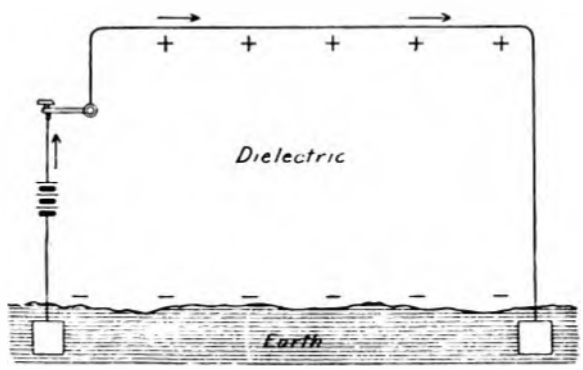

FIG. 28—INDUCTION BETWEEN WIRE AND EARTH

there could be no static charge on the wire, and as the inductive capacity of air is the lowest on the list, the static charge accumulated is not sufficient to be noticeable in ordinary single working, especially as the insulation of the dielectric is affected seriously by damp and wet weather.

In dry weather, however, if a battery be put to a long circuit, and, by means of a double contact key, the battery be suddenly removed and the line placed sharply to earth through the receiving instrument, the static charge on the wire and the corresponding charge on the earth's surface will unite through the connection thus made, and produce a signal on the relay. This discharge, or return current, takes place at both ends of the line, but principally at the battery end, on account of the potential being highest there.

If the wire is open at the distant station, the discharge at the battery end will be increased, and a discharge can be obtained from a shorter circuit. This discharge is called the static discharge of the line.

The "static capacity" of an aerial telegraph wire or its power of holding static electricity increases with the length and diameter of the wire and the nearer to the ground it is suspended. It is also further augmented by close proximity to other wires.

The effect of charging a wire of measurable static capacity is that at the moment of charge a greater rush of current takes place into the wire than would be the case were the conductor devoid of this quality.

The effect of discharging a similar wire is that at the moment of discharge, when the earth is suddenly substituted for the battery, the accumulated static charge rushes out from the line in a direction opposite to that taken by the charging current.

QUESTION PAPER.

(1) How is it that A does not get D's break in wet weather, with R on a normal adjustment? (Fig. 21).

(2) What do you understand by "Specific Inductive Capacity"?

(3) What do you understand by "Static Discharge"?

(4) How would you adjust for the terminal office under unfavorable weather conditions?

(5) Why is it sometimes necessary to lower the adjustment to get the nearest office, when the terminal station comes all right?

(6) How would you account for leakage, seeing that glass is a good insulator?

(7) If the insulating medium between a wire and ground consisted of paraffin instead of air, how would the static charge of the line be affected?

(8) Make a sketch similar to Fig. 21, showing the direction of the leakage currents, with K open and K^1 closed.

(9) Would the static charge on a wire be increased or decreased if the wire were brought nearer to the ground?

(10) Is the metal resistance of a wire affected by weather conditions?

(11) A line has a battery of 100 volts at each end. At a point on the line where the resistance on either side is exactly equal, will there be any static induction between the wire and earth?

(12) When ground is substituted for battery at one end of a long open circuit a slight click is produced on the relay by the static discharge. Where does this discharge current come from?

(13) Why is the resistance of a circuit less in wet weather than in dry weather?

(14) Explain fully why station C (Fig. 22) comes lighter on R than does station D.

(15) What is Static Induction?

(16) *(a)* Explain why the leaves of an electroscope diverge when a negatively excited body is brought near the metallic rod.

(b) Why do the leaves fall together when the excited body is withdrawn?

(c) If the excited body were charged positively, what would be the position of the gold leaves?

(17) Why is there greater attraction between

the relay cores and armature in wet weather than in fair weather?

(18) Explain how static electricity is accumulated on a telegraph line.

(19) Would it be correct to determine the amount of current flowing into a wire at the moment of charge by Ohm's law, $\frac{E}{R} = I$?

[Note—On page 13 of the January 1 issue the two upper figures in the illustration in the second column were turned upside down by the printer, in making the form ready for the press. Although the error will be obvious to the reader we wish to point out that by turning the cut straight the figures will be transposed, Fig. 24 becoming Fig. 25, and Fig. 25 becoming Fig. 24.—Ed.]

(To be Continued.)

Reminiscences of the Confederate Military Telegraph Service.

BY R. O. CAMP, WILTON, ALA.

At the time Chattanooga was evacuated, Barney Hughes, of whom I made mention in my article printed in your issue for December 16, 1912, went to Ringgold, Ga., where General Claborne stemmed the tide of the Union troops. When I arrived at Ringgold, Barney had picked up his traps, and moved to Dalton, and when I took charge of the office I found his will written in large charcoal characters on the hard plaster finish of the wall. The document was in poetry, and bequeathed to me his earthly possessions left in the office, which I discovered to consist of a dirty gunny sack, one pone of corn bread, and about ten Irish potatoes.

When Barney was manager of the three telegraph companies centering in Chattanooga, Mr. Jones, of the Southern Telegraph Company at Atlanta, and Mr. Clute, superintendent of the Southwestern, were badly at outs. When either of them visited Barney's office he proceeded to vilify the other in language, which left no doubt in the mind of the hearer that nothing short of a murder would occur should these two savage individuals ever meet. One day Mr. Clute came in and was discussing Jones in the usual fiery manner, when Barney received a message from the Dalton, Ga., operator informing him that Jones was on the train bound for Chattanooga. Barney received the news as he would an account of a washout ahead of the lightning express, and acted as promptly. When the train came in and Jones sauntered on to the platform, Barney inserted his bulky form in the frame of the back window in such a position that when the shooting began he could drop into the back yard of the old Crutchfield hotel, and thus preserve his efficient personality for further service for his employers. Barney did venture, however, to peep over the window-sill. When Jones came in, the latter saw Clute and said: "Hello, Clute, how are you?" Clute responded in the tone of one meeting a long-lost brother: "Hello, Jones, old man." Then Barney climbed back into the window and said: "Let's all go around the corner. It's on me."

When Barney was general passenger agent of the old Memphis and Charleston Railroad, he got an invitation from the manager of a new hotel at Memphis to come around with his chief clerk, and take dinner at that hostelry every day. Barney cheerfully accepted in good faith, and the two showed up for dinner as promptly as the clock struck twelve. After a few days the experiment seemed to wear on the manager of the hotel, and he decided that the beneficial influence of Barney's presence was not sufficient to square the steward's account of the provisions consumed; so he tactfully intimated to Barney that hereafter the regular rates would prevail in his case. A few days after this announcement from the manager, Barney was seen sauntering around in the lobby of the hotel, when in came five or six lively young men, each bearing a brand new gripsack, and wearing a spotless linen duster. Barney started forward, and shook hands all around with expressions of pleasure at again meeting them, and asked where they were going. They replied: "Oh, we just came up here for a good time." Barney asked where they were stopping, and they replied that they had not decided. Then Barney said: "Well, that's good; let me take you down to the hotel where I am stopping," and forthwith marched them out. The party proceeded around the corner to the store from which Barney had borrowed the gripsacks and dusters, and then Barney sent the young men back to their flagmen's jobs on the Memphis and Charleston. The next day Barney got a cordial note from the proprietor of the hotel, stating that business was good, and he would be glad to renew the former dinner invitation.

A few days after the battle of Chickamauga we had a hot engagement. I was acting as color-bearer, and found myself at the end of the fight with a slight wound, and the flag shot to pieces with eighteen bullet holes and a cannon ball through its folds, and the staff shattered. I was detached to General Bragg's headquarters as military telegrapher, and detailed to duty at Tyner's Station just out of Chattanooga on the old East Tennessee and Georgia Railroad, where we were moving Longstreet's corps, and Cheatham's division to Knoxville to block the efforts of the federal troops to join Hooker there. One morning the only wire we had toward Knoxville opened. I sent a lineman with some men on a hand-car north to look for the trouble. About four miles out they found that the wire had been cut, and they followed the loop down into the woods to an old stump on which they found a message addressed to me from operator J. D. Voltz, of the United States military telegraph regretting that he could not dine with me as he had urgent business with General George H. Thomas, United States Army. Voltz had tapped our wire. I afterwards became well acquainted with him in Atlanta, and I have learned that he died at Elgin, Ill., last year.

The Telegraph and Telephone Pension and Benefit Plan in Effect.

The new plan of benefits for disability due to accidents or sickness, of insurance and of pensions for the employes of the Western Union Telegraph Company, Western Electric Company and the Bell Telephone system went into effect January 1.

In making the announcement president Theo. N. Vail, of the Western Union Telegraph Company and the American Telephone and Telegraph Companies, says:

"Nearly 200,000 men and women, who are now giving their best years to the telephone and telegraph service of the country, will henceforth be assured of assistance in the exigencies of life, for which all are not able to provide, and will also be assured of a provision for their declining years.

"It is but natural that every employe should desire to assume the normal responsibilities of life, and to surround himself and those dependent upon him with the things that make life complete and enjoyable. Unforeseen happenings may make these responsibilities heavy burdens, and whatever may be put aside for the day of misfortune must in the beginning be small and accumulated slowly. A realization that obligations must be met in times of misfortune, as well as in times of prosperity, has made the need of something beside merely an old age pension appear absolutely vital.

"Employers buy, and employes sell service. Perfect service is only to be found when fidelity and loyalty are reciprocal in employer and employe. It is this relationship that brings satisfaction and success to both.

"The intent and purpose of the employer in establishing a plan of benefits is to give tangible expression to the reciprocity, which means faithful and loyal service on the part of the employe, with protection from all the ordinary misfortunes to which he is liable; reciprocity which means mutual regard for one-another's interest and welfare. This is justice, and without justice and sympathetic interest we cannot hope to do a thoroughly good piece of work.

"The American Telephone and Telegraph Company, which contralizes the Associated Companies into one system, with one policy for universal service, has considered the interests of all workers, and has made a comprehensive plan possible. It is the administrative clearing house, and the underwriter of the necessary reserve fund, upon which a general plan must depend.

"One illustrative instance of the exereise of these functions has been the unifying of the various interests so that any employe may aspire to work anywhere in the country with uninterrupted benefits, and any company can obtain any man it needs, without prejudice to his welfare.

"In behalf of the management of the American Telephone and Telegraph Company, the Western Union Telegraph and the Western Electric Companies, let me say that we have a personal interest in our public service, a personal interest in our employes, and a personal interest in our common country. It is our hope that what we have already accomplished has helped the men and women of the Bell systems to become happier and better American citizens, and it is our New Year's wish that what has been planned for the future will contribute to their constantly increasing happiness and betterment."

Details of the plan we published in our issue for November 16, 1912.

Interesting Morse Relics.

Mr. J. J. Ghegan, president of J. H. Bunnell & Co., New York, has recently come into possession of a unique telegraph set made for Prof. S. F. B. Morse by C. T. and J. N. Chester, of New York, the well-known manufacturers of telegraph instruments many years ago. The set consists of a miniature key, sounder, relay and battery, all in perfect proportion and made and finished in a manner fully equal to the highest standards of the present day.

The battery, which is of the plunge type, consists of six tiny jars, into which the zinc and carbon electrodes are lowered by means of a frame guided by upright brass posts at the ends of the battery rack. When the battery is not in use the electrodes are lifted out of the exciting fluid by the same means. On top of the lifting rack are switches which permit cutting in or out any number of cells within the limits. The over-all dimensions of the battery rack are 7 inches long and 3 inches high, the base being a zinc plate. The cell guards and the lifting rack are made of hard rubber. The zincs measure 9/16 inch wide, 1⅛ inches high by ⅛ inch thick, and the carbons are of the same dimensions except that they are semi-circular on the side next to the jar. The zincs and carbons are rigidly attached to the lifting frame, and are separated by 1/16 inch space.

The key is of the straight lever pattern. The sounder bears a striking resemblance to the modern sounder except that the armature lever is made in the form of a right angle instead of being straight, as in the modern instrument. The stop on the down stroke is a post located in front of the magnets, and the back stop is a similar post behind the magnets. The magnets are encased in polished hard rubber shells, and the base is of the same material. The general dimensions are: Base 2 inches long by 1¼ inches wide; magnets ¾ inch high by ½ inch in diameter.

The relay resembles the present-day instrument except in the length of its magnets. The magnets are 2⅝ inches long by ⅝ inch in diameter, the horseshoe core being made of ¼-inch round iron. The hard rubber base measures 4½ inches by 1¾ inches. A peculiar feature is that the core is movable within the coils, the combination forming a true solenoid with a movable iron core.

All of the instruments and battery are contained in a morocco leather, plush lined case, measuring 8¼ inches by 6¼ inches by 3½ inches. A plate on the cover has engraved upon it the words "Made for Professor Morse by C. T. and J. N. Chester."

The Arlington Wireless Station.

In an article published in the London *Electrical Review*, Messrs. Davis H. Tuck and Millard B. Hodgson give a description of the engineering features of the new wireless telegraph station at Arlington, Va., from which the following abstracts will be of interest to our readers, in addition to what we have already printed on the subject.

The three towers are built on the corners of an isosceles triangle, and are respectively 450, 450 and 600 feet in height, the 600-foot tower being erected at the apex of the triangle. The dimensions of the two smaller towers are identical, being 125 feet square at the base, and tapering to fifteen feet square at the top. The 600-foot tower is 160 feet square at the base, and tapers to fifteen feet at the top. All three are of the same general construction, being built up of box girders whose angles are of ½-inch steel reinforced with ⅜-inch plates. The platforms at the top are accessible by zig-zag ladders arranged with convenient landings. The four legs of each tower are embedded in a mass of concrete ten feet square, running into the earth a distance of twelve feet to a rock and clay sub-foundation.

The entire structures are insulated from the ground by marble washers waterproofed with varnish. There being no reliable data on the possible effects of great electrical capacity, such as that of the towers, on the signaling devices, it was deemed advisable to take this precaution. The towers are connected to earth by ground wires and disconnecting switches, so that such data can be obtained.

At present the energy is supplied by a local power company at 6,600 volts, twenty-five cycle, three-phase, and is stepped down to a pressure of 220 volts to operate a Westinghouse synchronous motor rated at 200 h. p. at 500 r. p. m. The revolving type of spark-gap employed, being a four-foot wheel whose fifty terminal spokes, corresponding to the fifty poles of the generator, give 1,650 discharges per second. These pole spokes are ½-inch copper, about eight inches in length. The minimum spark-gap is 1/64-inch, but owing to the high potential the air breaks down about three inches before and after the 1/64-inch gap discharge. There is a constant capacity consisting of nine condensers in parallel, each having a capacity of 0.036 mf. These condensers are made up of steel plates set in steel cylinders, and all air insulated at an air pressure of 300 pounds per square inch. The wave length is varied by means of three variable-inductance units. The signaling contacts are actuated from the operating room by relay, a variable resistance of 220 ohms maximum being shunted across the contact points on the low-voltage side to prevent excessive sparking at the contacts. The ground wires, which are led out through the basement, terminate in 6,000 feet of bare copper wire laid in trenches between the towers. The generating or sending wires to the aerials are led out through a one-inch thick window pane to a distributing pole. The sending wire from the generator, the receiving wire from the detector, and a third wire, deeply grounded, terminate here. The two wires from the generator and the detector respectively are heavily insulated from their wire supports by composition strain insulators, and from the posts of the distributing platform by double-petticoat porcelain insulators of special design. The terminals of these three wires form the three contacts of a three-way switch, which is controlled from the operating room by a system of chains and pulleys. The moving arm of the three-way switch is connected to the wires leading direct to the aerials. A second switch, suspended between the distributing poles and the wall of the building, but insulated from both by strain insulators, is placed in the detector side of the line. This switch is also actuated from the operating room by means of chains and pulleys. With this three-way switch arrangement it is obvious that the operator can at pleasure close the circuit for receiving messages, change over to sending them over the same route, or ground the entire system, as in time of electric storms.

The wires are run direct to the aerial spreaders, which are built up of 2½-inch galvanized iron pipe reinforced with ⅜-inch strapping of galvanized steel. They are eighty feet in length, square in section, and three feet on a side at the largest part. The aerial wires proper, twenty-three stranded cables of ⅛-inch diameter phosphor bronze, are soldered both directly to the iron pipe and by auxiliary wires to the bridle. The connections from one aerial to another are made by means of cages containing twenty-three phosphor-bronze wires soldered directly to the bridles of the spreaders. The wires between the 600-foot tower and the 450-foot towers are about 400 feet in length, and between the two smaller towers 300 feet, 40 feet being allowed in each case for sag. It is estimated by needle-point test (length of spark being eleven inches) that an electromotive force of 150,000 volts is obtained at the topmost point of the antennæ. As an illustration of the great current density, a piece of cloth which was blown from the top of one of the towers and landed on the aerial, instantly burst into flame.

The telegraph key operates, by relay, the contacts in the generating room, which in turn control the rate at which the radiant energy leaves the aerials, the impulse being transmitted to the topmost antennæ from the spark-gap, and the wave-length being kept at the desired value by the variable inductance units.

A novel and useful item in the equipment of the generating room is the provision made for testing out complete generating sets for any of the Governmental stations. A space of about twenty feet square is reserved, I-beams being laid three inches apart in the floor, to which heavy apparatus, such as motors and generators, may be temporarily bolted. This testing platform will have a special switchboard and current-distributing system, so that any desired voltage or frequency may be obtained.

On the Wing.

BY J. W. HAYES.

There are scattered over the broad expanse of our country, located in city and in hamlet, many bright and interesting characters whose friendship, or even acquaintanceship, form an oasis in this wilderness of our existence.

Mr. J. W. Hunter has worked in the Cleveland, Ohio, office for many years. Prior to his coming to Cleveland, Mr. Hunter was manager of the Sandusky, Ohio, office and it was there that the editor of this journal, the writer, and the publisher of the TELEGRAPH AND TELEPHONE AGE, respectively, labored, and all three agree that we never worked for a better or a whiter man than "Duke" Hunter, as he was affectionately known to us, and he possesses our respect and love.

There is another man in the Cleveland office that has, in his own kind and gentle way, rendered smooth the pathway of the younger operator. Who is it that does not know Albert J. Desson, who entered the service of the Western Union Telegraph Company January 1, 1863, and who is just rounding out his fiftieth anniversary in the employ of that company. Albert has worked continuously in the service, and has never missed one day on account of illness, neither has he ever been five minutes late. During this long period of Mr. Desson's service he has lost but thirty days, fifteen of these being when he married his estimable wife, who is still a sharer of his joys, for he has no sorrows. Mr. Desson is answerable for teaching the writer how to manipulate the key and also for performing the same office for the publisher of this journal. He is a man whom one is proud to call a friend, and it would be well if the telegraph companies had more like him.

In the little city of Fremont, Ohio, dwells a man who is the manager for the Postal Telegraph-Cable Company. His name is Eugene H. Sherwood, and he is particularly well known on the Pacific Coast. Mr. Sherwood met with a misfortune some thirty years ago, which more than ever endeared him to the telegraphic fraternity. He bears the unique distinction of being probably the only operator in the country for whom a railroad magnate and president side-tracked his private car so that he could come uptown, and pay his respects to an old comrade, and if any distinction is accorded Mr. Sherwood, how much more is due to Mr. B. A. Worthington, the president of the Chicago & Alton Railroad, who conferred this honor on his former colleague.

One of the finest operators, and the most genial and kind gentleman who erstwhile worked at the telegraph business, is V. D. Green, better known in years gone by as "Comb" Green. Mr. Green is now the manager of the American District Telegraph Company in Chicago, and is gracefully carrying the many years of service with the telegraph companies.

There is a man in the telephone business in Chicago whom we are all delighted to honor as having once been foremost in the ranks of the telegraph profession. This is Bernard E. Sunny, now the president of the Chicago Telephone Company, who makes the same beautiful copy that he used to in 1876, and who will spare an hour from his multitudinous duties to visit with an old-time operator friend.

I used to know in the early seventy's Mr. Joseph Keenan, who was lineman for the Western Union at Toledo, and who was the best lineman that I ever knew. It is pleasant to know that the son of Mr. Joseph Keenan, Mr. Edward C. Keenan, has recently been promoted to the position of general superintendent of the New York Central Railroad Telegraph lines, with headquarters at Chicago. Mr. Keenan is one of those happy, genial spirits whom we find but too seldom, and who are thoroughly appreciated when once known.

The TELEGRAPH AND TELEPHONE AGE of a recent date contained an item from the pen of Mr. Frank B. Knight, wherein he spoke of the beautiful copy of Mr. Thomas P. Wheeler, of the Postal office, St. Louis, Mo. Everybody who knows Mr. Wheeler will not gainsay this reference to his copy, which is the most graceful and ideal that can be found in a telegraph office; but it is of Mr. Wheeler's character and virtues that one loves to hear. Patient, painstaking, kind, compassionate to friend and stranger — qualities which have marked Mr. Wheeler's career, and these characteristics are as unchanging as is his "copperplate copy."

For forty years Mr. Rudolph H. Bohle has been at the head of the telegraph service as manager of the Merchants' Exchange, and later manager of the main office in St. Louis, Mo. He has lately been made special agent for the Western Union Telegraph Company, with headquarters at St. Louis, and it is a great boon to be able to spend a few hours with Mr. Bohle. No item of interest has escaped his fine memory, and his ready laugh is infectious.

One of the finest men who labored and came to the front in the telegraphic field, but who left it for broader pursuits, is Mr. Geo. M. Myers, now a prominent financier and capitalist of Kansas City, Mo. Mr. Myers has seen his adopted city grow out of her swaddling clothes to its present important position in the business world. Like all true old-timers, Mr. Myers will put his business aside to tell a story or listen to a yarn from some old-time friend in the telegraph business.

The world is better for the lives of such men as are here mentioned.

WIRELESS IN MONGOLIA AND THIBET.—Arrangements are in hand for the establishment of a system of telegraphs in Mongolia and Thibet. As it is expected the work will occupy at least three years, it is proposed to install for present use wireless telegraph stations at various places in both countries.

MR. J. W. PARSONS, secretary of the Ohio Masonic Home, Springfield, Ohio, an old-time and military telegrapher, in renewing his subscription writes: "I have been out of the telegraph business for many years, but still feel an interest in the profession, and I am always glad to recommend your paper whenever the opportunity occurs."

Western Union Bridge Duplex.

(Continued from page 20, January 1.)

The Polar Relay. This relay, as shown in Fig. 12, has two J-shaped permanent magnets, the "South" poles of which are adjacent to each other and connected together with a soft-iron bridge piece. Attached to this bridge piece is a soft-iron C-shaped piece, in which is fitted, with a very small air-gap, the pivoted end of the soft-iron tubular armature. The free end of this armature, which, by the arrangement just described, is also a "South" magnetic pole, plays between the "North" pole-pieces of the two J-shaped permanent magnets. The armature lever is, therefore, attracted equally by both pole-pieces, and will remain in contact with either its right or left-hand stops when placed there by hand, if no current is flowing through the magnet coils on the two pole-pieces. These coils are so connected together, for use in the bridge duplex, that when a current is passed through them it tends to demagnetize one pole-piece and to strengthen the magnetism of the other pole-piece; instead of being attracted equally by both pole-pieces as before, the armature is then only feebly attracted by one of them and with increased force by the other, so it moves toward the latter pole-piece with great speed. If the direction of the current is reversed, the attraction is transferred to the other pole-piece and the armature swings over in response to the change.

This relay may be used to operate a local sounder at terminal stations, or as a main-line direct-repeating relay at repeater stations, as both its front and back contact posts, in addition to the armature lever itself, are connected to binding posts on the instrument.

As already intimated, this relay, the coils of which shall always be connected in series, is placed in the cross wire of the bridge, the arms of which are represented by the two windings of the impedance or retardation coil marked WE-5-U in the various diagrams.

In order to center the relay (which is always advisable in the initial stages of adjustment) first throw the double lever of the Line Resistance Box (Fig. 12) over to its extreme right-hand position, which will open both the main and artificial lines. Then set the armature lever midway between the relay cores, leaving an air-gap of about 1/32 inch on each side. Afterwards adjust the limiting stops, until the play of the lever between them is just sufficient in amount to prevent sticking, and ensure clear breaking of the contact points.

It should be noted that the air-gaps between the armature and the relay cores can be regulated by moving these cores in or out of the permanent magnets, where they are held by small set-screws. While the spacing mentioned above (1/32 inch for each air-gap) is usually the best all-around adjustment, it is sometimes found desirable to deviate considerably from that figure.

After the cores and contact points have once been properly set, any "bias" necessary to strengthen the signals or overcome other peculiar conditions may be obtained by turning the large thumb-screw which moves the carriage on which both contact posts are mounted.

The Mil-Ammeter. This instrument, which is connected in series with the polar relay in the bridge, has been specially designed to facilitate the operations of line balancing. It will also indicate the precise value of such portions of the incoming currents as pass through the polar relay, as well as afford—by the character of its deflections—an index of the general condition of the circuit.

The mil-ammeter may also serve a useful purpose in detecting the presence of underground faults—such as escapes—which generally manifest themselves in a peculiarly distinctive way upon the meter. This arises from the fact that currents of opposite polarity in passing through the fault produce different electrolytic effects upon the conductor at that point; a positive current tending to oxidize and seal up the fault, while a negative current deoxidizes and further develops the fault. Hence, the balancing of a circuit in which such a fault has appeared will be rendered more difficult by the changeable character of the resistance of the fault under the current reversals; a balance obtained with one polarity of current to line being immediately destroyed by the current of opposite polarity.

At each disturbance of the balance, the meter needle will first be suddenly deflected to one side or other of its previously assumed position (according to the current polarity), and then gradually move in that same direction until it reaches some other point, where the needle will remain in a more or less stationary position. Symptoms of this character will indicate the particular nature of the trouble, to which the attention of the wire chief should immediately be directed.

The Combination Condenser. This consists of a wooden box containing three groups of condensers, two of which are adjustable and the other non-adjustable, as represented theoretically in Fig. 12.

The adjustable condensers, each of which has a total capacity of 3⅞ mf. graded in the manner shown, are to be used in the artificial line for the purpose of securing the "static balance."

The non-adjustable condenser has a fixed capacity of 1 mf., and is intended for use as a "spark" condenser, to be placed between the "ground" and the dividing point of the "5-U" coil, as illustrated in Figs. 10 and 15.

The ¼ mf. condenser, as shown in Fig. 11, is used to eliminate or reduce the spark which develops at the pole-changer contact points. It shall be connected in series with a twenty-ohm resistance lamp across the points referred to.

Balancing the Bridge Duplex. The usual practice of balancing to the distant "ground" on duplex circuits is now regarded as unnecessary, owing to the presence in the circuit of the mil-ammeter, which admits of the balances being taken against the distant battery with less loss of time, and under conditions that eliminate all differences that might happen to exist between the ground coil and battery resistance.

(Note: As the ground coil is thus no longer essential, its use will be discontinued, and the coil replaced by a direct ground connection, which can be switched into or out of the circuit in the usual way for purposes other than that of balancing.)

RESISTANCE BALANCE. In taking a resistance balance, proceed as follows:

(1) Ask the distant station to close his key, which will cause the mil-ammeter at the home station to deflect to the left, or in what may be called a marking direction.

(2) Note the number of degrees indicated on the scale, first with your key open and then with it closed, the deflection in each case being taken after the needle has come to rest.

(3) While the key is in the closed position adjust the balancing resistance until the needle reaches a point midway between the two readings referred to, which point will represent the deflection required to secure the ohmic or resistance balance. If, for instance, the needle stands at 14° on the open key and at 10° on the closed key, the adjustment should be such as to bring the needle to a position that will correspond as nearly as possible with the mean of the two readings, viz., 12°.

It will be found that when the resistance in the artificial line is greater than that in the main line, the needle will swing somewhat deliberately in an upward or spacing direction upon closing the key. And, on the contrary, the swing of the needle will be in the downward or marking direction should the resistance in the artificial line be less than that in the main line.

STATIC BALANCE. It will next be in order to take a "static" balance, any disturbance of which will make itself evident by a sudden throw of the mil-ammeter needle, which will quickly jerk or "kick" in one direction just as the key is being depressed, and in the opposite direction at the moment the key is released, the needle instantly returning to its normal or steady position after each movement of the reversing key.

In order to avoid confusion during these balancing operations, it will be well to disregard the effects produced upon the needle at the opening of the key, and take note only of those observed at the closing thereof.

(1) If, then, upon closing the key the needle swings, or kicks, in spacing or upward direction, and then rapidly returns to its former fixed position, it will be an indication that the capacity of the condensers in the artificial or compensating circuit is not enough, and should accordingly be increased.

(2) If, on the other hand, the throw of the needle is in the downward or marking direction at the instant of depressing the key, the condenser capacity should be diminished.

The amplitude of the swing or kick in each case will show the amount of the static unbalance, the latter depending upon the difference in strength between that portion of the current which suddenly rushes into and charges any main line possessing electrostatic capacity and the portion rushing into the artificial line to satisfy the "capacity" requirements of the condensers forming part of the compensation circuit.

RETARDATION BALANCE. If the retarding resistances in the paths of the balancing condensers are not accurately adjusted, the time occupied in charging and discharging the condensers will differ from that required to charge and discharge the main line. Should this difference be very pronounced, the mil-ammeter will give a peculiar "double kick" each time the key is opened and closed, this kick being readily distinguishable from that due to the ordinary static unbalance, in having a decidedly more jerky and lively action during its exceedingly brief period of existence. It may, however, be somewhat difficult to differentiate between the two, on account of the constant vibration to which the mil-ammeter needle is ordinarily subjected by induction from neighboring wires, the effects of such interference rendering accurate readings and close observations a matter of considerable difficulty. Under such circumstances it may be well to make the final compensating adjustments by rapidly dotting with your key while making such alterations of the capacity (and particularly of the timing or retardation resistances) as will cause the needle to show the least amount of disturbance as a result of the changes thus made.

APPROXIMATE BALANCE. A satisfactory balance cannot be secured until the needle shall have ceased to be influenced by the operations of the reversing key, the steady condition of the needle denoting that an equality of potentials (upon which the bridge principle depends) has then been duly established; or, in other words, that the pressures exerted by the outgoing currents at opposite ends of the "bridge" (in which the mil-ammeter and polar relay are placed) are equal in magnitude and oppositely directed, thus producing a null effect upon both of those instruments.

An approximately perfect balance being somewhat difficult of attainment (especially when the time involved is an important consideration), it is only necessary as a rule to obtain a good working balance, that is, one in which the clearness and legibility of the incoming signals are practically unaffected by the outgoing currents.

It should not be necessary, in most cases, to call in the aid, and await the appearance, of any traffic or repeater chief at a distant station for the purpose of restoring a balance, which can usually be effected by suitable "snap-shot" adjustments calculated to meet the practical working requirements without involving a stoppage of the circuit, or the delay incident to securing the attendance of the particular chief concerned at either the repeater or terminal office.

THE BRIDGE DUPLEX REPEATER. Any two duplex sets in the same office may be connected together to form a duplex repeater, by throwing the 3-point "local repeating" switches (see Fig. 11) and connecting the sending side of each set to the receiving side of the other set by means of a cord at the loop switchboard. The indirect repetition thus ob-

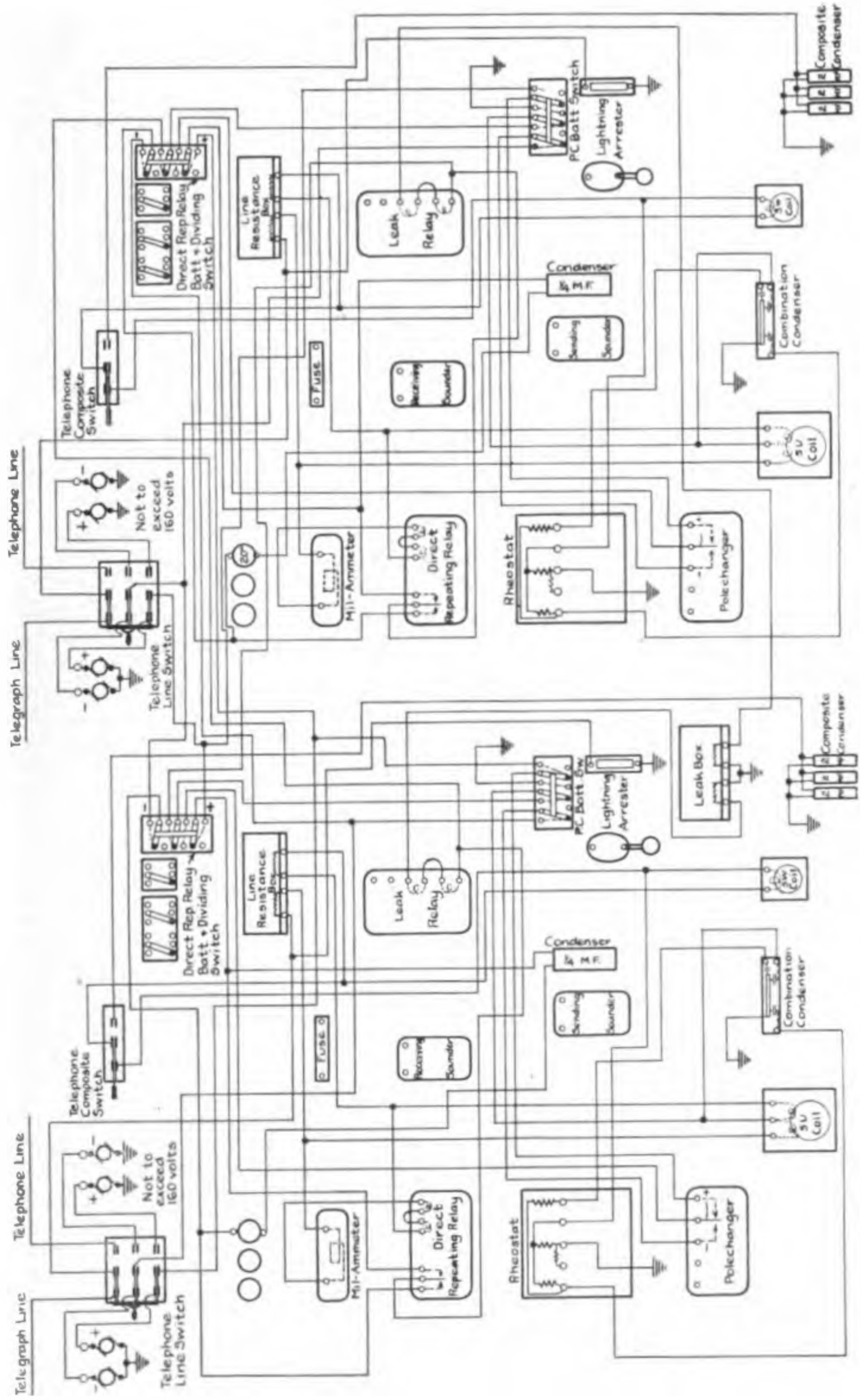

FIG. 13—BRIDGE DUPLEX REPEATER SETS FOR EITHER TELEPHONE OR TELEGRAPH WIRES

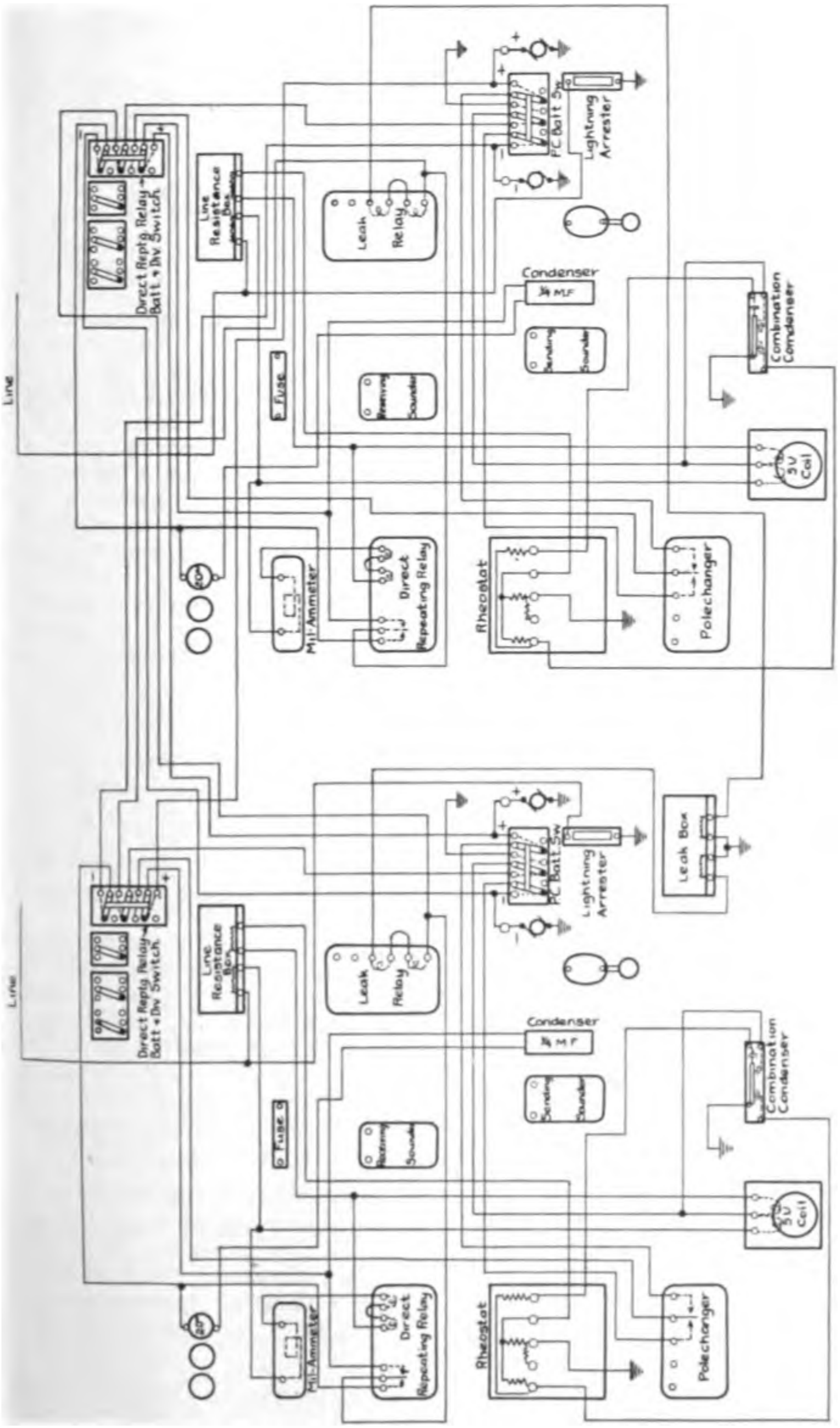

FIG 14—BRIDGE DUPLEX REPEATER SETS FOR TELEGRAPH WIRES ONLY

tained through the local circuits, however, is somewhat inefficient and should be used only in temporary combinations of circuits, when bridge duplex repeaters are not available. In repeater sets of the latter type, as shown in Figs. 13 and 14, the polar relay combines the functions of a receiving and transmitting relay, the arrangement being such as to cause the incoming signals from one main line to be directly repeated into the other line without the interposition of the local pole-changer, which, as previously remarked, is only brought into service when the repeater is "cut" for the purpose of balancing, talking or other local requirements.

[Note—Bridge duplex repeaters are sometimes used to secure increased efficiency on circuits operated by the single Morse method. In such cases the repeaters are slightly modified for 3-way service.]

(To be Continued.)

Electromagneto-Telephones.

BY ANDREW PLECHER, LAS ANIMAS, COL.

In the August 1, 1912, issue of TELEGRAPH AND TELEPHONE AGE, is printed an excellent illustration and description of the magneto-telephone in use at present.

"The principal parts," the article reads, "are the magnet, the diaphragm and the containing case. The magnet consists of two side pieces (f), which are of hard steel permanently magnetized, two soft iron pole-pieces, (g) one of which is a north pole and the other a south pole, and which are wound with fine wire (h)." Those who wish to see that the above description is correct need but open the receiver of their desk or wall set. There is no necessity of calling the electrician, since there is absolutely no danger of harm to anyone or a risk of breaking anything. The parts will be in every instance found exactly as described.

In case you do not care to take such pains, just unscrew the cap of the receiver, lay away the diaphragm, disconnect one wire so as to break the circuit, put your penknife to the pole-pieces, and you will instantly experience the pull of the permanent magnet, which is the one essential characteristic of the magneto-telephone. The wire leading to the receiver being disconnected, there could be no such strong pull from any other source, except a permanent magnet. Nothing more is inside the case but the wire and the magnet. Simple, isn't it? Yes, it is the same old hard iron telegraph magnet that gave Morse so much trouble in receiving telegraph signals, and that gave the very first experimenters in "transmitting sound by the telegraph," as the telephone art was first called, such an excellent, ready-made telephone receiver. This instrument was never invented; it was found ready for the purpose, and to show its readiness it worked even without armature as a telephone receiver.

Now, take out this permanent magnet, and use the soft iron pole-pieces alone, and you will have a modern, soft iron core telegraph magnet, but with the removal of the permanent magnet the property of receiving speech will be gone. On account of this the permanent magnet has been considered the indispensable part of a telephone receiver, and such became the fixed idea for generations. This is one of the immovable obstacles which has held back the advance of the art. Another is the conviction that a make-and-break transmitter is an impossibility. The first impossibility we will solve right now, and the solution of the second impossibility will be given in another article on a new transmitter.

One way of getting around the problem is to make the diaphragm of the receiver a permanent magnet and my peripheral reed diaphragm lends itself to this admirably. It will not injure its receiving property at all, if you use a heavy disk of hard steel in place of the very thin one in use at present.

The real solution, however, is the use of electromagnetism in place of permanent magnetism. The line winding will then form the secondary of an induction coil, the primary of which is permanently charged by a battery current. The coil may have a soft iron core, or have no core at all. Since my magnet is wound upon a non-magnetic spool, the primary winding, consisting of silk or enamel covered copper wire or insulated iron wire, may form the core. Such would properly be called a solenoidophone.

A permanent magnetic core need not be spurned, and the battery current is then used to regulate the magnetism to the very finest. It would still be an electromagneto-telephone, since the line impulses act on a current and not on a stubborn permanent magnet directly. A receiver with the new basic principle is a hundred times more sensitive than the old one, as the fixed and stable system of a permanent magnet does not have to be upset and changed by the line impulses, well known to be vanishingly small and of exceedingly short duration, and not able to magnetize and demagnetize a piece of hard steel every moment.

TELEGRAPH AND TELEPHONE AGE, dated September 16, 1912, shows the circuits of the new telephone receiver, and the battery establishing permanent magnetism in the receiver magnet, which has the shape of an induction coil. These new instruments, patented in twenty-three countries, are not on the market, but the time is not distant when they will do their share in encircling the globe.

TELEGRAPH AND TELEPHONE LINES IN BROOKLYN.—The placing of the Brooklyn telegraph and telephone lines under the jurisdiction of the Public Service Commission No. 2 is the principal provision of a bill which has been prepared by the Commission, to be presented in the Senate at Albany, N. Y.

ANNUAL MEETING OF T. M. B. A.—The annual meeting of the Telegraphers' Mutual Benefit Association will be held at 195 Broadway, New York, at 4 P. M., March 12. The proposition to change the name of the association to "Telegraph and Telephone Life Insurance Association" will be submitted at this meeting.


KERITE
1850
1913
DAYS KERITE
1860
1870
1880
1890
1900
1910

The Railroad.

MR. W. FRANKLIN ECKERT, chief dispatcher, New York division, Reading Railroad, Philadelphia, Pa., has been appointed superintendent of the Reading and Columbia division of that road, with headquarters in Columbia, Pa.

TELEPHONES ON THE GULF, FLORIDA AND ALABAMA RAILWAY.—A new railway system, the Gulf, Florida and Alabama, which is an outgrowth of a railroad originally used by a large timber company, and now converted into a standard gauge road, is to be equipped with Western Electric telephone apparatus for dispatching its trains. Fifteen way stations are to be equipped with selector sets, while the talking apparatus will consist of head receivers and chest transmitters. There are also to be fifteen siding telephones. The train-dispatching circuit will be about ninety miles in length, extending from West Pensacola, Fla., to Local, Ala. The dispatcher will be located at Pensacola.

Broken Insulators.

Broken insulators is a subject that has caused much annoyance and expense to wire operating companies, and railroad companies seem to get their full share of the trouble. So long as there are small boys who delight in making targets of insulators in stone-throwing, and hunters who shoot at insulators, for the sport, so long will the troubles exist. As the boys and the hunters cannot well be gotten rid of, the only alternative is to turn attention to the insulator itself. It has been suggested that it might be made fool-proof, and here is an opportunity for some one to exercise his inventive genius.

Mr. J. P. Church, superintendent of telegraph of the Wabash Railroad, Decatur, Ill., suggests the possibility of an unbreakable insulator. "I recently made a suggestion," he states, "that the insulators might be reinforced with wire the same as is being done with window glass, and that the difference in expansion between the wire and the glass ought not to break the glass or cause trouble any more than it does in the windows. If porcelain would be more suitable than glass for reinforcing with wire, it could probably be used without very great increase in the cost of the insulator."

[Mr. Church is evidently awake to the necessities of the situation, and while his suggestion as to the reinforcement of insulators is ingenious, such insulators would have a serious defect. The wire reinforcement would not prevent fracturing the material of the insulator whether it be glass or porcelain. The insulator might be broken into a hundred pieces, and the pieces would probably be prevented by the wire reinforcement from falling away, but right at this point a great weakness would be developed. The fractures would admit rain and moisture, which would likely cause a direct contact between the wire and pole, although the insulator might, from the ground, appear to be sound. Even if the contact were not direct, the accumulated moisture in the fractures would at least increase the leakage to such an extent as to probably destroy the insulation entirely. A defective reinforced insulator could easily escape detection from below, and a few such points of abnormal leakage would soon put the line out of service.—EDITOR.]

Municipal Electricians.

JACOB BOWER, aged 82 years, formerly head telegraph man in the Buffalo, N. Y., fire department, died in that city January 5. He installed the first fire alarm system in Buffalo.

FIRE ALARM TELEGRAPH IN PITTSBURG.—The Northside fire alarm telegraph and police signal system, in Pittsburg, Pa., is stated to be one of the most modern in the country. Mr. E. G. Loomis is the city electrician.

POLICE TELEGRAPH IN YORK, PA.—Mr. Warren E. Fastnacht, superintendent of fire alarm, York, Pa., in submitting his annual report to the City Council, states that the police telegraph system of the city has been greatly improved by the installation of a modern time stamper.

EXPLOSION OF FIRE ALARM BOX.—A man in Springfield, Mass., scratched a match on a fire alarm box recently, and the box exploded. Investigations revealed the fact that gas from a leaky main had passed through the conduit leading to the box where some of the gas had accumulated, and the match flame did the rest.

Obituary.

HENRY W. WEST, of Chicago, Ill., an old-time and military telegrapher, died in that city December 16.

MRS. CLARA KLINE KIHM, wife of Mr. F. J. Kihm, the well-known telegrapher and telegraph editor of the *Brooklyn Eagle*, Brooklyn, N. Y., died at a hospital in that city January 6.

W. N. WHITE, of Covington, Tenn., an old-time and military telegrapher, died some time ago. Mr. White was an occasional attendant at the old-time and military telegraphers annual reunions.

NATHAN DE BREE, aged 74 years, an old-time and military telegrapher, died in Helena, Mont., January 1. He was a native of Pennsylvania, and served throughout the civil war as operator. After the war he entered the service of the Western Union Telegraph Company, at Louisville, Ky., and later became general superintendent of the International Ocean Telegraph Company, with headquarters at Key West, Fla. He was afterwards manager of the Baltimore Western Union office, district superintendent of the Baltimore and Ohio Telegraph Company at Detroit, Mich., manager of the Postal Telegraph-Cable Company's office at Toledo, Ohio, and finally manager of the same interests at El Paso, Texas. Later he retired and settled at Helena, Montana.

MR. THOMAS A. EDISON is the author of an article in *Leslie's* for January 2, entitled "Give the Inventor a Fair Chance." He argues that the inventor should be given prompt and effective protection against an unworthy competitor.

Troublesome Connections on Telephone Circuits.*

BY J. A. KICK.

A carefully tabulated record of telephone troubles would clearly demonstrate the fact that a very large percentage of them are traceable to poor connections. Further investigation would definitely place the cause for a large percentage of these poor connections on the carelessness of installers and maintainers.

Haste and but little care in making a sleeve and soldered connections in the line wire produce a condition which in time becomes troublesome. One such case may be located with little difficulty, although it may be in any one of a considerable number of connections between two stations. Should the trouble be due to the cumulative effect of a number of these connections distributed over the circuit, the locating and clearing will be found to be a considerable task. Construction specifications call for a certain number of turns for each kind of copper sleeve, and to linemen's failure to comply with these specifications is due some cases of loose connections in the line wire. More often the trouble is due to indifferent work in soldered connections at terminal pins and elsewhere.

Upon pairing a new copper wire with an old one in which the joints had been bridged and soldered a very noisy circuit was found. When investigated, it was discovered that all joints had been bridged. but in soldering the bridging wires many loose connections had been left; that is, the bridging wire was wound around the line wire in a closed coil, and the solder applied to the outside of the coil. This resulted in all the solder on the bridging wire being held on the outside, so that none reached the line wire. There were therefore loose connections between the bridging and the line wires. By leaving plenty of surface of the line wire between the turns of the bridging wire, solder will take hold of both wires equally well and a good joint will be made.

In depots, towers and other buildings adjacent to railway tracks a constant trouble is experienced due to vibration causing loose connections at points where the wires terminate under screws and on binding posts. Wherever possible soldered connections should be used or else the wires terminated under some form of the various lock-nut connections.

Dry battery screw terminals are the source of much trouble, and some form of spring contact, such as the Fahnestock clip, is preferable.

Of the troubles most disastrous to a wire chief's good record is an elusive intermittent swing to cross or ground. Worst of all is the same character of a loose connection which evades every effort to locate, and produces silver threads among the gold.

The best way to minimize the troubles outlined is careful construction and regular, efficient inspection by men who will see that conditions which make for operating troubles are eliminated.

*From *Telephony*.

Telephone Pioneers of America.

H. J. CURL

Mr. Harry James Curl, the subject of this sketch, is with the Missouri and Kansas Telephone Company, Kansas City, Mo., and has been in the telephone service since May, 1888, beginning in Philadelphia, Pa., as night manager for the American Telephone and Telegraph Company. He was telephone and telegraph operator and afterwards became special agent for the same company at Philadelphia and Baltimore, Md. Later he was appointed district superintendent in the Pittsburgh, Pa., district, and finally was transferred to Kansas City as general contract agent of the Missouri and Kansas Telephone Company.

Mr. Curl is a man of engaging personality and has been a very efficient official in the company's service. He is one of the charter members of the Telephone Pioneers of America.

As early as 1877, Mr. Curl and his father built a line of poles over a mile long connecting their

H. J. CURL, KANSAS CITY, MO. (1888)

country house in New Jersey with the railroad station. The wire was about No. 25 soft copper and the long span had the effect of drawing it out so that it was necessary each day to go to the center point and take in the slack. The discovery of hard-drawn copper wire by Mr. T. B. Doolittle was therefore highly appreciated by Mr. Curl.

Mr. Curl has been with the Missouri and Kansas Telephone Company and the American Telephone and Telegraph Company constantly for nearly twenty-five years. He is now in charge of the Western Union relations for the Missouri and Kansas Telephone Company.

MR. ROY DELAY, of Dallas, Tex., in renewing his subscription for two years, writes: "The AGE is not a luxury; it is an absolute necessity for every man in the business."

Status of the Telegraph in 1912.

In a contribution to the *Electrical World,* Mr William Maver, jr., of New York, reviews the progress of land telegraphy and cable telegraphy during the year 1912.

Progress in the telegraph industry, he states, has been in the direction of refinements in operating equipment, and in the standardization of such apparatus and line materials, as well as in a closer supervision and better regulation of the traffic.

He points out that the introduction of the day and night letter service in this country has resulted in producing an increase of over 20,000,000 messages per annum in excess of the increase in normal business.

Referring to machine and multiplex telegraphy, he says:

"In the actual transmission of messages over the telegraph wires of this country, while the Wheatstone automatic and the Buckingham-Barclay and the Morkrum telegraph printers are already in considerable use and increasing in favor, it remains a noteworthy fact that approximately ninety per cent of the traffic is still handled by Morse operators on simplex, duplex and quadruplex circuits. It is also interesting to note in the latest arrangements of circuits devised for quadruplex operation a perceptible tendency to revert to the methods employed in the early days of quadruplex telegraphy; such as, for instance, the use of the bridge method of neutralizing the home relays to outgoing signals, the employment of extended magnets on the neutral relay, etc., all resulting in marked improvement in the operation of quadruplex systems. In Canada automatic and printing telegraph systems are but sparingly employed, the use of the manual Morse system being general in that country. This condition prevails quite largely also in Europe, Australia and New Zealand, although in Europe a relatively larger use than elsewhere is made of the Wheatstone automatic and telegraph printers of the Baudot, Hughes and Murray type. The operation of chemical systems has fallen considerably short of expectations, the last instance of this kind being the failure of the so-called telepost," he continues. "Even in Great Britain, the birthplace of chemical automatic telegraphy, that system has not been employed in commercial service for over forty years. The original Morse telegraph system, after half a century of use, still exists as the most general means of handling telegraph business virtually the world over. The well-known simplicity, flexibility and reliability of the Morse telegraph system, as compared with printing and other telegraph systems, requiring as it does only a key, relay and sounder, probably explains its continued employment throughout the world. Without doubt the general adoption of the typewriter by Morse operators for the printing of received telegrams has also exerted a strong influence for the retention of this system."

Referring to the joint operation of the Western Union Telegraph Company and the American Telephone and Telegraph Company, Mr. Maver says the merger of many telephone and telegraph offices has led to a wider use of the telephone for the local delivery and collection of telegrams. "The number of telegrams already handled in this way by both of the large telegraph companies in the United States," he goes on to say, "probably exceeds 1,200,000 per annum. Apart from the economies effected by the joint use of offices by the telegraph and the telephone in many cities and towns and general co-operation between these different methods of communication, the one naturally adapted for long distance, the other for shorter distance communication, great advantage must accrue to the public by placing within reach of the telegraph numberless hamlets and villages already reached by the telephone, but which are too small to maintain a separate telegraph office.

"In submarine cable telegraphy, while the mileage has steadily increased throughout the world, the type of cable laid, and the methods of transmission and reception of telegrams have undergone little change in recent years. The automatic transmission of business over cables by means of perforated paper strips and a mechanical transmitter somewhat similar to the Wheatstone transmitter is almost general. In some instance repeating relays are employed at cable stations, and in others a method is in vogue whereby the messages are automatically perforated on a paper strip as received from the land wires by Wheatstone, and the strip is then passed through another perforating instrument that automatically translates the Wheatstone perforations into the characters required for cable transmission."

Exploring by Electric Waves.—Experiments were made in England recently toward exploring the interior of the earth by means of electric waves. The matter has since occupied a good deal of attention, notably from Mr. E. Kilburn Scott. In the course of a paper before a London meeting of the Association of Mining Electrical Engineers, Mr. Scott referred to the future possibilities of firing mine and quarry explosives by "wireless" methods, thus making for the greater safety of those who are conducting the operation. The adoption of wireless principles for this duty would, of course, extend the possible range of the firing point almost indefinitely. "He would be an unwise man," remarked Mr. Scott, "who said this would never be done;" but, of course, lots of things are possible which are not commercial.

High-Speed Telegraph Machine.—Señor Balsera, of the Spanish telegraph department, Madrid, Spain, has, it is stated, invented a telegraph machine which is capable of sending and receiving 1820 words per minute. The instrument is said to be an improvement on the Hughes machine, which it somewhat resembles, the speed, however, being three times greater. It is stated that the machine has been tested, and gives satisfactory results.

Mr. David Adams, manager of the Great North Western Telegraph Company, London, Ont., in renewing his subscription writes: "We could not do without Telegraph and Telephone Age."

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What name is applied to the phenomena of transmitted magnetism?

In such cases, does the original magnet lose any of its magnetism?

At what points on a bar magnet is the magnetic force most evident?

What are these two points called?

What is the "neutral line" of a magnet?

What is the magnetic length of a magnet?

What effect is produced when a bar magnet is broken into several pieces?

What is the function of a soft iron bar placed across the poles of a horse-shoe magnet?

What is an armature?

What is the "magnetic spectrum," and how may it be graphically reproduced?

What is the magnetic field of a magnet?

What are lines of force?

If a bar magnet be suspended within the magnetic field of a magnet, what position will it assume?

What is the mutual relation of the magnetic north poles of any two magnets?

What condition must be produced in a magnetic field to produce an electric current?

What is the direction of the current produced when a decrease is caused in the number of lines of force which pass through or are cut by a closed circuit?

If a wire be wound about an iron rod, and a current of electricity is passed through the wire, what happens to the rod?

Upon what does the direction of an induced current depend?

What is the meaning of the word dynamo, as used in the book which is being studied? (The term "dynamo" has been superseded by that of "generator" in electrical practice.—Editor.)

What is thermo electricity?

Is it important in the science of telegraphy?

What important property is to be noted in the case of soft iron, which is not possessed by steel?

Is this property especially important to telegraphers?

What is electrolysis?

Can one "taste" an electric current?

What is the so-called "absolute" system of measurement?

What three conceptions enter into all such systems of measurement?

What distinguishes the absolute system of measurement from other systems?

Upon what system of weights and measures are the present electrical measuring units founded?

What is the "c. g. s." system?

What is a dyne?

What is a megadyne?

What is an erg?

Of what is the erg the measure?

What is the conservation of force?

Is energy ever lost?

Into what manifestation of energy is a part of every expenditure of force changed?

How are telegraphic signals usually produced?

(To be Continued.)

Physiological Effect of Hertzian Waves.

The physician in the French Navy whose investigations have led him to conclude that Hertzian waves as used in wireless telegraphy do definite physical injuries to those who come into their vicinity has against him the main current of experience and science, says the *Marconigraph*, of London. No protection of any special kind, either for the eye or the exposed parts of the body, is provided for, or demanded by, wireless operators. The notion that a wireless telegraph operator can have his health injured by the use of the electrical apparatus is based on some confusion between Hertzian waves and Röntgen rays. Now, it must be clearly and primarily understood that Röntgen rays, X rays, and so on, have nothing whatever in common with Hertzian waves. Röntgen and X rays do have a powerful physiological effect, and they are utilized on that very account. But Hertzian waves cannot be legitimately supposed to have any effect on the organism at all.

The idea that ultra-violet or other troublesome rays come from the arc used in wireless telegraphy is quite absurd, for the simple reason that the arc is enclosed. Thus the wireless operator is not affected by the arc in any degree, and so he is no more affected by the Hertzian waves than other persons in different parts of the body of the ship. Unfortunately everything electrical has to run the gauntlet of prejudice, and this attack on the hygienic properties of wireless telegraphy is easily paralleled by other attacks.

TELEGRAPH AND TELEPHONE LINES IN SALVADOR.—A very complete map of the national telegraph and telephone lines in the Republic of Salvador has been issued by that government. It gives a great amount of information in the form of symbols, for which there is a corresponding key. Mr. Fidel Villacorta is telegraph and telephone inspector of the first zone, with headquarters at San Salvador.

Military Telegraph Corps Pensions.

In his address before the Senate Committee on Pensions, Washington, D. C., on December 9, 1912, in support of the bill granting pensions to military telegraphers of the civil war, Col. William Bender Wilson, president of the Society of the United States Military Telegraph Corps, gave a history of the long fight to obtain justice for these valiant men.

"The United States Military Telegraph Corps, recognized by an act of Congress approved January 26, 1897, as an integral part of the Army of the United States during the civil war, was organized," he said, "under the war powers of President Lincoln as commander-in-chief. It sprang into being out of necessity, leaped to maturity, and when the war was over, melted into obscurity. It participated in all the dangers and hardships of the army, but did not receive any of the rewards or wear any of the laurels. It took its place as a matter of duty, moved with the rapidity of thought and the secretiveness of a sphinx. It completely encompassed the army and, like the shepherd dog, kept constant and jealous watch over its flock. It dug no trenches, built no lines of fortifications, laid no mines, led no attacks, nor did it deal out death; it was not a master of strategy or tactics, but it was the medium used by commanding generals to indicate where trenches were to be dug, fortifications built, mines laid, assaults made, troops deployed, and death's harvest was to be gleaned.

"On January 22, 1861, President Lincoln, through Secretary of War Cameron, summoned Thomas A. Scott, then vice-president of the Pennsylvania Railroad Company, to Washington to take charge of military railroads and telegraphs. He reached Washington on the twenty-sixth, preceded by four telegraph operators from off his line of railroad ordered there by his principal assistant, Andrew Carnegie.

"On May 3, 1861, Mr. Scott was commissioned by the President as colonel of the First District of Columbia Volunteers, and mustered into the United States service by Major Irwin McDowell. He was officially placed in charge of the Department of Military Railways and Telegraphs, and ordered to take charge of all government railroads and telegraphs and those which might be appropriated for government use, and was given absolute power over them. It will be seen by this that from the very first the army telegraph was made military in character.

"Until May 23, with the exception of a few miles of telegraph lines constructed under Col. Scott's direction, the government did not own any telegraph lines. These few lines were in Washington and vicinity, and were being operated by operators in government service under the immediate direction of Mr. Carnegie, whose keen power for organizing was used in laying the foundation upon which the organization of the corps was laid. From that time on the military telegraph lines and corps grew until over 15,000 miles of wire had been raised or laid within army lines, and 1500 young Americans called upon to operate them. Camp was connected with camp, brigade with brigade, division with division, corps with corps, department with department, and all with the President as commander-in-chief in the War Department and the general-in-chief at his headquarters. The corps was composed of a body of young Americans, who brought to perfection that mystic arm of military service subsequently adopted by the nations, but who as yet have not had their services in doing so recognized by their own government. For thirty years their appeals have been before Congress for justice and for the reparation of the wrongs they have suffered by not having their soldier status, with all its rights and privileges, proclaimed.

"It won for itself commendation in official places everywhere. The leading generals of the civil war bore testimony that the military telegraphers were soldiers *de facto*, which in truth they were, and all they ask or have asked is to have that status made *de jure*. The present proposed legislation is intended to accomplish that.

"But for the generosity of Andrew Carnegie in assuming the debt rightly due by the government until such time as Congress might enact a favorable pension legislation in behalf of the members of the corps, many members and many members' widows would be in want. To-day he is paying out in this connection monthly pensions to sixty-nine men and twenty-nine widows. These annually amount to $14,112, or five per cent on $282,240.

"While Mr. Carnegie most cheerfully carries the responsibility," he said in conclusion, "it is not creditable to this great government that it permits him to assume that which belongs to itself. It is due to Mr. Carnegie, that Congress should relieve him from this self-imposed benevolence, and due to the men who served their country so well in its hour of need by passing remedial legislation."

A vigorous plea for the recognition of the pension claims of the United States military telegraphers who served during the civil war is contained in a recent issue of "Leslie's Weekly." It gives a detailed statement showing the injustice of the Government in failing to recognize these men as entitled to receive annuities from the pension fund along with the rest of the men who served during the war. "Since December, 1907," says Mr. David Homer Bates, secretary of the Society of the United States Military Telegraph Corps, who is quoted in the article, "Mr. Carnegie has contributed nearly $100,000 to the needy members of the United States Military Telegraph Corps of the civil war, and their widows, on the basis of a private soldier's pension for which the surviving members of that corps, now numbering less than 250, have knocked at the doors of Congress without avail for over 30 years."

Mr. F. N. Dowler, the Eastern freight representative of a Western railroad and an old-time telegrapher, well known in the West, writes: "Telegraph and Telephone Age is as much appreciated by me as ever."

Some Western Electric Products During 1912.

Among the most striking developments in telephone apparatus by the Western Electric Company during the year 1912 may be mentioned the following:

In railway train dispatching the selectively-operated semaphore has been developed to the highest degree of efficiency. This semaphore in external appearance differs little from the familiar semaphore found on most railway systems. Semaphore blade and spectacle segment are of the standard type. The pole body differs from the usual type in that it contains a casting wherein is located the selector and talking apparatus as well as the mechanism for tripping and restoring the semaphore blade. The semaphore is operated selectively from the dispatcher's office, an answer-back signal notifying the dispatcher of the operation of the apparatus.

Two types of selector apparatus cases have been developed for use in dispatcher's offices. One for dispatching circuits only and the other for dispatching circuits and signaling stations on intercalling selective circuits. Each contains a telegraph relay for controlling current supply, protectors of the fuse and open space cut-out type, condensers, resistances and retardation coils for choking out noises on the circuits.

A new type of desk set for private line and for outlying station use in master and outlying station interphone systems is a self-contained instrument having a push button in the stem for signaling other stations and a buzzer in the base.

A mechanical signaling system has been devised for use in connection with interphone systems. It provides for the simultaneous ringing of a number of bells, and, further, is arranged to repeat the signal a number of times.

Switchboard development work during the past year has been confined to improving, in every possible way, the more recent types placed on the market.

This applies to the sectional unit type magneto, and the central battery lamp signal boards for small magneto offices and private exchanges.

The new convertible switchboards have also met with great success. There are three standard types. These are so designed that they may be used for either magneto or central battery service, or both, without changing any of the apparatus.

One of the most important developments of the year in switchboard apparatus is the "line and cut-off" relay for subscriber line use. This relay, it is claimed, marks a great step forward in switchboard apparatus.

For use on magneto line switchboards there has been developed a combined jack and drop, which is similar to the combined jack and signal, but differing from it principally in that a shutter-type drop is used in place of the familiar spherical indicator.

A new "loud speaking" telephone has been developed, and was used with success at the Boston Electric Show in October, 1912, for paging visitors and show officials, for announcing scores of the World's Series Baseball Games and for rendering musical selections in conjunction with a phonographic attachment.

A portable forest service set for the use of rangers in the United States Forestry Service has been developed, and a large number furnished to the Government.

Two new types of telephone arms have been placed upon the market. One is a balanced, self-contained arm having a desk-stand body with transmitter and receiver at the upper end. It is so arranged that in whatever position the arm may be, the desk-stand portion is always vertical. The other is of the folding or "ferry" gate type with a similar desk-stand body. This arm is also self-contained. Both types may be had arranged for mounting on roll-top or flat-top desks or on walls. A double arm has been designed for use where there are both independent and Bell services.

The battery gauge for testing dry batteries used in connection with high-resistance transmitters has been developed. Single cells or three cells in series can be tested, the gauge showing the "cut-off" point.

Telegraphers of Today.

An excellent opportunity is offered to telegraph people in general to become acquainted with over 600 prominent telegraph officials and others identified with the telegraph, the railroad, the submarine cable and press associations of the past generation, through their portraits and sketches of their careers as published in "Telegraphers of Today."

This work was issued in 1894 and includes photographic engravings and biographical sketches of all the individuals connected with the interests mentioned at that period, many of whom have passed away from their earthly labors. The younger generation, however, will find much of interest in looking upon their portraits and reading of their achievements in life. Many of them are still alive and in harness in the telegraph and other fields of activity.

Mr. J. J. Ghegan, president of J. H. Bunnell & Co., New York, who recently received a copy, expresses his appreciation of the work as follows: "Copy of 'Telegraphers of Today' received. I casually saw a copy of the book when first published, but never had I an idea that it was so beautiful, interesting and historically accurate. It should be of great interest to telegraphers with any sentiment in their make-up. It is magnificent, unique, and I truly pity those of the fraternity who fail to secure a copy before the edition is exhausted. Kindly send me five additional copies. I can use them to good advantage."

This book, which is 11½ x 14 inches in size, was originally published at $5 per copy, but in order to close out the remaining copies we offer them at $1 per copy by express, charges collect.

Address orders to J. B. Taltavall, Publisher, Telegraph and Telephone Age, 253 Broadway, New York.

Mr. Charles G. Burke, of New York, in renewing his subscription, writes: "No one at all interested in telegraphy can afford to be without Telegraph and Telephone Age."

A Talking Cocoanut.

The following humorous story is told by Mr. Sanford Jones, of North Yakima, Wash., of an experience while in the Government employ in the Philippines with a telephone among the natives. "I was stationed on the Island of Basilan," he says, "which is a small island in the Sulu Archipelago. The natives of this island were so uncivilized that they did not even know the value of money, and of course had never heard of a telephone. We frequently had them entertain us with their native dances, and in turn would fill them with wonder and awe with a phonograph which we had in our outfit. We found it necessary to put up a telephone line between two buildings that were a little distance apart, which we did, using two Western Electric magneto sets. One day I found a rather large cocoanut under a tree near the bamboo hut we were living in, and conceived the idea of making a cocoanut talk. So I emptied its contents and hung it on the outside of the house opposite the telephone, so arranged that we could put the receiver through the grass wall and drop it into the cocoanut. We invited some of the natives to see the wonderful cocoanut that we could make talk, and with the aid of an interpreter at the other telephone who understood their language, we had a lot of fun. Some of the natives were so frightened they left the village, and one day a delegation of natives came and asked us to burn it, as they did not like to have so uncanny a thing around. So with great ceremony and much rejoicing we consigned it to the flames, and to this day I suppose they are telling their children about the cocoanut that could talk."

Entertaining Chicago Messengers.

On the evening of December 19, 1912, the Western Union Telegraph Company, in conjunction with the Young Men's Christian Association in Chicago, entertained about 400 of the company's messengers at a supper and vaudeville show. The boys paraded from the main office to the Lincoln Inn, where the supper was served, and their neat and manly appearance atttracted much popular attention. The parade was headed by a brass band of fifty pieces.

During supper an orchestra played popular airs, and the boys joined in the singing. After the supper they attended a vaudeville entertainment in the Y. M. C. A. auditorium in an adjoining building.

The supper and entertainment were attended by Division Commercial Superintendent M. T. Cook, Division Auditor Milne, Mr. Morgan of General Manager T. P. Cook's office, and Mr. J. Fitz Patrick, district commercial superintendent.

To Investigate Leased Wire Service.—The Interstate Commerce Commission has decided to make an investigation of private and leased telegraph and telephone wires to ascertain whether any of the wires of the American Telephone and Telegraph Company, the Western Union or the Postal Telegraph-Cable Company are used by lessees for the transmission of business by other parties in violation of the law.

Radio Engineers' Election.

At the meeting of the Institute of Radio Engineers at Columbia University, New York, on January 8, the following officers were elected for 1913: president, G. W. Pickard, Boston, Mass.; vice-president, R. H. Marriott, New York; secretary, Emil J. Simon, New York; treasurer, John Hays Hammond, jr., Gloucester, Mass. Directors: John Stone Stone, New York and Boston; R. A. Wegant, New York; J. L. Hogan, Brooklyn, N. Y.

Mr. Marriott, the retiring president, spoke on the subject of "Radio Operation by Steamship Companies." Arguments were presented to show wherein operation by the steamship companies could be made to give better service than is now obtained by operating companies. Mr. Pickard made an inaugural address on the subject of "Radio Engineering Ethics."

The Call-word "Telegram" Prohibited in Nebraska and New Jersey.

The Nebraska State Railway Commission at Lincoln, Neb., has issued an order requiring the Bell and the Lincoln Telephone and Telegraph Companies to cease discriminating against the Postal Telegraph and Cable Company by using the word "telegram" as a call word. A similar order has been issued by the New Jersey Board of Public Utility Commissioners against the American Telephone and Telegraph Company.

A Surprise to Mr. Terry.—On New Year's eve, December 31, 1912, a surprise banquet was given Mr. A. C. Terry, district commercial superintendent, of the Western Union Telegraph Company at Pittsburgh, Pa., by the employes. Mr. Terry received a telegram from a New York official inviting him to dinner at the Fort Pitt Hotel in the evening. He went there expecting to meet the gentleman, but instead was conducted to the Dutch Room, where a table of fifty covers was laid and beautifully decorated with evergreens. Mr. Thomas Gosden, chief clerk in Mr. Terry's office, acted as toastmaster, and remarks were made by Messrs. E. A. Baird, manager; L. A. Watson, assistant manager; T. J. Jones, district cable manager; R. O. Walters, special agent, and Henry Abrams, solicitor. The addresses were interspersed with recitations and vocal and instrumental selections by G. J. Tress, Samuel Bell, F. L. Barnum, W. B. O'Hara, E. A. Baird, W. E. Galbreath and G. D. Chisholm. The affair was a complete surprise to Mr. Terry, who took occasion to express his appreciation of the co-operation and loyal support which had been given him during the past year in building up the business of the third district.

Damage to Wires by Storms.—Since the first of the year the telegraph and telephone companies have suffered more than at any previous time from extraordinary wire conditions. The contributing factors have been usually heavy and continuous sleet storms, snow and excessively high winds in various sections of the country.

Our Subscription Contest.

The prize contest for subscriptions to TELEGRAPH AND TELEPHONE AGE is proving very satisfactory as to results, and our agents are making an excellent showing. Apart from the financial advantages of the undertaking, it shows that there are hundreds of active and former telegraphers who have been in darkness as regards progress in telegraph affairs, and that there are many hundreds more who ought to read the representative telegraph journal of America. The contest closes with January, and it looks as if there would be a grand dash for supremacy at the end of the month.

Sixty dollars in cash will be distributed to those of our regular agents who send us the largest number of new subscriptions and renewals during the months of November, December and January. The prizes are as follows: First, $25; second, $15; third, $10; fourth and fifth, $5 each.

The contest is limited to new subscriptions and renewals only, and does not include orders for books or mechandise.

The contest to date stands as follows:

Mr. H. H. Dengler, Postal, Chicago, $57.00; Misses G. G. Amber, Western Union, Philadelphia, $39.25; M. Wright, Western Union, Chicago, $30.00; Messrs. C. F. Bartlett, Postal, St. Louis, $27.75; W. C. Hair, Western Union, Atlanta, Ga., $17.75; D. F. Brown, Western Union, Washington, D. C., $16.00; L. A. Ott, Postal of Texas, Dallas, Tex., $13.50; J. A. Vogt, Postal, Baltimore, Md., $13.50; A. E. Krumling, Western Union, Toledo, Ohio, $12.80; W. W. Umsted, Western Union, Omaha, Nebr., $10.50; G. C. Moeser, Western Union, Oklahoma City, Okla., $10.00; C. W. Alexander, Western Union, Kansas City, Mo., $9.75; R. J. Ramsey, Michigan Central R. R., Jackson, Mich., $9.25; P. G. Galbraith, Can. Pac., Toronto, Ont., $8.00.

Write to J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, for fuller particulars.

MORE TELEPHONES ON THE NEW YORK, CHICAGO AND ST. LOUIS.—The New York, Chicago and St. Louis Railroad recently placed another order with the Western Electric Company for apparatus to be used in extending its telephone circuits. Two divisions of the road are to be equipped. The one extending from Fort Wayne, Ind., to Stony Island, Ill.; a distance of approximately 145 miles, will have thirty-two way stations equipped with telephones. The other line will extend from Fort Wayne to Bellevue, Ohio, a distance of approximately 125 miles, and will have twenty-five way stations. In both cases the dispatcher will be located at Fort Wayne.

AN APPRECIATED MESSENGER.—The *Ardmoreite*, of Ardmore, Okla., in a recent issue told how a messenger for the Postal Telegraph-Cable Company of Texas, in that city, sold his stock of cotton. "The cotton buyers of Ardmore," it says, "took a unique method of bestowing a token of appreciation on Newton Benton, the fourteen-year-old messenger for the Postal Telegraph-Cable Company of Texas, in this city. Newton has been noted for his promptness in handling messages, and his promptness has made many friends for the young man. The cotton men showed their good fellowship when they bought his cotton 'crop' from him, paying at the rate of thirty-five and one-seventh cents per pound. It might be well to add that Newton's cotton crop consisted of the samples which had been plucked from the bales of farmers by the buyers."

MILITARY TELEGRAPH SERVICE IN ALASKA.—The report of Brigadier General James Allen, chief signal officer of the United States Army for the year 1912, has just been issued. It shows that the Washington-Alaska military cable and telegraph system now embraces 2,621 miles of submarine cable, 1,064.5 miles of land lines, and ten radio stations. The installation of new 10-kilowatt sets of the latest quenched-spark type at Nome and Gibbon, and a new station at Nulato, completes a chain of radio stations across Alaska from the Canadian boundary to Norton Sound, which, General Allen states, can be depended on to maintain communication when accidents interrupt communication on land lines. The supply of qualified radio operators to maintain these stations in a high state of efficiency has been, he states, a very vexatious problem. A fine map of Alaska and adjoining waters shows the system in detail.

Bound Volumes of Telegraph and Telephone Age.

For those of our readers who desire to have the past year's issue of TELEGRAPH AND TELEPHONE AGE in a form in which they can readily preserve all of the copies for future reference we would recommend a bound volume. We are now able to supply these containing the twenty-four issues of 1912 for the nominal price of $3.50. There are several features in one of these volumes, which comprises nearly 900 pages of reading matter, which are alone worth much more than the amount asked. The most important series of articles during the year was the "Course of Instruction in the Elements of Technical Telegraphy," which is widely studied and highly commended. These articles, together with the series by Mr. Willis H. Jones entitled, "Some Points on Electricity," are worth many times the price of the book. We have also published articles by the best-informed authors upon the developments in wireless telegraphy, and, in fact, there will be found recorded in this book all of the important improvements in the wireless art during the past year. The use of the telephone for train dispatching has largely increased since January, 1912, and we have kept pace with its development by presenting to our readers many articles upon this subject, written by some of the best-posted men in the railway and telephone world. Those interested in any branch of the telegraphic industry will find much valuable information in one of these bound volumes. A copy of this work will be sent to any address, upon receipt of price, $3.50, by J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

THE KANSAS CITY TELEGRAPH TOURNAMENT.—In the account of the telegraph tournament held in Kansas City, Mo., December 13, 1912, published in our issue dated January 1, it was stated that Mr. A. S. Carver, the winner of the key-sending contest, broke the world's record in transmitting 219 words in five minutes. Our attention has been called to the fact that Mr. F. M. McClintic, of New York, holds the world's record, he having transmitted 517 words in ten consecutive minutes at the Atlanta, Ga., tournament of 1902, as shown on the official records. This was at the rate of 51 words per minute, and this record has never been since equalled.

THE MARCONI WIRELESS TELEGRAPH COMPANY OF AMERICA, New York, is desirous of securing a few more men who wish to become wireless telegraph operators, and, incidentally, see more of the world. The conditions for wireless operators are constantly improving, and the compensation has been placed at a point which makes the service more attractive than before.

ELECTRICAL SUPPLIES WANTED.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., is advertising for bids on rubber-covered conductor, steel conduit, copper wire, electrical supplies to be furnished at the Washington Navy Yard.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

MRS. WM. SCHADE, née Miss A. L. Wright, formerly of the city line general operating department, died on January 6.

LOUIS MELOCHE, a well-known newspaper operator, and lately connected with the *New York Journal* office, died at his home in Brooklyn, N. Y., December 16. Delegations from both the Western Union and Postal companies attended the funeral.

MR. JOHN MORISON, assistant general traffic chief at 195 Broadway, has returned from his vacation.

PHILADELPHIA POSTAL.

Among recent visitors at this office were Messrs. E. J. Nally, vice-president and general manager; C. C. Adams and Edward Reynolds, vice-presidents; E. B. Pillsbury, general superintendent; J. P. O'Donohue, division electrical engineer, and D. H. Gage, jr., assistant electrical engineer, all of New York; S. L. Dixon and F. B. Thompson, chief operators at Baltimore and Washington.

The Needham annunciators recently installed on small branch office circuits have proved a valuable addition to the office equipment.

A signal lamp to attract the attention of checks for wire messages has been installed.

The twenty-fifth annual meeting of the Electrical Aid Society of Philadelphia was held January 8. The following officers were elected: President, Wm. R. Harmstad; vice-president, A. G. Strickland; recording secretary W. E. Van Arsdale; financial secretary, R. C. Murray; treasurer, J. H. Wilson. Executive committee, F. E. Maize, G. A. Rogers, Mrs. N. H. Maloney, Mary McFadden. Trustees: Geo. J. Wells, M. N. Redding and R. H. Conway. The amendment increasing the salary of the financial secretary from $100 to $180 a year was passed. The meeting was well attended. After the banquet dancing was indulged in. Among those present was former treasurer H. N. Hetzel, who made a special trip from New York to be present. He thanked the members for calling upon him.

WASHINGTON, D. C., WESTERN UNION:

Mr. R. W. Bender, on January 1, completed the fiftieth year of continuous service in this office. He came to Washington on December 31, 1862, from the Army of the Potomac, which had gone into winter quarters after the battle of Fredericksburg, Va., and has remained in Washington ever since. On the occasion of the completion of this long service in one office, Mr. Bender was the recipient of many messages of congratulation from his telegraphic friends in the various cities, one from the New York Western Union night staff, referring to him as the "prince of stayers." A magnificent bouquet of flowers came from an "Old Timer." Mr. Bender continues hale and hearty, and is just as active in his work as he was a score or more years ago; "from Lincoln to Taft," as he terms it.

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Telegraph and Telephone Age

No. 3 NEW YORK, FEBRUARY 1, 1913. Thirty-First Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Hand-Sending Machines.

The true value of hand-sending machines as an asset to the telegraph service can never be determined or their faults remedied by a mere expression of opinion on the part of individual users thereof, or by indefinite arguments one way or the other.

To say that they are very efficient "if properly handled" seems to be an indisputable statement, yet it does not cover the case, and, in a sense, is untrue. The statement is correct only so far as it refers to the machine and the sender himself.

The fact is, the receiver, as a rule, is more often to blame for what he considers its faults than is the sender, and the remedy lies principally in the education of receivers as to what really causes the ills from which he suffers. Hence, instead of arguing the question let us give the actual facts, and offer a practical remedy for eliminating or at least minimizing such faults.

First, let us consider the electrical conditions in the circuit. An impression exists that fast sending will not "carry"; that is, does not reach the distant end. This idea is incorrect so far as the current itself is concerned, but it is often unfortunately true in regard to the signals received. The fact is, no hand-sending machine could possibly make dots as fast as a current of electricity could record them chemically on a running tape, hence, the current itself actually does reach the receiver's instrument. Obviously, then, the rate of speed with which signals may be delivered depends principally upon the efficiency of the receiver's recording apparatus, and that in turn depends solely upon the manner in which is is adjusted.

To illustrate: let the sender adjust his machine properly for a maximum rate of speed, and give his own sounder lever a very wide play. Under these conditions he finds that his own signals are entirely too light or even unreadable, and usually he proceeds to alter the adjustment of his machine, which, we will assume, did not need attention. To test his machine he should simply have diminished the play of the relay and sounder levers gradually, and noted results. He would then observe that the signals became firmer as the play was diminished and perfectly clear when the play was minimum.

Now that is precisely the condition that exists at the receiving end. If the signals do not record firmly the operator should first reduce the play of his own sounder lever, and adjust his relay closely before complaining of the sender. In most cases the receiver can remedy or minimize his troubles by merely pursuing the plan suggested. In case he cannot do so he should then challenge the sender, who will probably find no difficulty in satisfying him by simply effecting a slight readjustment.

These suggestions are all that are necessary to correct ninety per cent of the difficulties experienced with machine transmission, and on single-line circuits the remedy should be effected by the sender and receiver alone, but for duplex and quadruplex circuit operation another factor must be considered. On these circuits neither sender nor receiver may be at fault. The trouble may be caused by an improperly adjusted pole-changer, hence, the quadruplex attendant should be notified after the usual single-line adjustment methods fail. Here the pole-changer must be treated as though it were an additional receiver, for it must first receive the machine's signals, and respond to them before it can repeat them into the multiplex circuit.

Old-type pole-changers and transmitters, on account of their cumbersome construction, used to cause considerable trouble, but the new types have so small mechanical inertia that comparatively little difficulty of this kind is now experienced.

It is therefore evident that hand-sending machines may become a very valuable adjunct to telegraph service, and be welcomed generally, instead of indifferently, as they now are in many localities. It is admitted by all that on most of our first-class press circuits, where intelligence is requisite, and exercised, so great a volume of matter could not be handled without them.

Some day, perhaps, our official schools may include practical object lessons on the handling and adjustment of hand-machines and receiving apparatus, as part of their instruction.

The go-as-you-please method of learning is no doubt responsible for the inefficiency of so great a number of hand-machine senders, and should be discouraged.

Telegraph and Telephone Patents.

ISSUED JANUARY 7.

1,049,499. Receiver. To O. M. Leich, Genoa, Ill.

1,049,526. Desk-Telephone Apparatus. To N. Pedersen, Genoa, Ill.

1,049,537. Selector. To H. O. Rugh, Sandwich, Ill.

1,049,568. Chronometer-Controlled Signaling Device for Telephone Exchange Systems. To I. D. Fellows, Syracuse, N. Y.

ISSUED JANUARY 14.

1,050,101. Telephone Switchboard. To P. C. Burns, Chicago, Ill.

1,050,104. Differential-Microphone Repeater. To J. J. Comer, Chicago, Ill.

1,050,163. Telegraphic Tape-Perforating Apparatus. To J. P. O'Donohue, East Orange, N. J.

1,050,304. Telephone-Transmitter. To C. E. Scribner, Jericho, Vt.

1,050,404. Telephone Fixture. To W. C. Ude, West Haven, Conn.

1,050,514. Telephone-Call Indicator. To B. L. Behrendt, Newark, N. J.

1,050,532. Party-Line Telephone System. To B. C. Groh, Trenton, N. J.

1,050,664. Telegraphic Transmitter. To I. Kitsee, Philadelphia, Pa.

1,050,777. Phonographic Wireless Telephone. To A. F. Collins, Newark, N. J.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, January 27:

American Telephone and Telegraph Co.	133¼
Mackay Companies	88
Mackay Companies, preferred	67
Western Union Telegraph Co.	72½

PERSONAL.

MR. LOUIS M. POTTS, of Baltimore, Md., inventor of the Pott's printing telegraph system, was a recent New York visitor.

MR. GEO. M. MYERS, a well-known capitalist of Kansas City, Mo., and a former telegrapher, was a New York visitor, January 20 and 21.

MR. CHARLES E. SMITH, an operator of Colorado Springs, Col., is totally blind, but copies the Associated Press report for one of the local papers. He receives 16,000 words a night on the leased wire, and it is said he does his work almost without an error.

MR. M. F. ROBINSON.—The Conneautville, Pa., *Courier*, recently published an interesting sketch of Mr. M. F. Robinson, of Sanford, Fla., an old-time and military telegrapher. Mr. Robinson clerked in a general store in Conneautville in his younger days, before he became a telegrapher.

MR. FRANK F. FOWLE has severed his connection with the *Electrical World*, New York, as one of the editors, and has resumed his electrical engineering practice, with offices at 68 Maiden Lane, New York. Mr. Fowle is well known in telephone and railway telegraph circles, and is an authority of high standing in these lines of work.

MR. JAMES F. HUGHES, secretary of the Charles A. Borne Company, of New York, is an old-time telegrapher. He was born in Pittsburgh on August 14, 1845. He learned telegraphy on the Pennsylvania Railroad in the well-known "Outer depot" at Pittsburgh, where he was employed for some time. Mr. Hughes in the sixties worked in the West, including several towns in Nebraska. After his return East he worked in the Pittsburgh main office, and was chief operator at Titusville, Pa., in 1869, under the management of M. F. Robinson, and later manager of the Oil Exchange office at Pittsburgh. He then came to New York, and worked for the Pacific and Atlantic Company, and was manager of the 60 William street office. In 1870 he abandoned the telegraph key to engage in other business.

OBITUARY.

ABSALOM M. MORRIS, a member of the United States Military Telegraph Corps, died in Millington, Tenn., recently.

GEORGE H. WHYLAND, a telegrapher for the Delaware and Hudson Company, was gored to death by a bull near Plattsburgh, N. Y., January 21.

FRANK H. EVANS, a member of the United States Military Telegraph Corps, died in Washington, D. C., recently. He was a cousin of Mr. Charles A. Tinker, formerly general superintendent of the Western Union Telegraph Company, and a prominent member of the Military Telegraph Corps.

Death of J. Compton.

James Compton, aged 79 years, former district superintendent of the Western Union Telegraph Company at Nashville, Tenn., but for several years past retired, died in that city January 16, from the infirmities of age. Mr. Compton was born in Ireland, but at an early age came with his parents to the United States. He entered the telegraph service in 1848. He was actively engaged in the Confederate telegraph and transportation departments during the Civil War, and was captured by General Sherman's army at Canton, Miss. After the war he became general passenger and freight agent of a Southern railroad, but in the early eighties resigned to become district superintendent of the Western Union Telegraph Company at Nashville, which position he filled until his retirement. Deceased had a large circle of friends in Nashville, and was universally esteemed. He is survived by his wife and eight children.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

Mr. W. I. Capen, vice-president of the company, after spending a vacation in Cuba and Florida, will proceed through Texas and other States on a business trip for the company.

Mr. E. B. Pillsbury, general superintendent, Eastern Division, New York, sailed on the steamer "Brazous" for Porto Rico, on January 25, on his vacation trip.

Mr. Vernon H. Borst, manager of the Petersburg, Va., office, has been advanced to the management of the Richmond, Va., office, vice Mr. C. T. Sydnor, retired. The managership at Petersburg has been filled by the promotion of R. H. Carter, of the same office. Mr. R. R. Rayburn fills Mr. Carter's place. Mr. C. T. Sydnor had been identified with the Richmond office for the past twenty-two years.

Mr. C. W. Oran, manager at New Brunswick, N. J., has been transferred to the main operating department, New York. He is succeeded at New Brunswick by Mr. N. Aronowitz, formerly manager at Plainfield, N. J. Mr. J. Laurino succeeds Mr. Aronowitz as manager at Plainfield.

Mrs. H. L. Ditmas has been appointed manager at Orange, N. J., to succeed Miss L. C. Delehanty, who has left the service.

Mr. E. M. Underhill, chief clerk to superintendent E. Kimmey, New York, has been advanced to the position of chief clerk in the office of vice-president Charles C. Adams, vice Floyd Hallenbeck resigned to engage in the banking business in Portland, Ore.

Mr. Charles C. King, wire chief at Albany, N. Y., was presented recently with a Masonic charm by the linemen of the second district of the Albany division as a "token of recognition for his earnest endeavors during the twenty-five years of service in maintaining a friendly union among those to whom he issued orders," and his generous and honorable treatment of each individual lineman under his supervision. Mr. King expressed his appreciation of the gift in a few appropriate remarks.

J. Hennessy, aged forty-three years, manager of the messenger department at 253 Broadway, dropped dead of heart disease at his home, January 27. He had been in the company's employ for eighteen years. He was formerly manager of the delivery department, afterwards becoming manager of the service department. He was transferred to the messenger department about three years ago. Mr. Hennessy was a man of sterling character, and held in high esteem by the officials of the company.

F. W. Sprong, Superintendent Postal Telegraph-Cable Company, Chicago, Ill.

Mr. Frank W. Sprong, whose appointment as superintendent of the Postal Telegraph-Cable Company at Chicago was announced in our issue dated January 1, was born in Cincinnati, Ohio, February 27, 1863. He entered the telegraph business in Cincinnati in the fall of 1879, and afterwards occupied positions as operator for the Western Union and Baltimore and Ohio telegraph companies, later becoming manager of a Postal branch office. His next appointment was as cashier for the same company, and finally he became manager of the office, which position he held at the time of his appointment as superintendent.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

Mr. George D. Perry, general manager of the Great North Western Telegraph Company of Canada, Toronto, Ont., and Mr. C. E. Davies, supervisor of equipment and manager of the Ottawa office of the same company, were recent New York business visitors.

Mr. J. McRobie, general manager of the American District Telegraph Company, New York, left for San Francisco, Cal., on January 25, to be absent about six weeks. He will stop at various places en route.

Mr. J. P. Spanier, Continental representative of this company, with headquarters at Naples, Italy, who has been visiting in this country for the past month, will return to Europe by way of London, on the steamer "Kronprinzessin Cecilie" on February 4.

Mr. D. C. Dawson, district traffic superintendent, St. John, N. B., was a recent executive office visitor. He is on his way to the Pacific Coast on a leave of absence for a month.

Mr. J. W. McMahon, district manager, New York, has been appointed assistant to the manager at New Orleans, La.

Mr. J. J. Whalan, cashier in the office of Mr. W. J. Higgins, superintendent of supplies, New York, will be married on February 1 to Miss Shaffer.

Miss Julia S. Jennings, of the claim department, Richmond, Va., was a recent New York visitor.

Mrs. W. J. Fraser, wife of Mr. W. J. Fraser, district cable manager, Boston, Mass., died January 23.

Mr. J. R. Terhune, district commercial superintendent, Nashville, Tenn., announces the following recent appointments in his district: W. K. McClarin, district plant superintendent at Nashville, Tenn.; H. H. Kirkpatrick, district cable manager at Nashville; C. H. Carroll, C. W. Chenault, and H. H. Whitsett, district commercial managers at Louisville, Ky., Nashville, Tenn., and Jackson, Miss., respectively, and A. H. Stewart, commercial manager at Nashville.

F. O. Nourse, District Traffic Superintendent, Richmond, Va.

Mr. F. O. Nourse, whose appointment as district traffic superintendent at Richmond, Va., covering Virginia, North Carolina and South Carolina was announced in our issue for January 16, was born in Littleton, N. H., October 3, 1859. He learned telegraphy at Wing Road, in that State, in 1876. Later he came to New York, and passed through various positions in the telegraph service until he finally became general traffic chief of the operating department at 195 Broadway. After a temporary retirement from the telegraph service, he returned to it in 1903, and soon afterwards was placed in charge of the Western Union office at Macon, Ga., from which position he was, about three years later, promoted to be chief inspector of the Southern Division, with headquarters at Atlanta. In July, 1906, he was promoted to the position of assistant superintendent at Nashville, Tenn., and 1910, was appointed district traffic superintendent of the first

F. O. NOURSE, DISTRICT TRAFFIC SUPT., RICHMOND, VA.

district, Southern Division, at Richmond, Va., which position he held at the time of his advancement to be district traffic superintendent over a larger territory, with headquarters at the same point. From his wide experience Mr. Nourse is eminently fitted to fill his new position.

THE CABLE.

W. G. HAMILTON, vice-president and director of the Mexican Telegraph Company, and Central and South American Telegraph Company, New York, died in that city January 23. Mr. Hamilton was the last surviving grandson of Alexander Hamilton.

A CABLE INFORMATION BUREAU has been established by the Western Union Telegraph Company at 16 Broad street, New York, and is proving a very valuable department of the company's service. Mr. Patrick J. Tierney, a well-known cable expert and manager, is in charge.

JAPANESE TRAWLERS DAMAGE CABLES.—Complaint is made that Japanese trawlers are damaging submarine cables off the coast of Japan, and interruptions to cable service are frequent. Steps are being taken by the Japanese authorities to overcome the difficulty.

Dinner of Western Union Cable Staff.

The third annual dinner of the staff of the Western Union Cable system took place at the Cosmopolitan Hotel, New York, on the evening of January 25. There were one hundred and twenty-five employes present, and seated at the guests' table were: Chief supervisor T. F. Foley; chief operator N. N. Mathewson; G. H. Messner; A. Lister and J. B. Taltavall, publisher of TELEGRAPH AND TELEPHONE AGE.

Mr. A. B. Fiske made an excellent presiding officer. He was ably supported by H. Stiegler, C. B. Porter, G. Jenkins, W. Virge, D. Gilvey, Y. Dedominicis, and Chas. Birkner and other members of the various committees, and made interesting remarks in introducing the speakers. District traffic superintendent Mr. W. A. McAllister was present, and received an ovation. Mr. McAllister stated that he was proud of every member of his staff, and he congratulated them on their loyality to the company's interests. He added that the executive heads of the company were doing their utmost to make the duties of every man agreeable, and these efforts were much appreciated by everyone concerned. Mr. McAllister then read a letter from Mr. J. C. Willever, United States Manager of Cables, regretting his inability to be present. After giving some important statistics, Mr. Willever said: "We must rely upon the employes of the Central Cable office not merely to get the maximum capacity of the cables, which is the common duty of all cable station employes, but, in addition, to carefully classify the traffic according to its urgency and importance, and the peculiar needs, of particular lines of business—to see that it is all properly tagged and started, and generally to check up the service in all its details on both incoming and outgoing traffic. It is, in fact, at the Central Cable office that the reputation of our service is largely established, and employment there is of itself a badge of distinction.

"I am glad to say that so far as I have had an opportunity to observe, the employes of the office, as a rule, appreciate their responsibility, and strive in every way to justify the confidence which is reflected in their appointment to this the most important station in the system."

Mr. Patrick J. Tierney, dean of the cable service, who has charge of the cable information bureau, delivered an appropriate address.

The orchestra and entertainment was made up of office talent, and it was of a high order. Among the selections rendered were: J. Gaffney, vocalist; Geo. Clark, humorist; Gilbert Manson, cornet solo; Maskelyne and Devant, magicians; Frank Stuchbury, elocutionist; Joe Matier, comedian; William Beynon, vocalist; T. Whalan, comedian; Chas. Lawner, modern ventriloquism and J. Lister, Scottish melodies.

WIRE THIEF ARRESTED.—A man was arrested January 22, near Pittsburgh, Pa., on the charge of stealing over twenty miles of copper wire from the Standard Oil Company, the Bell Telephone Company and the Pittsburgh Coal Company. On more than one occasion thousands of men were thrown out of work in the Pittsburgh Coal Company's mines by reason of interruptions to the wire service.

Health Protection and Preservation for Telegraph and Telephone Employes.

Dr. Alvah H. Doty, formerly health officer of the port of New York, has been appointed medical director of the Employes' Benefit Fund Committee of the American Telephone and Telegraph Company, the Western Union Telegraph Company and the Western Electric Company in connection with the administration of the new pension and sick benefit plan for employes of these allied corporations. There will be established gradually by these companies a system of medical supervision and preventive sanitation designed to preserve the health of the telephone and telegraph army.

Mr. Theo. N. Vail, president of the American Telephone and Telegraph and Western Union companies, in announcing Dr. Doty's appointment said:

"It is intended that the medical department shall have wide range in its activities. In addition to the usual functions of such a department, it will devise and carry out various methods of health protection known as 'preventive measures.'

"So far as practicable, we shall seek the early detection of diseases, particularly those that are communicable, notably tuberculosis, and arrange for their prompt removal, care and treatment. This not only offers a far better chance for the patient's recovery, but also protects other employes.

"Preventive measures also will include sanitary conditions in offices and workshops, such as proper lighting, good air, pure water, safe plumbing, and the discontinuance of articles in general use which are believed to be agents of infection.

"By various plain and practical methods, employes will be instructed in hygiene and sanitation, and we hope that the information thus gained will extend to the home and to the public generally.

"Modern sanitarians know that the public health is best maintained by prevention rather than by treatment of disease after it develops. The measures we plan are of inestimable value, not merely in the interest of our companies, but also in public education on sanitation subjects, for our employes are everywhere in the United States, even in smallest towns.

"Supervision by the medical department over sick and injured does not necessarily mean that the companies are to furnish medical attendance for those who are disabled, but so far as possible they will aid in securing prompt and skilful treatment for employes. Arrangements will be made with hospitals throughout the country for prompt reception of those who may decide upon this form of treatment. Medical representatives will be selected to deal with the various conditions and emergencies that may arise in connection with this branch of the service.

"The various measures outlined will be carried out in a reasonable way, and without undue haste, for haste often involves unnecessary expense, and with but little benefit to employes.

"This undertaking in accord with modern sanitation will also benefit the companies, as it is intended to do. It provides mutual protection and co-operation between employe and employer. It insures far better and less interrupted service, and constitutes an economical factor in the interest of both parties."

Dr. Doty's office will be in the Western Union building, 195 Broadway, New York.

Reduction in Money Transfer Rates.

Rates for the transfer of money by telegraph throughout the United States and Canada will be reduced by the Western Union Telegraph Company, March 1, subject to approval by commissions.

The design of the new rates is to cheapen particularly the charges for transfer of small sums of money. The number of places in the United States and Canada to which money may be transferred by Western Union telegraph for payment is now over 14,000.

The new rates will be as follows: For a transfer of $25 or less, 25 cents; for a transfer of over $25 and not exceeding $50, 35 cents; for a transfer of over $50 and not exceeding $75, 60 cents; for a transfer of over $75 and not exceeding $100, 85 cents; for each additional $100 or fraction thereof up to and including $3,000, 25 cents; for each additional $100 or fraction thereof over $3,000, 20 cents.

In addition to the premium there will be a charge for telegraph service equal to the price of one 15-word day message from the office of deposit to the office of payment. No change is made in the current rates for money transfer by cable to foreign countries or to Mexico.

Western Union Report.

The earnings report of the Western Union Telegraph Company for the five months ended November 30, 1912, compared with the same period in 1911, shows the following results:

Gross earnings, $19,458,205.38 against $16,683,-374.92 in 1911; total expenses, $17,960,845.60, as compared with $13,528.35 in 1911; balance, $1,-497,359.78; (1911) $3,154,884.57. After adding income from various sources, and deducting interest on bonded debt, and five months' proportion of dividends the balance carried to surplus is $51,678.80, as compared with $1,700,974.81 in 1911.

The estimated earnings for the quarter ended December 31, 1912, based upon completed figures for October and November, and partial returns for December, show gross earnings, $11,835,500; total expenses, $10,713,300, leaving a balance of $1,121,-700. Deducting interest and dividends, the balance carried to surplus is $39,350.

Condensers.—A condenser of unit capacity (one farad) would be too enormous to be constructed. As a practical unit of capacity, the microfarad is chosen. This is equal to one-millionth of a farad, and is a capacity about equal to that of three miles of an Atlantic cable. Condensers of 1/3 microfarad capacity are about equal to one nautical unit of cable. They contain about 1,200 square inches of foil, and mica is used as the dielectric.

THE TELEPHONE.

New Exchange for Paris.—A large new telephone exchange is to be established in Paris by the Post and Telegraph authorities.

Automatic Telephones in New Zealand.—Tenders are to be asked for 500 automatic telephones to be installed in Auckland, New Zealand, and for an installation in Wellington.

New Telephone Bonds.—The American Telephone and Telegraph Company announces an issue of $67,000,000 of 4½ per cent convertible bonds. These bonds are convertible into stock at 120 after March 1, 1915.

To Oppose Reduction in Rates in San Francisco.—The Pacific Telephone and Telegraph Company proposes to resist the enactment of the proposed ordinance to be passed upon at the election, reducing by twenty per cent the rates charged subscribers in San Francisco.

Boston Telephone Plant Chapter.—The thirteenth regular meeting of the Boston Plant Chapter of the Telephone and Telegraph Society of New England was held in that city, January 24. Mr. L. C. Whitcher, division superintendent of traffic New England Telephone and Telegraph Company, addressed the Chapter on "Handling Telephone Traffic." Mr. Gordon S. Wallace, Boston, is secretary of the Chapter.

Play "Examinations" to be Repeated by Telephone Society.—The New York Telephone Society will, during the latter part of February, repeat the play "Examinations" which was produced at the Hotel Astor, New York, as part of the intertainment of the Telephone Pioneers during their convention, November 14, 1912. The play will be given in some prominent theatre in New York for the benefit of the employes of the telephone, telegraph and associated companies.

Telephone Dividends in New York State.—A statement issued by the Public Service Corporation, second district, New York, shows the rates of dividend paid on common and preferred stock of various electrical and telephone companies in the State. The American Telephone and Telegraph Company and the New York Telephone Company, according to this report, pay eight per cent dividend. The Cazenovia, the Eden, the Union and the Port Henry Telephone companies each pay ten per cent.

British Telephone Award Settled.—The court of arbitration sitting in London to determine the value of the property transferred to the British Government by the National Telephone Company, January 1, 1912, has decided that the government pay $62,576,320 for it. The telephone company originally asked $105,000,000 for its interest. The award, therefore, reduces this amount over $42,000,000. During the trial the parties came to an agreement as to the cost of the plant, the sum being $51,568,625.

Telephone Report.—The report of the American Telephone and Telegraph Company and associated holding and operating companies in the United States, not including connected independent or sublicensee companies, for eleven months ended November 10, 1912, shows: Gross earnings, $181,411,083, increase of $17,724,754; total expenses, $128,599,603, an increase of $11,879,415; net earnings, $52,811,480, increase $5,845,339; after deducting interest and dividends the balance to surplus is $12,998,234, increase $2,170,429.

Telephone From New York to San Francisco.—Mr. N. C. Kingsbury, vice-president of the American Telephone and Telegraph Company, New York, while in San Francisco recently, stated that the company expects to have a direct telephone service between New York and San Francisco before the Christmas holidays this year. It is planned to have two routes west of Salt Lake, one via the Central Pacific Railroad, and the other via the San Pedro, Los Angeles and Salt Lake Railroad to Los Angeles, thence, north to San Francisco. The toll will be $18 per minute.

Mr. Watson Before the New York Telephone Society.

At the meeting of the New York Telephone Society January 22, Mr. Thomas A. Watson, the distinguished telephone pioneer, made the principal address. He was introduced by Mr. T. D. Lockwood, general patent attorney of the American Telephone and Telegraph Company, Boston, Mass. Mr. J. J. Carty, chief engineer of the company, New York, also spoke.

The Glee Club sang, and a vote of thanks was tendered to Mr. Watson for his interesting remarks. The meeting was presided over by the president of the Society, Mr. D. C. Cox, of Syracuse, N. Y. After the meeting Mr. Carty gave a dinner party to a few friends.

Death of W. J. Denver.

W. J. Denver, aged seventy-two years, an old-time telegrapher, a director and assistant general manager of the New England Telephone and Telegraph Company, at Boston, Mass., died in Florence, Mass., January 18. Deceased was born in Springfield, Mass., August 18, 1841, and began his telegraph career in 1857. In 1878-79 he was actively engaged in the telephone business on behalf of the Western Union Telegraph Company, and was afterwards manager of the Springfield, Mass., office of the same company. In 1885 he was appointed assistant general manager of the New England Telephone and Telegraph Company, which position he retained up to the time of his death.

Mr. Denver was a member of the Old-Time Telegraphers and Historical Association, the Telephone Pioneers of America, and many other organizations and clubs.

Death of Francis Blake.

Francis Blake, aged sixty-four years, inventor of the telephone transmitter known by his name, died in Weston, Mass., January 20. He was a director of the American Telephone and Telegraph Company, and was elected an honorary member of the Telephone Pioneers of America, at the second annual convention of that association in New York, November 14, 1912.

Deceased was born at Needham, Mass., on Christmas Day, 1850. For nearly fifteen years he served on the United States coast survey. He devoted all his leisure to experimental physics, and his invention of the Blake transmitter in 1878 played a very important part in the development of telephony, and gave him a prominent place among inventors throughout the world. Later he patented many other electrical devices.

RADIO-TELEGRAPHY.

COMMANDER W. H. G. BULLARD has been appointed chief of the Navy Department's radio-telegraph office in Washington, and will have charge of all the wireless stations of the department.

MR. OSCAR CHRISTENSON, of the Marconi Wireless Telegraph Company, New York, has gone to the Philippines and China in connection with the installation of wireless stations in those countries.

KING ALFONSO'S NEW AUTOMOBILE.—King Alfonso of Spain was recently presented with an automobile equipped with a complete wireless outfit.

WOMAN GETS WIRELESS LICENSE.—Mrs. F. B. Chambers, of Philadelphia, recently obtained a wireless operator's license at the examinations in that city, and, it is said, she showed greater proficiency than most of the male applicants.

WIRELESS INTERFERENCE COMPLAINED OF.—The United States authorities have complained to the chief of police at Trenton, N. J., that several wireless stations on housetops in that city interfere with Government business in violation of the Federal wireless law.

MEMORIAL TO WIRELESS OPERATOR.—A site has been selected in Battery Park, New York, for a drinking fountain in memory of J. G. Phillips, wireless operator, who lost his life on the "Titanic," George Sczpanck and George C. Eccles, other wireless operators who went down with their ships.

MR. MARCONI'S LECTURE.—The New York Electrical Society has published in pamphlet form the lecture of Signor Guglielmo Marconi delivered before that body in New York, April 17, 1912. Several illustrations are included in the text. Mr. G. H. Guy, 29 West 39th Street, New York, is secretary of the society.

THE COLTANO WIRELESS STATION.—The Coltano, Italy, wireless station, erected for the Ministry of Posts and Telegraphs, is, according to the *Marconigraph*, capable of transmitting and receiving messages to and from 10,000 miles or more. Its available power is 10,000 kilowatts, and messages can be transmitted to Canada and America with the utmost ease.

WIRELESS BETWEEN NEW YORK AND BERLIN.—The first transmission of wireless signals between Germany and the United States direct took place January 12. The large station at Nauen, near Berlin, which is being reconstructed, sent out a few test signals on this occasion, and they were distinctly received at the Sayville, L. I., station of the Atlantic Communication Company.

HONOLULU WIRELESS PLANT.—The sending station of the new wireless plant at Honolulu, Hawaii, will be composed of two separate "legs," one for sending to San Francisco, and the other, a longer and heavier one, for sending to the Oriental stations. There will be ten masts in the first leg, about 1,000 feet apart, and stretching a total length of 4,500 feet. The leg for sending to the Orient will also have ten masts, stretching over about 5,000 feet, making twenty sending masts in all. The station for receiving from San Francisco will consist of a row of masts 400 feet high, and about 4,500 feet apart. That for work with the Orient will be five masts, about 5,000 feet apart.

THE MECHANISM OF WIRELESS TRANSMISSION.—According to Mr. W. Duddell, the eminent English electrical engineer, the exact mechanism of the means of wireless transmission between the two aerials is at the present moment under discussion, and opinions differ as to how far waves through the air, waves through the earth, and waves on the surface of the earth take part in the transmission. The general conclusion seems to be that Hertzian waves propagated through the atmosphere are sufficient to explain transmission over short distances, but when we come to consider the observed bending of the radiation around the curvature of the earth, it is necessary to take into account the fact that the earth is far from being a perfect conductor, that the upper layers of the atmosphere are far from being insulating, and also the effect of sunlight on the conductivity of these upper layers. It must be remembered that the waves are being regularly transmitted round one-eighth of the earth's surface, and that Mr. Marconi has received signals over 6,000 miles; that is, round one earth quadrant.

THE KANSAS CITY TELEGRAPH TOURNAMENT.—In reference to the record made by Mr. A. S. Carver at the Kansas City telegraph tournament on December 13, 1912, as published in our issue dated January 1, it is interesting to note that Mr. C. Fred Hutchinson, in 1881, handled 376 messages in five hours, an average of 75 1/5 messages per hour, at the New York Western Union office. For speed and endurance, Mr. Hutchinson states, this record has stood for thirty-one years. Mr. Hutchinson is now manager of a brokerage firm in Washington, D. C. In our issue for January 16, reference was made to the record made by Mr. F. M. McClintic, of New York, at the tournament in Atlanta, Ga., in 1902, which also surpassed that of Mr. Carver.

PROMINENT MILITARY TELEGRAPHERS SPEAK AT BANQUET.—Messrs. David Homer Bates, Chas. A. Tinker and Col. A. B. Chandler, of the Society of the United States Military Telegraph Corps, were speakers at the first annual dinner of the Union Society of the Civil War held in New York, January 23.

The Sending Machine.

BY A WESTERN MANAGER.

I note with pleasure that my article published in Telegraph and Telephone Age dated December 16, 1912, has attracted some attention, and hope that others will join in the discussion.

Owing to my clumsy way of expressing myself my friend, "Telegraph Engineer," does not appear to have grasped the points aimed at. In reference to the trouble experienced by many operators in copying Spanish, etc., the point I desired to emphasize is that they attempt to copy behind, instead of following the sounder, letter for letter, as it comes. This is especially difficult when following a transmitting machine that is improperly manipulated.

The issue between us as to the merits of the machine in proper hands is not very great. In my former article I said, "properly handled, they are a great benefit to the sender, and a delight to the receiver."

While attending to my various duties I often listen to different senders on a through wire and hear many "scraps" with repeater stations, and the conclusion forced upon me is that there has not been a repeater made that would carry much of the sending I hear.

The second point which I desire to emphasize is the great need of the traffic chiefs or others in authority giving more attention to the manner in which their operators are handling these machines. It is not unusual for a first-class receiver to complain of a sender who is known to be inexperienced, only to be met by a statement from the sender's chief that his man is a first-class operator, and that the trouble is not at his end of the wire. Later, when some serious error develops, the inexperienced operator makes the statement: "I sent the attached as per copy," which no doubt he did, but it sounded very different at the other end. To this the chief operator, who knows the man is not first class, and has had limited experience, adds: "Statement of sending operator "Blank" attached. He is a first-class operator, and his record for care is good." The result is that the receiver, who may have had twenty or twenty-five years' experience, and is a strictly first-class man, is charged with the error.

Why should chief operators and others in authority not be required to give more attention to the manner in which their operators are manipulating these machines?

The matter of requiring chief operators and managers to give absolutely correct statements in reference to the ability and experience of operators involved in the investigation of errors is another affair of great importance to the experienced men in the service; but I shall leave this subject for others to follow up.

Another correspondent writes:

Will you permit me to say a word in reply to the remarks by a "Western Manager" in your issue of December 16, 1912, relative to the alleged universal incompetence in handling messages written in Spanish and cipher?

I have been trying to think what principal relay office was referred to. It must be, I think, a very small and inconsequential point, for it certainly does not apply, even in part, to a modern first-class office.

Citing as an example the Chicago office, which works direct with all Mexican relay and transfer points—El Paso, Dallas and Houston, and Galveston at times—I can say with confidence that there is no such thing as "bulling one-third," nor, indeed, one five-hundredth, of the Spanish traffic. The operators assigned to these wires are gilt edge, experienced, educated and, necessarily, reflect a high order of intelligence. No one, I am quite sure, attempts to copy Spanish or cipher and code messages by the whole words; such a procedure would not express the intelligence of even a mediocre operator of a first-class office.

I do not agree, and the facts will support my statement, that the standard of service or operating ability is far below, nor, indeed, anywhere near as low, as it was twenty-five years ago. If our critic were to stand behind the Chicago-San Francisco or the Chicago-Los Angeles fast Morse circuits and observe expert, intelligent, conscientious men turning out seventy-five and eighty messages per hour, many of them difficult cipher and cable messages, on a 3,000-mile circuit having four and five repeaters, I imagine he would see up-to-date telegraphing in a new light.

I personally give all credit to those most faithful and expert "stick" performers of olden days, but I know they insist, for old times' sake, perhaps, on looking at progressive telegraphing through the same lens worn by one of the first superintendents who posted the notice in the old telegraph office back in Pittsburgh more than half a century ago, reading, "Operators are strictly forbidden to receive by sound; stick to your register."

All first-class offices, particularly Chicago, maintain a special supervisor, equipped with the proper apparatus, whose sole duty is to cut in on the various circuits, and observe the quality and quantity of work performed by each man; thus, the official in charge of the department keeps himself thoroughly informed as to what his men are doing.

Practically all first-class operators in the Chicago office use sending machines, and to their credit be it said that their equal, individually or collectively, both as to operating ability and intelligence, cannot be found in any other office in the world. An observer of their daily work would feel quite assured that no circuit would have to be "cut through" in order to handle a Spanish message correctly.

Telegraphs and Telephones in Madagascar.

At the close of 1911 there were 4,461 miles of telegraph and 385 miles of telephone line on the island of Madagascar; Tananarive, Tamatave, Majunga and Diego-Suarez having telephone service. Tamatave is also connected with Tananarive by telephone. On June 1, 1912, a wireless telegraph station at Diego-Suarez was opened to the public, thus making three such stations on the island.

Getting the Telephone and Telegraph Together.*

BY ANGUS S. HIBBARD, AMERICAN TELEPHONE AND TELEGRAPH COMPANY, NEW YORK.

The wire communication business of America can be greatly extended and improved if the people who own and operate the wires and systems of communication can get together and co-ordinate their plans and their services to the extent that the service requires—that the demands of the public require, and to the extent that will develop a greater and better telegraph as well as a telephone business. This move has come along at the same time as the change over thousands of miles of line from the telegraph to the telephone in the handling of trains, and in the handling of the commercial business. A telephone man to-day does not have to say that he can transmit messages by telephone. You have proved that that can be done, and are doing it to-day more extensively probably than it has been done anywhere. Still, it has been tried out in other countries. The English Government is using telephones in hundreds of its offices for transmission of commercial messages. Now another thing has come along, which is a factor in the business performed, especially in the handling of commercial telegrams at the small towns. The Interstate Commerce law has come along with its restrictions, under which it is necessary for you in hundreds of cases to shut up the telegraph office for several hours during the day. You really can't afford to open it. There is no answer at all. Under the circumstances we have simply got to shut up the shop, and the telegraph office is out of business for long periods at noon, evening and night. It is Mr. Vail's idea that a telephone exchange which is open day and night, in a small town as well as a big town, may be utilized to supplement the existing telegraph office, sometimes being a branch of a railroad office, sometimes the railroad office a branch of it, and keep an open telegraph office for the public, so that the Western Union Company can have a 24-hour telegraph service, and if the railway operator is away, the telephone operator can take the message, and it can be handled sometimes by telegraph and sometimes by telephone. The facts are that the American Telephone and Telegraph Company has on hand in all of these places a force of people and a plant of wires, and the means of handling this business, all of which we are trying to utilize. At the same time there has come along the effort of the telephone and the telegraph company to increase the commercial business by the receipt of telegrams over the telephone, and to expedite it by delivery in the same way. I can well understand that perhaps to the superintendent of telegraph the idea may occur that the advertising of this particular service will put upon agents at railway stations duties that are hard to perform, and the situation will be a difficult one. Now, the condition is this: At all of these places we are doing a commercial telegraph business over the counter anyway, and the taking of telegrams over the telephone is not entirely new. It is not the invention of the past year or two, but has been going on for thirty years, with a few large customers, more or less, and hundreds of operators have been for many years getting telegrams over the telephones and delivering them that way, so that no entirely new business is going to be thrown upon them in a tremendous amount or volume, but that class of the business is increasing. The public is appreciating it, and some railways which, under their contracts, have a direct interest in the commercial earnings of the Western Union, are providing for every message which may come over the telephone just as well as over the counter.

Now, all of these things are focusing at about this time. Opening up of joint offices is going on. In New England, I think, we have upwards of one hundred commercial telegraph offices opened in the telephone exchanges, and in the same towns the railroad offices remain. It has not altered the situation, except that the railroad operator is relieved to some extent of the work of receiving messages and delivering them, and whether or not the railroads are financially interested to a great extent in the earnings, it has been possible to improve the conditions of the telegraph company, and this has been worked out case by case. In other districts the same thing will apply, and some superintendents of telegraph may think that this telephoning of telegrams is to be boomed, and will increase the duties of the agent and operator so that perhaps they can hardly handle it, but, as I say, it seems to me that this is in a transition period. If at any place the work is a burden, the probabilities are we shall have another telegraph office in our telephone exchange that will finally rid the railway office of about everything except the business that may be passed over the counter.

On the telegrams which you receive by telephone, the telegraph company has arranged with the telephone companies to collect bills and act as fiscal agents, and just as far as possible to simplify and make easy the work of the telegraph operator whether at a railway depot or in a telephone exchange, extending this service to all customers. This can be worked out, and as far as it has gone it has worked pretty well. There have not been any bad breaks in it, and the railroads assume no increased financial liability.

At the same time, another thing in a way is focusing about now. We find in a town where depots are closed for two or three hours at noon, sometimes necessarily so, that the business man is all out of joint with the telegraph company. He is complaining because he is unable to send telegrams out of town when he wants to. At hundreds of these points the telegraph company is a partner with you in the ownership and maintenance of a commercial telephone circuit, and our people would handle all of the commercial messages in and out of the little town if we could get at this circuit. The key is in the pocket of the station agent, and he has gone home to dinner, or to tend his garden. I don't know what he is doing, but he is gone, and there is nothing doing in the way of telegraph business.

*Address before the Convention of the Association of Railway Telegraph Superintendents, New York, June 4, 1912.

Now, it would seem to me, and it seems to others with whom I have talked, that a possible way out of this bad condition is to work up a scheme under which, during the closed hours of such a railway station, the commercial circuit will be tapped into the telephone office; not into the exchange board, but into the office just as if it was a Morse line, and if a telegram is offered during these hours it may be handled over the commercial circuit at a way point from this Western Union office operated by the telephone company, just as it is now handled at the terminals of the lines, as the terminals extend into the telegraph office in most every case where commercial messages are handled. This is a subject which the telegraph company is taking up with you, and hopes to develop as a means of providing an all-day telegraph service in these communities. We hope it will popularize the telegraph. We hope it will show the public that we can give a dependable, all-around telegraph service without putting a burden on anybody. All that we ask especially is, that if any of these arrangements, as they come along, seem a burden to you on your railway lines, or to your agents or operators, that you take the matter up with the telegraph company, so that we may have a chance to talk it over together. What we ask is co-operation in the endeavor to give a better telegraph service on a reasonable basis of operation.

We are also taking up with the telephone companies all over this country the matter of maintenance of lines, which is, I am sure, something that interests all of you.

The telephone companies have maintenance men distributed over every ten or fifteen miles, all over the United States. They are planted in ones, twos, tens, fifties and hundreds. It is a great organized force, handling an enormous wire plant. The study is to take advantage of these forces so that we may also maintain telegraph wires, all of the combined wire plant, better than we ever have before. I think we can do it with the co-operation of you gentlemen here, which we fortunately have been having, and for which we thank you. We are working out very interesting things along the lines of our plant, and equally so along the lines of our operation, and if in the telephone operations we may have the benefit of your suggestions and your co-operation and help. I am sure we will all pull together in bringing out a tremendous improvement of the telegraph service, and a better operation of railway wires, because what will benefit one will benefit the other. It ought to come; it may be made to. It is a work which is very interesting, and I feel sure that we have made a good start, and have had the co-operation of all you gentlemen, and our desire is to co-operate, and help and assist in working out these problems, which will be mutually very beneficial.

Copper Production.—The copper production in the United States during 1912 was 1,249,000,000 pounds, worth $200,000,000. This production is an increase of 151,000,000 pounds over the year 1911.

Mr. T. M. Brennan, "Father of New York Telegraphers."

At a recent chance gathering of old-time telegraph people in New York, among the subjects that were discussed was the personality and career of Mr. Thomas M. Brennan, of the Western Union Telegraph Company, New York, and all present expressed tender sentiments and the highest regard toward that gentleman, who was affectionately referred to as the "father of New York telegraphers."

No one in the Western Union service is better known than Mr. Brennan. He has hired and relieved operators at the main operating room at 195 Broadway for thirty-five years or more. His administration of these delicate duties has given him unusual opportunities to study human nature, and while he has always displayed a gentle firmness it has been tempered with a proper amount of tenderness and consideration towards deserving ones.

It was remarked on the occasion referred to that Mr. Brennan had at one time or another during his career hired as operators more men who are now prominent in telegraph and railway circles, and in other lines of business, than any other living person. The list enumerated was a long one, and it was casually remarked that it did not include the name of Mr. Theo. N. Vail. One of the gentlemen present stated, however, that in 1862 Mr. Vail appeared at the branch telegraph office at the Allerton stock yards on Forty-fourth street and Madison avenue, New York, with a letter from superintendent S. C. Hendrickson, of the American Telegraph Company, at 145 Broadway, addressed to Mr. T. M. Brennan, informing him that the bearer, Mr. Vail, would relieve him, and that he (Mr. Brennan) had been appointed manager of another branch office. Therefore, the claim that Mr. Vail had actually worked with Mr. Brennan in 1862, it was asserted, was justifiable, although he was not hired by Mr. Brennan.

With such a record any man might feel justly proud, but Mr. Brennan's unassuming character does not betray any of the eventful episodes of his long experience. All those who have worked for him or dealt with him in any relation whatsoever, have learned to love the man, and they all wish him many years in the enjoyment of the real good things of life.

The "Pendograph."—Mr. A. MacDonald, a telegrapher in Adelaide, Australia, has invented a transmitting machine, which from the brief description given appears to be similar to the like instruments used in this country. It is called the "Pendograph," the dots being made by the pressure of the fingers on one side of the lever, and dashes on the other side. Mr. G. D. Hall, a Sydney, N. S. W., operator, who has been working the pendograph on the line between Sydney and Melbourne, has some very excellent performances to his credit. One achievement of 1,657 words in thirty-eight minutes probably constitutes a record, the message being taken at Melbourne on a typewriter.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

E. B. SHERBURNE, Advertising Manager.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, FEBRUARY 1, 1913.

Optimism and Pessimism.

Emerson says: "Omit the negative propositions * * * Don't waste yourself in rejection, nor bark against the bad, but chant the beauty of the good."

Many natures are prone to criticise and find fault with things as they are, and with what others do and think. Such people only bring misery upon themselves; through their distorted vision imperfections are magnified, and what is good is overlooked. Pessimists usually labor upon the false belief that their way of thinking and doing is right, and that the ways of others are all wrong—in other words, they set themselves up as standards; but what standards! They hinder rather than promote or assist progress in thought and action, because they spend their time in caviling and belittling what more progressive spirits are doing.

What the world needs is more optimism—looking upon the bright side of things. An optimistic spirit is like a ray of light entering a dark room, it dispels the darkness, and it is cheering to all coming within its wholesome influence. It uplifts those who are discouraged, encourages the half-hearted, and moves men to do the best they can.

Which is better for the individual and for the world, an optimist or a pessimist—to encourage or discourage?

What Constitutes Progress.

The key-note of all reports of progress made in telegraphy and telephony during the year 1912 are uniform in one particular, that developments have been made mainly along the line of refinement of existing apparatus. There have been no startling inventions, but much progress was made, nevertheless. A fundamental discovery is one thing, and a practical application of the principles involved is another, and as the principles are applied it takes a long course of time to develop the possibilities to their ultimate practical limit.

The average person little realizes the amount of time, thought and experimentation represented by the highly efficient telegraph and telephone apparatus of to-day. If told that the results obtained are due to painstaking observations and close attention to details, he is likely to express surprise that little things can have so much bearing on large results.

As a matter of fact great achievements in any line of activity do not come as a thunder clap; they are the reward of hard work, deep thinking and careful investigation and experimentation. Progress is slow, but the results are worth the effort.

Every little refinement of apparatus means greater operating efficiency, and all the companies concerned are satisfied if their facilities are improved a little at a time, because usually it means to them a gain in one way or another.

The year 1913 will likely outdo its predecessors in developments and refinements, and several important results are likely to happen, all through close attention to the little things.

Wire Thieves.

There seems to be pernicious activity among wire thieves at the present time, and reports come in from many parts of the country of extensive thefts of copper wire.

America is not the only country which suffers from this form of thievery. Complaints of the same kind come from European countries, and it is a problem with wire companies how they shall protect their lines. In the Pittsburgh district twenty-one miles of wire have been stolen, the embarrassment caused to one operating company being very serious. Another report comes from Bridgeport, Conn., where wire valued at $1,000 was stolen from cars in the freight yards. The usual method of filching is to cut the wire out of the lines, naturally under the cover of darkness. Copper being a valuable metal it very naturally forms a strong temptation to evil-doers when they see so much of it hanging where they can so easily get at it. Any invention that will lessen the evil will be welcomed by telegraph and telephone companies.

Damage to Wires by Sleet Storms.

How to diminish damage to telegraph lines by sleet is a problem with which telegraph engineers are confronted every winter, but as yet it is apparently as far from solution as ever. A railroad telegraph superintendent has hopes that it may yet be solved, and looks to the telegraph engineers to lead the way. Sleet and snow storms cost the wire companies hundreds of thousands of dollars every year, and the one who finds a way to avoid such losses will confer great benefit upon the public as well as upon the telegraph and railroad companies. During a recent discussion of the subject various ideas were offered, some of a humorous character. One gentleman, who evidently had unlimited faith in the ability of Mr. Theodore Roosevelt to accomplish great things, thought that the latter gentleman might be able to offer a remedy. Another suggested that the Gulf Stream might be diverted up the Mississippi River.

No Necessity for Telephone Prosecution.

Attorney-general Wickersham, on January 20, decided that no necessity exists for instituting a prosecution of the American Telephone and Telegraph Company as a combination in restraint of trade. At his suggestion the Interstate Commerce Commission will make a comprehensive investigation of allegations that a telephone and telegraph monopoly exists. Another allegation is that the American Telephone and Telegraph Company discriminated in favor of the Western Union Telegraph Company by not giving satisfactory facilities for communication by telephone with the Postal Telegraph-Cable Company.

In discussing the relations between the Department of Justice and the American Telephone and Telegraph Company, and particularly the status of the company under the Sherman Law, president Theo. N. Vail, of the company, says:

"We do not think we have anything to fear from the attorney-general's office. To be sure, his office has been investigating the telephone and telegraph situation; that the attorney-general cannot think we are entirely bad, for since the investigation began we have, with his expressed approval, put together Bell and opposition services in several large places where local authorities and the public have expressed their desire for such action. At Detroit, for instance, the opposition was merged after approval by, and at the desire of, all local and State authorities, and with the acquiescence of the attorney-general, and the same thing has been done in other places of almost equal importance.

"I believe the attorney-general has found that the public does not want two systems, and we hope that fuller appreciation of that fact will lead him to leave the question entirely with State and interstate commissions, where the matter belongs, and where it is bound to go anyway.

"Last year the Interstate Commerce Commission assumed jurisdiction, by express authority of Congress, over the telephone and telegraph companies so far as interestate business is concerned. That body, together with the State commissions, should be able to arrange matters satisfactorily to the company and to the public."

Mr. Union N. Bethell, senior vice-president of the American Telephone and Telegraph Company, New York, issued the following statement: "We are, of course, gratified to know that, after carefully investigating the matter, the attorney-general has concluded to refer it to the Interstate Commerce Commission. Our policy in dealing with the commission will be to give it freely and fully all information desired, as it has been in dealing with the attorney-general and with Public Service Commissions and other governing bodies."

Commercial Wireless Telegraph Development in 1912.

In an article on this subject by Mr. John Bottomley, vice-president of the Marconi Wireless Telegraph Company of America, New York, printed in the *Electrical World*, that gentleman says that in a commercial sense wireless telegraphy has made greater progress in the year 1912 than during any previous twelve months. In many respects the course of wireless telegraphy is following the corresponding early development of both the telephone and telegraph. The early days of reckless financing and unfair competition were not conducive to healthy growth and stability. The year just ended has witnessed the exit in bankruptcy or through the activity of the Department of Justice of all but those few concerns that were engaged in the wireless business on a legitimate commercial or experimental basis.

"From the operating point of view the principal development of the year in wireless telegraphy," he continues, "has been an increase in the power used rather than any well-defined difference in method. The experience of past years, gained by the expenditure of large sums of money and persistent effort, has opened up the way for the use of high-powered apparatus to span distances over which it was formerly thought impossible to communicate commercially during day and night. Owing largely to the glibness with which the public press insists upon printing the freak transmissions accomplished only at night over great distances by stations of small power, the layman gathers the idea that such results may be commanded at will, while as a matter of fact nothing could be further from the truth. To transmit over a given distance at night under favorable conditions is one thing, but to provide a twenty-four-hour night-and-day service under all kinds of adverse conditions is another matter.

"America bids fair to lead the way with the first comprehensive chain of high-power stations for oversea transmission, for already thousands of tons of steel are being fabricated for the necessary masts, and the high-powered apparatus is under construction. Before another year shall have passed, large stations will be in competitive operation across the Pacific to Honolulu and Japan, and also across the Atlantic by way of one route to Great Britain and by way of another to Norway."

To Dissolve the British-Marconi Wireless Contract.—At the inquiry being conducted in London regarding the contract between the British Government and the Marconi Wireless Telegraph Company for the Imperial wireless system a letter was read on January 20, from managing director Godfrey C. Isaacs, of the Marconi Company, requesting that the government treat the contract as no longer binding on either party. Mr. Isaacs states that the protracted inquiry is causing serious detriment to the company.

Course of Instruction in the Elements of Technical Telegraphy—XXXII.

(Copyrighted.)

(Continued from page 46, January 16.)

[We began in our issue for October 16, 1911, the publication of a course of instruction in technical telegraphy. The course, which was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, is published for the benefit of those of our readers who desire to fit themselves for better positions in their vocation. It is elementary throughout and is divided into chapters, following one another in logical order.

The course has received the hearty commendation of telegraph officials and experts for its scope and accuracy and its sound practicability. In each chapter examples are presented in order to illustrate the application of the rules to practical cases, and each chapter is followed by a series of questions pertaining to the subject of the chapter, to be worked out by the student in order to review his progress. Back numbers containing these valuable articles can be obtained on application, at 10 cents per copy.]

Testing at Terminal Stations.

The following are the principal faults of a circuit:

Disconnection—when a circuit is broken so that the current cannot pass.

Earth—when a wire is in contact with ground, or some conductor in connection with ground, or when insulation is exceedingly defective.

Contact or cross—when two wires touch one another, or are so connected by a conductor that the working of one affects the other.

Swings—when there is intermittent contact between two wires, or between a wire and ground.

Weather-cross—when the current from one wire escapes to another and to earth by means of the moisture covering the insulators, cross-arms, etc., in wet weather.

These faults will be treated in the order given.

DISCONNECTION.

Fig. 29 represents a wire between New York and Buffalo, with Albany and Syracuse as intermediate offices. When a fault appears, New York inserts test relay R and key K at the switchboard, between the main battery and line. If R remains open with K closed, the main battery is reversed. If R is still unaffected, the fault is a disconnection, or break, and the wire chief proceeds to note the various effects observed, which usually serve as a guide in roughly determinating the proximity of the trouble. He can, for instance, tell almost instantly whether the opening in question is remote, or close at hand, by the presence or absence of a static charge upon the wire. By turning down the spring of his relay and depressing K, the line becomes charged as far as the break with static electricity which manifests itself by a momentary attraction of the relay armature. The magnetism developed in the relay by this charge is more or less intense according to the amount of electricity accumulated upon the wire, and this amount will obviously depend upon the distance to the break. Thus, the armature indications on working the key will afford a simple and convenient clue to the probable whereabouts of the opening. The same approximation may also be determined by noting the intensity of the spark developed at the switchboard by first charging the line with M B, and then instantly discharging it to ground, by quickly moving the plug from the battery row of disks to the upper one which is in connection with earth.

On a short stretch of wire the amount of the charge condensed upon it might be insufficient to produce a spark, or to affect the relay in the manner described, though it might be possible to "feel" its existence by connecting the battery with the line through the tips of the moistened fingers. This "finger testing" is indeed much resorted to by experienced wire chiefs, who can form a very fair idea of the distance to a break by the amount of "shock" they experience. On badly insulated lines, however, this would not be possible, owing to the permanent current which flows to line, whose circuit is partly completed through the escapes or leaks that exist in it. In all such cases the static electricity combines with the steady current, and none of the characteristic features due to the static charge are perceived either through the sense of

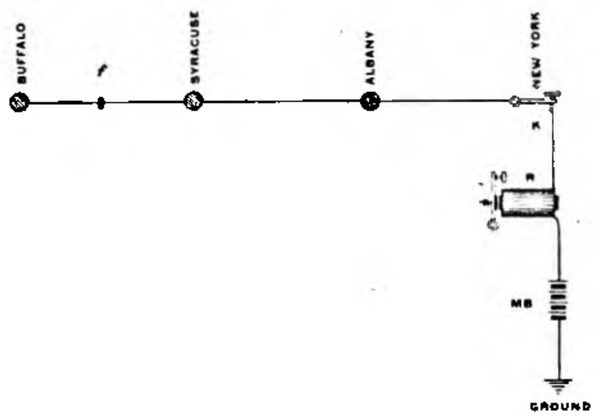

FIG. 29—TESTING FOR FAULT ON A CIRCUIT.

touch or on the relay, the latter of which, under a low adjustment, will respond to the motions of the key as though the line were intact.

Under these circumstances, or whenever it becomes otherwise impossible to judge of the distance to a break, the fault has to be localized by having the wire grounded at successive test stations along the line until it is definitely located between two of them. First of all, make sure that the trouble is not at your own station. To prove this, close K, and connect the line terminal at the back of the board with ground. This puts the home battery to earth with only the office apparatus in circuit, and if R does not now close, the fault must be between the battery and switchboard. Test the battery or change it. If R is still open, try another test instrument; the fault may be in the instrument cords. If R closes when the line and ground terminals at the back of the board are connected, the break is beyond the home office, and the following method should be adopted.

Select a station about midway in the circuit, in this case Syracuse, and request him on another wire to ground the interrupted wire at his switchboard. If on this being done test relay R closes, the break must be beyond Syracuse, since R by its closing shows an uninterrupted circuit. Syracuse is therefore requested to restore the faulty wire to its original position, and Buffalo instructed to ground the wire in a similar way.

If now R remains open, the break must be between Syracuse and Buffalo, and the lineman in charge of that section should be instructed to repair it.

EARTH.

New York, on being informed of an interruption, inserts test relay R as before, and finds that with K closed the relay armature is not only atttracted as usual, but the pull between the armature and magnets is greater than it should be under normal conditions, indicating an increased current from his battery.

This increased current may be due to defective line insulation, or to the shortening of the circuit by an earth fault, as at *f* in the figure; but if the circuit is working on a normal adjustment when the fault appears, it may be safely assumed that the trouble is due to the latter cause.

Should the attraction of the armature be strong enough to indicate a possible short circuit of the battery, New York, to prove the fault outside his office, disconnects the line from its terminal behind the switchboard, thus breaking the circuit of the home battery M B.

Relay R should immediately open. If it does not, there must be an earth in the circuit somewhere between the battery and the line terminal, and the instrument connections, battery leads and lightning arrester should be overhauled.

If R opens when the line is disconnected the fault must be beyond the home office, and a somewhat similar course is adopted as in the case of a disconnection, the wire chief first roughly determining the proximity of the trouble by carefully noting the pull between the cores and armature of R. If the attraction is not much stronger than usual, the fault must be near the distant end, since the circuit resistance has not been materially affected. But if the relay shows the presence of a powerful current the circuit resistance has been correspondingly reduced, and the fault must be nearer the testing office.

Having estimated the probable whereabouts of the trouble, he requests the station he thinks nearest the fault, say Syracuse, to open the wire. If the earth is at *f*, R will instantly open, but will remain closed when Buffalo in turn opens the wire, owing to the circuit being still completed through *f*. The condition of his relay informs New York that Buffalo is practically out of the circuit, and that the fault lies between the latter station and Syracuse.

(To be Continued.)

A MODEL MANAGER.—A Western paper describes the visit of a former telegraph manager to the town as being the head of the telegraph company, a strong Republican, an old-time Presbyterian elder and an all-round good-fellow.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

If a wire is placed over a magnetic needle and parallel thereto, and a current flows through the wire, what will be the effect upon the needle?

Why does the needle come to a rest at an intermediate position?

What does this experiment show?

How is it proved that the magnetic lines of force encircle the wire instead of radiating outwardly?

Upon what does the angular position of a magnetic needle depend when the needle is subjected to the influence of an electric current?

What is the name of the two forces acting upon the needle?

What force holds the magnetic needle in the meridian when no current is flowing in the wire?

Is this force constant or variable?

What is the unit of measurement of the earth's magnetism at any place?

What is the force of the earth's magnetism at New York?

What is the difference between a galvanoscope and a galvanometer?

What precautions are taken in the mechanical construction of galvanometers to secure a definite ratio between the angle of deflection of the needle and the value of the current?

What kind of a galvanometer fulfills this condition?

What is a tangent galvanometer?

Describe the tangent galvanometer in its simplest form?

How many loops of wire are there in a tangent galvanometer?

What relation should the needle of a tangent galvanometer bear to the diameter of the circular loop?

Study carefully the principle of action of the tangent galvanometer as shown in Fig. 34 on page 42.

Why is this form of instrument called a tangent galvanometer?

What are the three qualities of an electrical current?

What are the various names for quantity and potential?

What are the two distinct classes of electrical measurements?

Battery Receiver.

BY ANDREW PLECHER, LAS ANIMAS, COL.

Everyone knows the failure of Bell's magneto transmitter, and its inefficiency when applied to comparatively short distances. On that account it was almost immediately superseded by the battery transmitter designed by Edison.

Why Edison did not make another stride and do away with the magneto receiver, by giving us also the battery receiver, is a matter for speculation. It seems that Edison did not fully understand his own invention, which very frequently happens to highly trained and well-educated minds, for who can foresee the essential point of any new thing, or who might not be absorbed with a beautiful minor point, and suppose the fundamental point granted. In fact, Edison seems to have attributed the good qualities of his invention to the use of carbon. On this account the Berliner patent became possible, using a metallic contact point.

A slight oversight like this brought about a fierce lawsuit in the United States courts, a thing perhaps impossible in the courts of any other country. It only shows how our patent system is entirely based on nerve-sapping lawsuits. Nevertheless, and in spite of the courts, everybody gives Edison credit for inventing the battery transmitter.

The battery receiver is now ready to supplant the magneto receiver. It has been suggested that the newly invented instrument he called "electromagnetophone," also "direct-current receiver"; but after all, it seems best to call it battery receiver, since the essential of the invention consists in doing away with the permanent magnet, and producing a steady magnetic field by battery current, which, up to the present, has been the best means known for producing a steady electric flow.

This gives us also a ready means for comparison. As the battery transmitter has extended the distance of commercial telephony a hundred and a thousand fold, so is the new battery receiver ready to open up distances hitherto impossible even with the best and heaviest copper circuit. With the new receiver a smaller wire having less capacity will not only be an advantage, but will save money. Small wire is ideal for telephone transmission, and this ideal can be realized by the use of the new instruments. We may see in the near future all wires underground, like true nerve fibers imbedded in the protoplasm.

Quick-Acting Repeaters.

BY STEPHEN D. FIELD, STOCKBRIDGE, MASS.

I notice in Mr. Jones' article on "Quick-Acting Repeaters" in the January 1 issue of TELEGRAPH AND TELEPHONE AGE a description of my pole-changer (now used as a standard by the Western Union Telegraph Company), wherein it is stated that the excellence of its operation is due to the rapidity with which the armature makes its excursion from one contact to the other.

This is true in a minor degree only. It is the rapidity with which the contact is established after the armature has accomplished its excursion that renders the apparatus so efficient.

When an armature is actuated by a spring there is always a rebound or "chatter" when the contacts meet, thus delaying the establishment of current flow. When, however, a magnet is employed as the actuating medium for the armature, there is little if any rebound, the current flow is established in the shortest possible time, with consequent gain in the working margin of all attached apparatus.

In my pole changer both contacts marking and spacing are accomplished magnetically, and with equal value.

Telephone Pioneers of America.

W. R. ABBOTT.

Mr. William Rufus Abbott, general commercial superintendent of the Chicago Telephone Company, whose portrait we present herewith, was born in New York, September 18, 1869. He entered the telephone service in New York, February 1, 1889, as clerk for the Westchester Telephone Company, and later became cashier. In 1891 he entered the office of the general superintendent of the Metro-

W. R. ABBOTT, CHICAGO, ILL., (1889).

politan Telephone and Telegraph Company in New York as order clerk, and in February, 1893, was transferred to Chicago as order and record clerk for the Chicago Telephone Company, with which company he has been associated ever since, passing through the positions of chief clerk to the general superintendent, special agent in charge of personal injuries and claims, superintendent suburban division, and finally general commercial superintendent, which position he still holds.

On August 1, 1912, he was placed in charge of the commercial work of the Chicago Telephone Company, and the Central Union Telephone Company for the entire State of Illinois.

The Seven Mounds.

BY JEFF W. HAYES.

Many solicitous enquiries have been made in the last decade relative to the whereabouts or probable fate of Aaron B. Hilliker, telegraph operator, minstrel and story writer. These enquiries come from such well-known telegraphers and ex-telegraphers as Ernest W. Emery and Judd Thompson, of Washington; Alf. B. McCoy, Jack Morison, Frank Giles and J. Frank Howell, of New York; G. M. Myers, of Kansas City; Dr. L. M. Rheem, of Helena, Mont., Col. L. H. Korty, of Omaha; Chas. T. Day, of Mexico; B. E. Sunny, of Chicago, and many others, all anxious for some tidings of their former friend.

Aaron Burr Hilliker was known from New York to San Francisco prior to the War of the Rebellion. His was an adventurous nature, and he assisted materially in making the path to the great West easier for the next comer. He possessed a gentle spirit and many lovable traits, which endeared him to all his friends, who were legion. The following weird story which came to the knowledge of the writer may establish beyond question the passing of Aaron B. Hilliker, and his last days on earth.

* * * * * *

A party of thirteen left Boston in May, 1888, bound for the West. It consisted of John B. Lansing, his wife and her sister, and eight young fellows around town, well to do and of an adventurous turn of mind, the party being under the guidance of two middle-aged prospectors. These two latter personages had come to Boston to organize this party for the purpose of prospecting and developing some alleged wonderful gold mines in southern Nevada and California.

The members of this little party were in high spirits as they pursued their journey to the far West, the grandeur of the scenery and the vastness of the country filling all with awe and admiration.

Many stops were made en route on the trip, mostly in Colorado, Wyoming and Utah. At one of the stations in Colorado Mr. Lansing and his wife formed the acquaintance of a telegraph operator. He had passed the middle age, but was hale and hearty. He appeared to be thoroughly conversant with the country, and as the party numbered the unlucky thirteen the operator was asked to join the adventurers, which he did. It is said that his singing "The Old Oaken Bucket," which was rendered in a most artistic manner, was one of the leading attractions that enabled the telegraph operator to be offered a place with the party.

It was some time in July, 1888, that a caravan composed of seven wagons drawn by a dozen horses and a yoke of oxen made their departure from Reno, Nev., bound south. No address was left with any of the merchants who fitted out the party, and it appeared as if that were to be a secret. There were two ladies in the party, probably dressed for the occasion. The ox team was driven by a man of fifty-five or thereabouts, who seemed to be the life of the caravan. He was continually cracking jokes upon his comrades, and just before leaving he with three other good voices, sang, "The Old Oaken Bucket," which received a rousing encore.

As the caravan paid cash for everything they obtained, the episode of their coming and going passed out of the minds of most everyone excepting the several persons that helped to outfit the party.

The caravan went due south through Carson and Jack's Valley, where they entered the sterile country once known on the maps as the "Great American Desert."

* * * * * *

It was in June, 1907, that Eugene Burdick, mining engineer, civil engineer and prospector, residing in Tuolumne County, Cal., received a letter from Boston, which read as follows:

"I am seeking information regarding a party that left Boston in May, 1888, bound for southern Nevada and California. I am willing to pay $5,000 for authentic information, which will enable me to establish beyond any doubt the fate of these people. There were thirteen persons, two women and eleven men. The leader of the party was John B. Lansing, and it is of his fate that I desire to know because a large estate is in litigation. The last heard from Lansing, was from Reno, Nev., in July, 1888."

Burdick was well acquainted with all the country leading from Reno to the south, and readily accepted the mission. His visit to Reno elicited the facts related above, and taking up the clue Burdick began his laborious task of finding the lost caravan. Carefully he followed them across mountains and desert, through what looked like inaccessible canyons, but not one item of intelligence could he learn of the missing ones.

It was on the evening of the seventh day after leaving Reno that Eugene Burdick stopped for the night at the wickiup of Shoshone Joe on the border of Death Valley. This Indian had lived in and around this neighborhood with his wife Sally for more than twenty-five years, and was a character well known to emigrants and prospectors.

A present of a few trinkets to the Indian made him quite friendly. Burdick enquired if they had ever seen a caravan of seven wagons passing that way long ago. Shoshone Joe with many "ughs" "ughs" picked up seven twigs, which he placed in the ground in a straight line a few inches apart, and then taking a stick, with one sweep knocked them all down, dramatically exclaiming, "All gone."

Burdick inferred from this that the Indian knew something which might assist him in finding the lost ones. He gathered that the Indian had seen the party, and had furnished them with fresh water prior to their crossing the valley. A blinding sand-storm occurred a few hours later, and the caravan lost its way, going south of the regular trail. Shoshone Joe said, that once when he was down the valley he could see seven little hills at a distance of ten miles, but Indian-like, he was afraid of the "Debbil," and he had never investigated.

This information interested Burdick very much, and by making a few more presents he induced the

Indian next morning to come with him and locate the seven hills he had told about.

Taking a two day's supply of water and a pick and shovel, Burdick with his companion started across the valley in the direction indicated by Shoshone Joe. The route was arduous, the sand being so deep and fine not more than a mile and a half an hour could be traveled.

Five miles of this wearisome journey had been traversed when Burdick located, by means of his spy-glass, the seven mounds described by the Indian, at a distance of probably ten miles away to the south, and this added fresh impetus to his efforts.

Six hours later the twain arrived at the seven mounds. A vigorous blow with the pick axe felled a mound to the earth, and two skeletons fell out into the deep sand. The relics were those of a wagon which was ready to crumble to pieces, the tires on the wheels being worn as fine as ribbons. This wagon had been drawn by an ox team, the horns and bones of which were half covered with the desert sand.

Twenty feet further along was another similar mound. It took but a little shake to bring the second wagon to the ground, and two more skeletons were exposed to view. An object that proved to be a gold watch and chain fell out into the sand, but was speedily found by the watchful Burdick. He pried open the case of the watch, and on the inside read the following inscription: "To John B. Lansing from his wife, Dec. 25, 1886."

"This is all the proof that I want," said Burdick, and bidding good-by to the gruesome spectacle he beat a hasty retreat. The Boston people were satisfied with Burdick's story, and the evidence that he produced, and he received the reward.

The shifting, treacherous sands now completely cover the seven little mounds, and all that is mortal of Aaron Burr Hilliker, telegraph operator, philosopher, Bohemian, gentleman.

[Dr. L. M. Rheem immortalized A. B. Hilliker in articles written for this journal some years ago—Editor.]

Magnifying Feeble Currents in Cables.

Mr. S. G. Brown, of London, England, inventor of the telephone relay, delivered an experimental lecture on methods of magnifying feeble telegraph currents, at the recent exhibition of scientific apparatus held by the Physical Society, London. He described the improvements in the sensitiveness of the siphon recorder. The inertia of the coil and of the siphon, he said, should be equal, in order to minimize the inertia of the system. He exhibited a device which magnified the motion of the coil.

A fine fiber, kept in tension by flat springs, was attached to an arm carried by the moving coil and to a vertical fiber on the siphon suspension device, which was fixed on an aluminum carrier held by a vertical fiber at the top and by two parallel fibers 0.2 inch apart below. The one leg of the siphon was on the axis of the suspension between the two latter fibers, and the whole suspension device was vibrated up and down by the aid of a lower (very weak) and an upper flat spring so as to jerk the ink out. When the instrument was adjusted to 10.5 natural periods per second, with a 300-ohm 300-turn coil, a current of fifty micro-amperes gave a full-sized signal corresponding to a deflection of 0.1 inch on the paper, and the back e. m. f. was reduced to a quarter or less of its ordinary value. On the largest Atlantic cables an increase in speed of thirty per cent had been realized by these means.

The second improvement concerned a thermo-electric relay. In this device a very light thermopile of five junctions (platinum, and platinum with twenty per cent of iridium) was kept oscillating between two small alcohol flames by an arrangement resembling the one adopted for the siphon, some of the fibers being phosphor-bronze wires. The flames were wick burners, each provided with a copper cap fixed above a few turns of a copper wire coil, which became hot, and insured a steady production of vapor. In the neutral position both ends of the thermopile were dull red; when deflected by the cable current one junction became bright red, the other almost dark. There was a lag in the thermal current, but it was inappreciable for cable work, and, in fact, advantageous with simplex working, because it facilitated the balancing of the sending current which might affect the receiver. With a natural period of the coil equal to 8.7 periods per second, and a 480-ohm 480-turn coil, a coil current of 0.03 milliampere gave a current of 0.81 milliampere from the pile through an external resistance of forty-two ohms, the thermopile itself being deflected by 0.075 inch. Thus there was a magnifying power of twenty-seven.

The remarkable property of this relay was that its magnifying power was constant, and that it multiplied the impulses received in exact proportion to their strength, as was shown by curves. How this was possible Mr. Brown further explained by the simple mechanical experiment that a heavy weight, suspended by a string coiled round a rotating spindle, could easily be raised almost without pulling the free end of the string up at all, because additional power came from the motor driving the spindle (a treadle in the demonstration). This principle of mechanical power magnification was utilized in a third device, by means of which it was possible to work an ordinary siphon writer, normally requiring three milliamperes, by a current of ten micro-amperes. On a German-American cable an increase of speed of forty per cent had been maintained in three weeks' trials by the aid of thermo-couple.

Mr. Oscar Moll, managing director of the Deutsch-Atlantische Telegraphengesellschaft, at Köln, Germany, in renewing his subscription for another year, writes: "We invariably find in your various issues of Telegraph and Telephone Age, not only very interesting, but also instructive matter, valuable for electricians, and the telegraph workers generally."

Western Union Bridge Duplex.

(Concluded from page 54, January 16.)

The Leak Circuit. In order to ascertain the character of the signals transmitted to each line by the direct-repeating apparatus, the two main-line wires are tapped at the tongues of their respective relays, and a small portion of the outgoing currents from each transmitting relay is diverted through a separate high-resistance leak circuit in which a sensitive polarized "leak" relay that actuates a local sounder is placed. The regular box form of polar relay with its coils in "series" will be utilized in the latter connection, the leak resistance being represented by a box containing a series of coils graduated from 8,000 to 20,000 ohms, and so arranged that the leak circuit shall never have less than 8,000 ohms in it. (See Fig. 12, January 1 issue.)

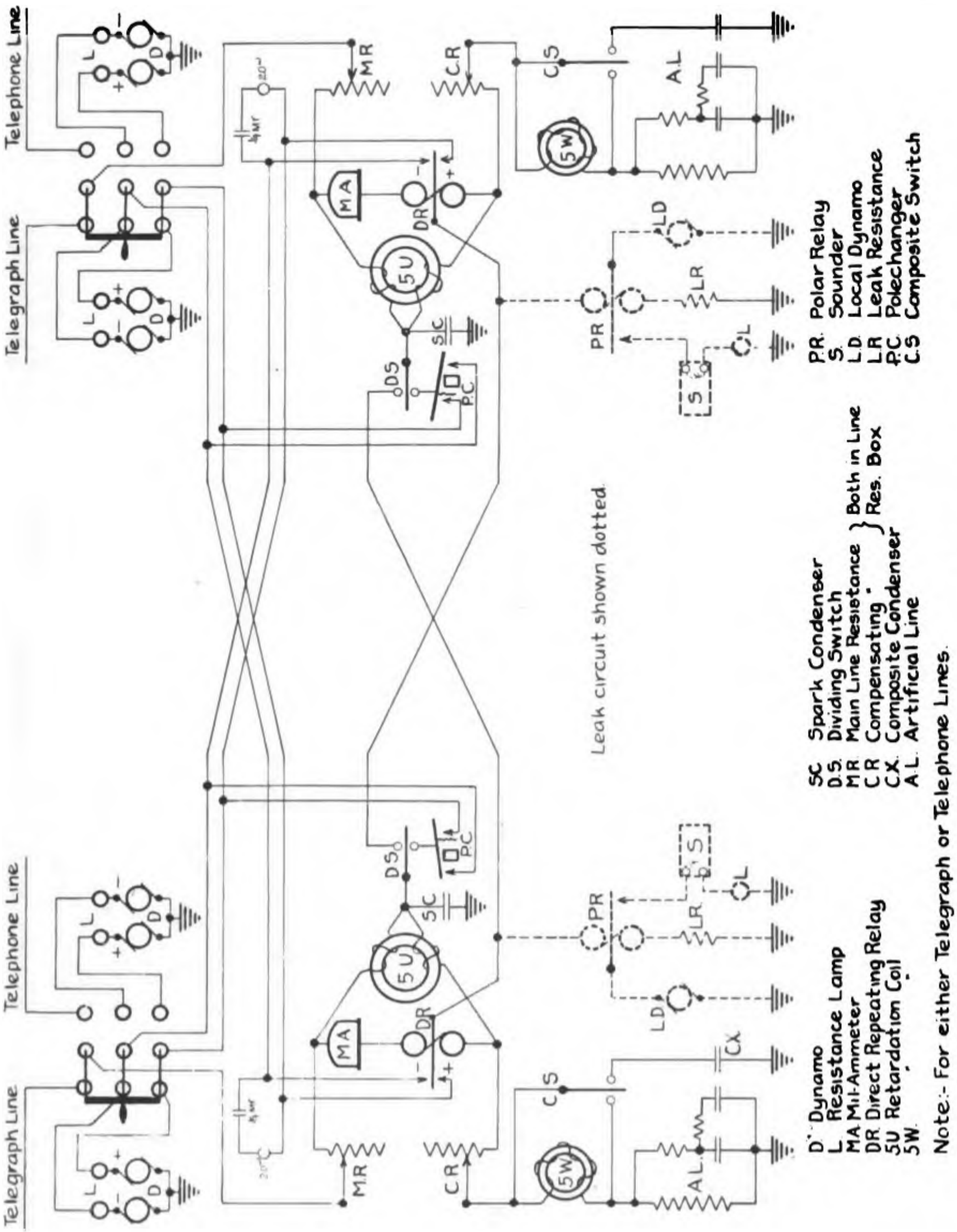

FIG. 15—CONNECTIONS FOR EITHER TELEGRAPH OR TELEPHONE LINES.

THE LEAK RESISTANCES. The proper amount of resistance to insert in the leak circuit is practically determined by the amount of current required to satisfactorily operate the leak relay.

It is very desirable, however, that this resistance should be maintained at the highest value practicable in order that the main line may not be deprived of too much of its working current; but as the portion diverted down the leak circuit is necessarily smaller with each increment of resistance, the adjustment of the leak relay must be correspondingly delicate to make that instrument responsive to the weaker currents.

CENTERING THE LEAK RELAY. Since any "biasing" of the leak relay would be liable to affect the character of the signals imparted to its local sounder, and as such signals might not be truly representative of those passing into the main line, the desirability of keeping the leak relay properly "centered" will be obvious. This can be done at any time without interfering with the "through" working by opening the leak circuit, which can be readily accomplished by throwing the appropriate lever of the leak box over to the stud marked "open."

SPECIAL EQUIPMENT FOR "COMPOSITE" WORKING. The equipment of a certain number of duplex circuits will be such as can be utilized for operating either over the ordinary telegraph wires, or over such telephone wires as are now available for the work of simultaneous telegraphy and telephony, a suitable voltage and other requirements being necessary to obviate interference with the telephone service.

"COMPOSITE" COIL AND CONDENSERS. This apparatus is only to be used when telephone circuits of the "composite" type are also employed for telegraph purposes, under which arrangement the coil and condensers are switched into the circuit of the artificial line. This is done in order to balance a similar set of apparatus introduced as "graduators" between the telegraph and telephone branches of the composite circuit with a view to silencing the effect of the Morse signals upon the telephone receiver.

In the superimposed method of simultaneous telephony and telegraphy, known as the "simplex" system, this null effect in the telephone is attained without the use of the graduating apparatus; so that a "simplexed" telephone circuit would only require to be balanced in the ordinary way to obtain an additional Morse duplex circuit, the WE-5-W coil and composite condenser compensation being excluded from the artificial line in all such cases.

LINE RESISTANCE BOX (in connection with telegraph circuits). This box—shown in Fig. 12—contains two separate and independent sets of graduated resistance coils, each set aggregating 1,250 ohms, and so arranged that resistances in equal amounts can be simultaneously cut into or out of both the main and artificial lines by one and the same movement of the double lever with which the box is provided. The primary object of the line resistance is to afford a means for increasing the electrical length of short circuits, in order that the latter may be successfully operated on potentials ordinarily used in connection with comparatively long circuits.

It may also be employed to advantage in reducing the strength of earth currents on lines between whose terminal ground plates potential differences exist that would be detrimental to the working. Similar advantages often result from its use on circuits subjected to inductive disturbances from nearby electric power, railway or lighting circuits.

LINE RESISTANCE BOX (in connection with telephone circuits). This can be inserted to cut down the strength of the main-line current in telephone circuits of low resistance, in which the current, due to the combined effects of each of the terminal voltages, might otherwise exceed 100 milliamperes. This restriction in the magnitude of the line current is absolutely necessary to prevent interference with the "signaling" and "load coil" arrangements of the telephone system, as well as to obviate all possibility of the Morse signals affecting the telephone receiver.

Now, since the mil-ammeter is located in a branch circuit off the main line, its deflections do not represent the full values of the line currents; but if both sets are well balanced and the two terminal potentials are equal, the main-line current will normally be between six and eight times that in the branch containing the mil-ammeter and relay. Wherever practicable, the current should be determined by inserting a mil-ammeter directly in the main line, at the switchboard or elsewhere, while the terminal potentials are assisting each other, that is, with the pole-changer open at one end of the circuit and closed at the other. Where this cannot be conveniently done, it will usually be safe to assume that the limit of 100 milliamperes in the main line is not being exceeded if the mil-ammeter on the duplex set indicates less than twelve milliamperes.

The amount of extra line resistance to be added should, as a rule, be split up between the two offices, equal amounts being preferably inserted at each end of the line; but where the distance between the telegraph and telephone offices is very considerable in the one case as compared with that of the other, a proportionately larger amount should be inserted at the end nearest the telephone station.

It may be incidently remarked that in order to properly balance a composited circuit, it is necessary that the amount of resistance added to the main line, in the manner and for the purpose mentioned, should be compensated for by an equal amount of resistance inserted at a point corresponding thereto in the artificial line. In practice, this compensating resistance forms part of the line resistance box, and, as previously intimated, can be introduced into or withdrawn from the artificial line simultaneously with the insertion or withdrawal of any main-line resistance that the circuit requirement may happen to call for.

THE SIGNALING CIRCUITS. The local signaling device (for calling in quad and duplex attendants), which forms part of the multiplex table equipment

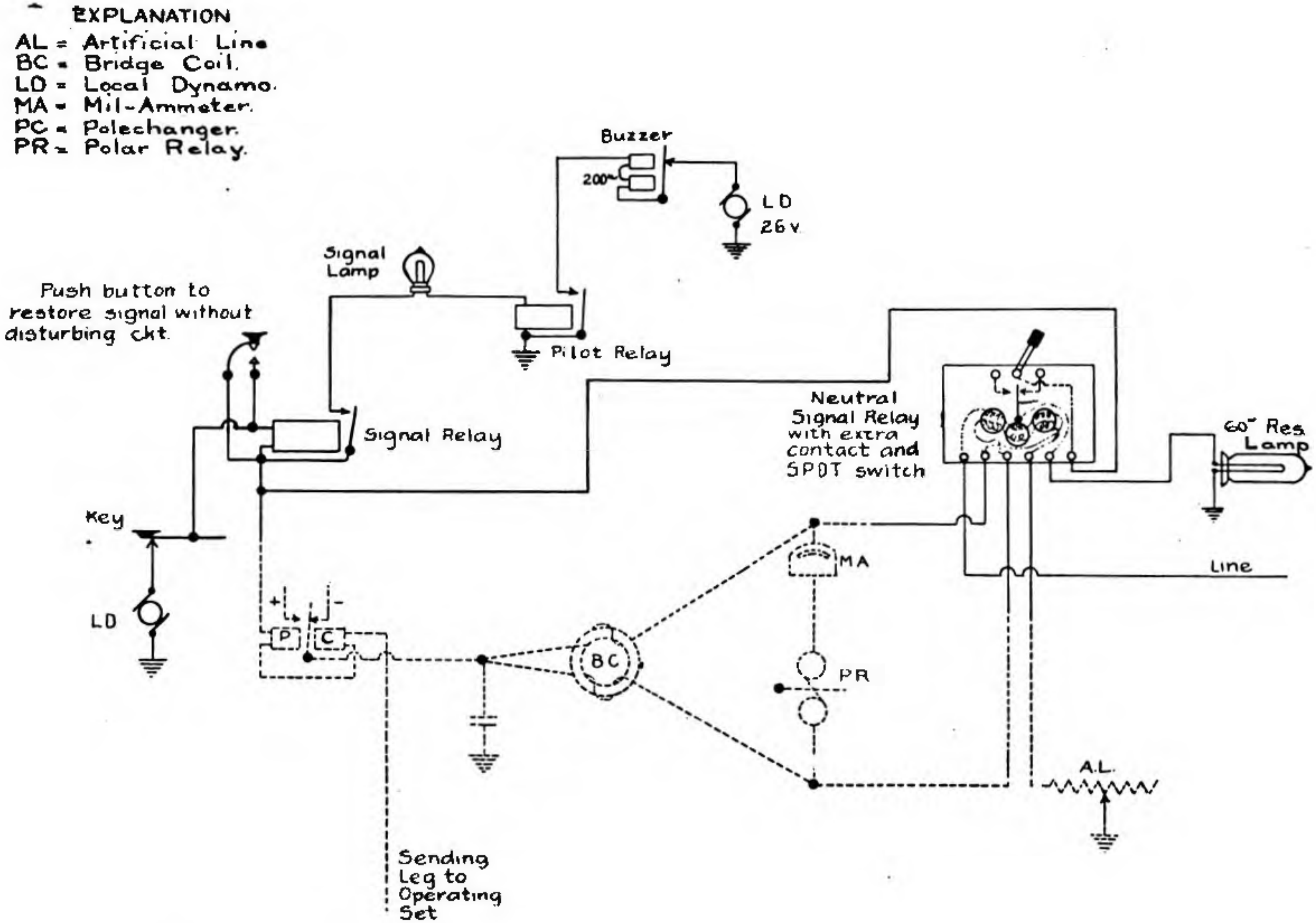

FIG. 16—ATTENDANT'S CALL SIGNAL.

for quad and duplex circuits, includes a low resistance signal relay and a two-c.p. lamp, the functions and operation of which are more specifically set forth in the specifications describing this signaling system.

The Telephone in 1912.

Mr. S. G. McMeen, the well-known telephone expert, in reviewing the advances in telephony during the year 1912, in the *Electrical World*, states that no epoch-making invention was produced, but that attention to refinement of details was marked.

The loading of the largest copper wires commonly used in the United States (435 pounds per mile of wire) tends principally to increase the radius of communication. Loading of circuits other than those requiring the largest wires may reduce the total cost of a line for a given grade of transmission over a given distance. The happiest way, however, of reducing the cost of a line, is to reduce the actual amount of metal in it, and this, in telephony, is done by the use of phantom circuits. Theoretical development of phantom circuits has covered a long period. Practical development, and wide use of these developments, mark 1912 as their banner year.

Telephone companies have applied composite and simplex methods to long-distance lines for years, but have suffered from the lack of a broad market for the telegraphic facilities so produced. On the other hand, telegraph systems have had within themselves the opportunity for similar economic gains because, fundamentally, two simple telegraph circuits are wasting one telephonic possibility. The coalition of commercial relations of the Western Union Telegraph Company and the American Telephone and Telegraph Company removed a difficulty in this regard. The best interests of the community require the best use of all property belonging to any part of the community.

The years succeeding 1912 will mark further economies in the harmonious operations of the telegraph and telephone facilities in the United States. Such possible expansion was not great in 1912, but the year was notable in its preparatory work. Progress along these lines in Europe was less marked than here, for obvious reasons of governmental inertia. A fourth advance in the economics of wire uses was in the further spread of train dispatching by telephone. As the year closes it may be said that arguments against the handling of trains by telephone have ceased.

The common battery multiple switchboard remained the standard manual equipment for large central offices. Substantial progress was made, however, in the development of semi-automatic equipment, designed to reduce the amount of incoming trunk switchboard apparatus, and the amount of labor required to operate it. In this regard the year may be taken as the last one of preparatory development, and 1913 may be expected to include the installation of many important examples of this system. Development in these semi-automatic systems has been dominated by several distinct interests in the United States, and is more recently attracting the attention of competent minds abroad. Several of the fundamentals of this practice were reduced to finality during 1912. The way thus is paved for substantial progress hereafter. The contributions of 1912 to that art may well be considered notable. In the greater number of exchanges, both here and abroad, there is no interoffice trunking at all. In them, if operating labor is to be eliminated in any very great degree, automatic or semi-automatic systems must do all or some of the work of manual operators. The automanual system has had a wider trial during 1912, and has made useful history in the art of doing mostly by machinery what is done on a multiple board by hand.

Automatic switching systems, wherein the subscriber directs and partly controls the switching mechanism, and in which no operator other than the subscriber has part, reached a new relation to the using public during 1912. Heretofore the widest use of and interest in automatic switching equipments have been in the United States. The installation of new systems in this country has been less than in other years. The growth in systems already installed went on at a satisfactory rate. No previous year covered more important refinements of detail of automatic apparatus than did 1912, and considering the development of devices for both semi-automatic and automatic systems as a single kind of endeavor, 1912 exceeded all previous ones in total accomplishment. In Europe, furthermore, the automatic idea attracted more attention, received more thought and progressed further toward wide use in 1912 than in any previous year.

Telegraphers' Mutual Benefit Association.—In an exhaustive report dated December 28, 1912, the examiners of the Insurance Department of the State of New York state that the Telegraphers' Mutual Benefit Association, on November 30, held gross assets amounting to $353,677.37 against death claims amounting to $13,500. The cash held is deposited with the Western Union Telegraph Company, which allows the association six per cent interest per annum on balances, and in addition further materially assists by providing office room, light, heat, and telegraph facilities free of charge. They also point out that as there are no officers under salary save the secretary, who acts as office manager, only necessary expenses are incurred, all of which enables the association to be operated at a very low expense ratio. These facts as well as that the association has never contested a claim, but always paid in full at maturity elicited warm praise from the officials. Mr. M. J. O'Leary, 195 Broadway, New York, is secretary.

Cable Cut.—One hundred feet of cable under the Delaware and Raritan canal at New Brunswick, N. J., was cut out and stolen on January 18. Communication with New York was interrupted for eight hours. The cable contained twelve wires.

The Reid Memorial Fund.

In our issue dated January 16, we referred to the increasing interest in the Reid memorial monument, and noted that $637.25 had been subscribed toward the fund up to that date. Following is a list of the subscriptions composing that amount:

$1.00 Subscriptions.—Frank A. Albert, David Homer Bates, G. A. Stimpson, Frederick A. Coleman, I. W. Garnett, W. A. Jones, J. B. Konndorfer, C. B. Mears, Louis Meloche, Miss E. J. Vatet, John F. Allen, Joseph Anderson, C. H. Ashburn, Albert Baur, Charles H. Beckworth, Robert J. Bell, Dr. Charles A. Bigler, E. A. Burns, N. W. Charles, Frank Bell, Charles E. Bliss, Herbert Boyeson, J. Doughty, John E. Brick, Thomas Bromley, Sr., William T. Carter, Bennett F. Coan, J. G. W. Cobb, Elias W. H. Cogley, Miss Elizabeth Cogley, Edwin H. Corey, C. E. Diehl, Charles C. Doten, D. D. Dow, George M. Dugan, Wm. F. C. Fellers, H. L. Fisher, W. P. Flanagan, A. M. Floyd, J. W. Gilliam, Thomas Gosden, T. J. Hoge, W. M. Hannon, George E. Holbrook, A. K. Holman, Wm. H. Hornbeck, S. A. Howard, A. E. Hoyt, W. J. Huggins, H. H. Huntling, E. T. Hulaniski, Francis W. Jones, Frank J. Jones, W. L. Jones, Wm. H. Keer, C. C. Kennedy, Wm. E. Kettles, C. C. King, C. Fred Kuehn, John Lapey, J. E. Lawhead, J. D. Lawton, R. Lipscomb, W. C. Lloyd, W. O. B. McCarty, Miss Anna T. McCulley, Isaac H. McEwen, O. P. McGinnis, J. G. McNerny, John F. Moore, Sylvester Myers, N. H. Netrie, W. L. Nickerson, Miss Lola A. Norrell, T. H. O'Mara, J. A. Pferd, Austin D. Paige, Fred H. Polhill, H. Otis Pond, H. E. Rawson, Samuel Reese, G. W. Ribble, S. P. Rice, George S. Richtmyer, W. T. Salisbury, Edward Schnitgen, Mr. and Mrs. H. J. Stilson, W. S. Taylor, George F. Thode, H. B. Thornton, P. H. Tennell, A. D. Tiffany, G. T. Tucker, A. Watson, Henry E. West, T. P. Wheeler, J. S. Whitacre, George B. Wilde, Rees D. Williams, Wm. Bender Wilson, Edgar Winter.—Total, $101.00.

$1.50 Subscription.—Edwin Peel.

$2.00 Subscriptions.— John F. Cleverdon, Mrs. Jessie L. Cutts, John Doran, A. J. Driver, Evelyna Halsey, T. J. Howlett, Donald McNicol, George N. Drewer, W. G. Brownson, T. E. Clarke, G. E. Cromwell, N. De Bree, Mortimer Du Perow, R. F. Easson, J. L. Edwards, Thomas R. Fox, J. T. Gray, John B. Hammatt, Nathaniel Hucker, J. W. Sullivan, J. J. Keegan, John Lonergan, G. R. Shultz, W. I. Slowen, Charles W. Thayer, J. A. Townsend. —Total, $52.00.

$2.50 Subscriptions.—J. E. Hall, Albert Klein, A. P. Farmer, W. F. Snowden, W. S. Nelson, R. H. Hope, J. P. Smith, (combined), $2.50.—Total, $7.50.

$3.00 Subscriptions.—C. E. Bagley, E. W. Collins, S. H. Mudge.—Total, $9.00.

$5.00 Subscriptions.—James R. Beard, Thomas M. Brennan, A. R. Brewer, Charles P. Bruch, A. B. Chandler, M. M. Davis, Louis Dresdner, William B. Dunn, Louis B. Foley, John J. Ghegan, Mrs. Horace Tracy Hanks, Gardner Irving, R. J. Marrin, William Marshall, T. C. Martin, J. W. McLaren, Edward J. Nally, M. J. O'Leary, Edward B. Pillsbury, B. P. Stephens, J. B. Taltavall, George G. Ward, George W. Wyeth, John C. Barclay, E. A. Chenery, Thomas David Conway, W. C. Daviet, H. F. Dodge, S. M. English, U. J. Fry, E. P. Griffith, Thomas W. Hill, Arthur K. Ingraham, James C. Johnson, Cyrus Moffat, Henry O. Nightingale, H. J. Pettengill, Adam W. Reidler, C. A. Richardson, S. L. Robinson, George B. Scott, L. W. Storror, George H. Usher, W. C. Walstrum, George T. Williams.—Total, $225.00.

$10.00 Subscriptions.—F. F. Fitzpatrick, Walter C. Humstone, Charles A. Tinker, Sidney B. Gifford, Frank J. Loesch, James Merrihew, Postal Telegraph Club of Atlanta, Charles Selden.—Total, $80.00.

$15.00 Subscriptions.—R. C. Clowry, Old Time Telegraphers' and Historical Association, William R. Plum.—Total, $45.00.

$20.00 Subscriptions.—W. C. Brown, Thomas A. Edison.—Total, $40.00.

$25.00 Subscription.—Richard O'Brien.

$50.00 Subscription.—James A. Scrymser.

Three persons contributed from 25 cents to 50 cents.—Total, $1.25.

Grand Total—$637.25.

It is only proper to state that a number of those who have subscribed comparatively small sums have expressed their intention to increase the amounts of their respective subscriptions if necessary.

Remittances should be made to Col. Albert B. Chandler, 253 Broadway, New York, the treasurer of the fund.

New Book.

Methods of Measuring Electrical Resistance. By Edwin F. Northrup, Ph. D., New York: McGraw-Hill Book Company. 390 pages. Price, $4.00.

This treatise contains a compilation of many methods of measuring electrical resistance, most of which are fully described. Some of the methods are new, and several are illustrated with records of sample measurements. Rules for the estimation of errors are briefly considered, and one chapter describes methods of measuring temperature by means of resistance-measuring apparatus. Methods of locating faults on telegraph, telephone and other land lines form the subject of another chapter. The appendix contains data and information useful in connection with the subjects treated.

The author is professor of physics at Princeton University, and is well known in electrical engineering circles. He has been engaged in electrical measurement for twenty years, and is therefore qualified to write on the subject. The work should find a welcome among telegraph and telephone engineers, as it brings together in one volume practically every method of measurement known.

Copies of this book, and any other on electrical subjects, can be obtained of Telegraph and Telephone Age, 253 Broadway, New York.

THE RAILROAD.

SEVERAL APPOINTMENTS have recently been made of former telegraphers to high positions in railway circles. Among them are Mr. John F. Auch, vice-president and freight traffic manager of the Philadelphia and Reading Railroad at Philadelphia; H. O. Dunkle, general manager of the Erie lines west of Buffalo and Salamanca, N. Y., at Cleveland, Ohio, and A. M. Schoyer, general manager of the Vandalia line at St. Louis, Mo.

ADDITIONAL TELEPHONE EQUIPMENT FOR THE ROCK ISLAND.—The Chicago, Rock Island and Pacific Railway Company recently placed an order with the Western Electric Company for apparatus to be used in extending two of its telephone train dispatching circuits. One circuit will be installed between Des Moines, Iowa, and Trenton, Mo., about 110 miles, and the other will be used as a short-haul talking and message circuit between Davenport, Iowa, and Rock Island, Ill., about five miles, including the yard district in the latter territory. Miscellaneous equipment and line material is also being furnished. Mr. C. H. Hubbell, Chicago, Ill., is superintendent of telegraph of this road.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—The Association of Railway Telegraph Superintendents will hold its next annual meeting in St. Louis, Mo., May 20, and there is every indication that it will be largely attended. Train dispatching by telephone will be one of the principal subjects to come before the attention of the superintendents, and other matters of importance to railway operation will receive special consideration.

Mr. J. B. Sheldon, superintendent of the Union Pacific Railroad, Omaha, Neb., is president of the association, and Mr. P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill., is secretary.

C. G. Baird, Division Operator, Pennsylvania Railroad, New York.

Mr. C. G. Baird, formerly manager of telegraphs and telephones of the Pennsylvania Railroad in New York, has been promoted to the position of division operator of the Manhattan Division, with headquarters at the same point.

Mr. Baird was born February 10, 1880, and entered the service of the Pennsylvania Railroad March 9, 1893, as messenger at Philadelphia. On May 21, 1894, he was advanced to be extra telegrapher, which position he held for seven years. He severed his connection with the Pennsylvania Railroad September 25, 1901, to enlist in the Signal Corps of the United States Army, and was honorably discharged as first-class sergeant September 23, 1904. On March 23 of the following year he re-entered the employ of the Pennsylvania Railroad, and filled several important positions at the general offices in Philadelphia until he was transferred to New York on March 1, 1910, to supervise the installation of the extensive telephone and telegraph systems at the company's new station. As division operator Mr. Baird has charge of some 200 telegraphers and telephone operators.

CANADIAN NOTES.

MR. A. B. SMITH, manager of telegraphs, Grand Trunk Pacific Railway, Montreal, Que., announces the following appointments: Mr. W. J. Rooney, superintendent of plant, and Mr. H. Hulatt, commercial and traffic superintendent and superintendent of time service, both at Winnipeg.

MR. T. AHEARN, president of the Ottawa Electric Company, Ottawa, Canada, accompanied by his nephew Mr. Quain, of the same place, were recent New York visitors. Mr. Ahearn is a well-known old-time telegrapher, and was employed by the Western Union Telegraph Company as an operator in New York in the seventies.

A. B. Smith, Manager of Telegraphs, Grand Trunk Railway System, Montreal, Que.

Mr. A. B. Smith, manager of the Grand Trunk Pacific Railway, whose jurisdiction, as announced in our issue for January 16, has been extended to include the entire Grand Trunk Railway System, with headquarters at Montreal, Que., commenced his business career with the Montreal Telegraph Company. On the formation of the Great North Western Telegraph Company he became identified with it, and in 1889 was appointed superintendent of construction for that company. On November 1, 1905, at the invitation of the late Chas. M. Hays, president of the Grand Trunk Railway System, Mr. Smith severed his connection with the Great North Western Telegraph Company to assume the position of manager of telegraphs of the Grand Trunk Pacific Railway, with head office at Montreal. In 1906 Mr. Smith transferred his office to Winnipeg in order to maintain closer supervision over all construction and development work in the West.

Mr. Smith's extended jurisdiction gives him full charge of all telegraph interests on the Grand Trunk Railway, the Grand Trunk Pacific Railway, Transcontinental Railway, and controlled lines, and when present construction work is completed will centralize the management of telegraphs connected with approximately 13,000 miles of railway.

A transcontinental commercial telegraph service is being developed under Mr. Smith's direction, simultaneously with the construction of the Grand Trunk Pacific-Transcontinental Railway and allied lines.

SCHNEIDER'S ELECTRICAL TESTING.—A new edition of Schneider's "Electrical Instruments and Testing" will be ready in a short time. It has been throughly revised, and some new chapters added, thus bringing it up to date.

ODD RESULTS OF AN ERROR IN A TELEGRAM.—An error in a telegram resulted in two graves being dug in two different Texas cities for one body. Suit was brought against the telegraph company for damages, but the company won the case.

Testing Telephone Train Dispatching Currents.

While a bridge is of great assistance to a wire chief, and, in fact, is indispensable for testing commercial telephone circuits, it is not an absolute necessity in testing telephone dispatching and message circuits as other means are at hand, says Mr. J. A. Kick, in *Telephony*. A ground can be located at a station or between two stations by the "listening test." A cross by the "talking test," and induction and other troubles by one or both of these tests in combination.

On selective circuits having a number of bridges, it is not always practical to give up the circuit, and strip the line for a bridge measurement, nor is it always possible to raise the smaller stations. Hence, other and more practical means must be employed. The dispatcher may complain of a noisy circuit, and the wire chief, with the assistance of the dispatcher, will definitely locate the trouble without serious interference with the dispatcher's routine.

The listening test is positive, provided, however, the user is posted on the laws upon which it is based. There are several reasons for the ordinary failures and errors in using this test. Some of them are: Lack of practice, which teaches the ear to be "a keen telephone ear"; insufficient knowledge of the characteristics of electrical circuits; failure to study inductive effects produced by various paralleling circuits. A working knowledge of Ohm's law and a study of the magnetic circuit will clear up many difficult problems.

Wire chiefs can often trace inductive disturbances to their source by some characteristic of the primary circuit, which becomes evident when the tone of the induced current is carefully studied through the medium of "the telephone ear." The source of an inductive trouble is frequently located as at a distance or quite near, by the clearness of the tone; the observance of a clearly defined rise and fall; or a number of notes which appear to be superimposed, one upon another.

To some wire chiefs an inductive disturbance is a "noise," and unusual credit is taken when it can be located between *X* and *Y*, and a lineman instructed to clear "the Disprs. CKT. noisy between *X* and *Y*." To other wire chiefs this trouble is an interesting problem, and its solving is complete when the source and cause are both definitely known.

Too many wire chiefs use the stock phrase, "crossed to battery between *X* and *Y*," never going any further with the test, although in almost every case further and more definite results could be secured. There certainly must be a source to produce a "battery," hence, further effort would locate the offending circuit. Its identity would perhaps fix the point of contact within a comparatively short section and allow the maintainer to act quickly with assurance of results within a given period.

A telephone pair "open between *X* and *Y*" is a very unsatisfactory entry in a wire chief's log, as it is an indication of failure to follow up the trouble. Two wires open between two stations and without further notation, means that the two are separated with all four ends clear. There are conditions under which it is impossible to pick up the circuit beyond the trouble to test back, but they are infrequent. A pair open and clear at both ends has a suspicious significance of protection trouble, or irregular testing by reason of some way station attendant giving a false test. Although it is not impossible for a pair to be "open and clear, both ends," yet it is very infrequent. Such an indication is worthy of a "check test," which will often locate and clear the trouble.

A case comes to mind of a wire chief keeping a lineman after an open wire between *X* and *Y* stations for three days, when it was in the section between *Y* and *Z*, and not indicated on account of the ground eaten off at *Y*. Very poor judgment, indeed! It indicated that the wire chief was not a thinker, or he would have become suspicious after the lineman had made one trip. A test of the ground on another working wire or backing up on the wire in trouble, would have indicated the "poor ground."

Having been appointed wire chief on a railroad division, I found that only one or two way station operators could patch wires, or were able to locate telephone troubles. With a telegraph switchboard and a pocketful of plugs, I traveled over the division. The results from these instruction visits were surprising in that, with very few exceptions, the operators could make any kind of a patch. My system of instructions was based on the belief, "Know the designer's idea and the rest is easy."

The procedure was about as follows:

Question.—"Do you understand the switchboard?"

Answer.—"Yes," or, "I think so."

Question.—"Can you explain its construction?"

Answer.—"Yes."

The operator then tried in some cases, but frequently had to give it up. With the small board in hand as a sample, I then explained the mechanical construction, assembly and the electrical paths produced by plugs being introduced between discs and strap, then again the question:

"Do you understand it?"

Answer.—"Yes."

The operator was coached until he was able to rapidly go through the explanation, and to verify his explanation by reference to the board. He was asked to make some complex patches and explain the circuit which resulted.

With the telephone a detailed explanation of the apparatus, the primary and secondary circuit, and what should be done to definitely locate troubles, was carefully gone over until the operator could give a good account of his actions in any case about which he was asked. A wire chief can, from a distance, frequently assist an operator in locating telephone troubles, such as on yard and block circuits, by having the way station operator follow out a "process of elimination." "Process of elimination" is the slide rule of a wire chief with which he divides his troubles into primary and secondary circuits, subtracts the troubles from the circuits and equipments, multiplies his capabilities and adds to the general efficiency.

MUNICIPAL ELECTRICIANS.

Convention of Municipal Electricians.

This year's convention of the International Association of Municipal Electricians will be held at Watertown, N. Y., of which place Mr. H. C. Bundy is superintendent of fire telegraph. Mr. Bundy was president of the Association during the year 1910-11, having been elected at the Rochester convention in 1910. The convention at Peoria, Ill., last year was one of the most interesting and successful ever held by the Association, and from present indications it is safe to assume that this year's meeting will surpass the earlier ones in attendance and interest. The Association is rapidly growing in importance in keeping with the large development of municipal, fire and police alarm affairs throughout the country, and the positions of the members are becoming more and more technical each year.

The officers of the Association this year are: president, J. W. Kelly, jr., Camden, N. J.; vice-presidents, O. C. Trussler, Indianapolis, Ind.; W. R. Arbuckle, Bayonne, N. J.; A. G. Sangster, Saskatoon, Sask.; B. A. Blakey, Montgomery, Ala.; secretary, Clarence R. George, Houston, Tex.; treasurer, C. E. Diehl, Harrisburg, Pa. There will probably be a large and comprehensive exhibition of fire alarm and police telegraph and other apparatus of utility to the municipal electricians.

Discovery of Electrical Conductivity of the Earth.

When Steinheil, in 1838, was making some experiments on the Nürnberg-Fürther Railroad, for the purpose of determining whether the track could be used for telegraphic purposes, he noticed that the current passed from one of the rails to the other through the earth, and the thought occurred to him whether it might not be possible to use the ground itself and in this way dispense with half of the metallic circuit. This proved to be feasible, and he was then enabled thereafter to work his line with a single wire.

The discovery by Steinheil that the earth may serve as a conductor for the galvanic current is justly regarded as one of the most important discoveries ever made in the art of electric telegraphy, and it is one which has contributed very largely toward the extensive development of telegraphic lines. It is not easy to determine whether the earth really conveys the current in the manner of an ordinary conductor from one station to another, or whether it should be regarded merely as a reservoir into which the electricities of the battery pass.

INDUSTRIAL.

INSULATOR BOOKLET.—The Brookfield Glass Company, New York, has issued a booklet giving illustrations, specifications and other data of the various designs of insulators manufactured by it for aerial conductors.

TELEPHONE DISPATCHING ON THE OREGON ELECTRIC RAILWAY LINES.—The Oregon Electric Railway has adopted the telephone for dispatching its trains, and will equip two circuits with apparatus supplied by the Western Electric Company, one from Portland to Forest Grove and the other from Portland to Eugene. The former division is approximately 40 miles, while the other is approximately 125 miles in length. There are to be two train dispatchers, both located at Hoyt street station, Portland, thirty-five way stations, and the trains will be equipped with the usual standard apparatus.

THE EDISON STORAGE BATTERY COMPANY, Orange, N. J., has issued in pamphlet form, reprinted from the *Army and Navy Journal*, a series of twenty-five letters addressed to the personnel of the army and navy by Mr. Miller Reese Hutchison, chief engineer and personal representative of Mr. Thomas A. Edison, relating to the adaptation of this type of battery to army and navy use. A complete account of the manufacture of the battery is also given.

WESTERN ELECTRIC'S PRIZE SALESMEN.—A conference of prize salesmen of the Western Electric Company was held at the Hawthorne works during the week of January 6. There were thirty salesmen present, and they spent a busy week with entertainment, instruction and sight-seeing. There were numerous inspections of the Hawthorne plant, and talks by members of the manufacturing staff in explanation of the processes and rigid inspection methods pursued. At other times, members of the other general departments addressed the salesmen on various specialties of the company, and discussed questions of policy. The evenings were given over entirely to entertainment.

Condensers.

BY "AN OPERATOR."

I have been an interested reader of your paper for many years, and have garnered much valuable information therefrom; but I must admit that I am much befuddled by articles appearing in your journal from the pen of well-known practical telegraph engineers, highly recommending the small rolled condensers, while at the same time practically admitting that they are defective, by stating that a duplicate set is provided and so arranged that any unit may be quickly removed and replaced; then again we are told that the spark which causes every puncture passes through the paper without scorching it, and that though the current is strong enough to shrivel up the conducting surface around the puncture, the operation can be repeated many thousand times without reducing the capacity or the insulation resistance. Are not these statements somewhat inconsistent?

I believe that this is the first time in the history of telegraphy that telegraph engineers of well-known ability have recommended the use of a defective apparatus. I should like to hear through TELEGRAPH AND TELEPHONE AGE from others who may have had a more extended practical experience than myself.

[Our correspondent errs in his assertion that telegraph engineers recommend the use of defective apparatus. They, and everyone else know, or should know, that nothing produced by man is perfect and final. The telegraph engineer demands the best that can be had, recognizing, however, that the best is by no means perfect. Our correspondent probably meant "imperfect" when he used the term "defective." All apparatus is imperfect in an absolute sense, but we are compelled to use it if we wish to make any progress, because we can get nothing better. Because it is not absolutely perfect is no reason why we should not use it.

The two types of condensers referred to represent the most advanced state of development in this class of instrument, and should be judged by what they accomplish rather than by their imperfections. Telegraph companies would be glad if they could get perfect apparatus.

The apparent inconsistency of statements which our correspondent complains of is a matter of individual mental tendency. Some people see the good in all things, and others the reverse, and if all people looked only upon the dark side of material conditions there would be no incentive to do better. There is a right way to do everything, and if all men knew this way there would be no differences in their work. We are all more or less in the dark and groping our way, and we have to do the best we can with the means at hand.

The men who are trying to produce better instruments should be encouraged in their work and not discouraged because they do not obtain perfection.—Editor.]

Annual Meeting of the Serial Building Loan and Savings Institution.

The twenty-eighth annual meeting of the Serial Building Loan and Savings Institution was held at 195 Broadway, New York, January 21. In his annual address president A. G. Saylor congratulated the shareholders upon the progress made by the Institution, and stated that its growth in membership and assets during the year was the greatest in its history, six hundred and seventy-five new names having been added to the membership roll. He emphasized the fact that the investment of the Institution's deposits is entirely in first mortgages on homes. Boys and girls in the service, he pointed out, may deposit their small savings in their own names, regardless of age, and thus control their own savings without interference by anyone. "So much has been said and written on the twin topics of economy and thrift," he said in conclusion, "that we are apt to lose the personal character of this most important subject. The margin of saving, the systematic accretion of small sums, is the dividing line between affluence and penury, between lifelong service and manly independence. It is the one safe road for every young man to travel who hopes for ultimate and assured success."

The annual statement, dated December 31, 1912, shows the following:

ASSETS.

Cash in Bank	$ 12,161.45
Loans on Mortgages	585,710.05
Loans on Serial Stock	5,069.00
Real Estate	14,871.76
Land Contracts	9,593.32
Advances for Taxes, etc.	1,657.65
Furniture	400.00
	$629,463.23

LIABILITIES.

Instalment Shares	$180,018.48
Savings Shares	118,719.55
Income Shares	238,260.07
Juvenile Shares	1,220.86
Due on Loans	16,667.27
Borrowed Money	31,600.00
Undivided Earnings	42,977.00
	$629,463.23

The election of officers resulted as follows: president, A. G. Saylor; vice-president, James R. Beard; secretary, Edwin F. Howell. Directors: Thos. M. Brennan, G. W. Blanchard, Wm. J. Quinn, E. E. Brannin, C. A. Kilfoyle, H. W. Pope, Thos. E. Fleming, M. J. O'Leary, J. T. Laidlaw, M. S. Cohen, W. B. Dunn, J. F. McGuire.

It is interesting to note that Mr. A. C. Terry, district commercial superintendent of the Western Union Telegraph Company, Pittsburgh, Pa., who is a member of the Institution's advisory committee, added seventeen new names of Pittsburgh depositors within a few days.

Gottschalk Telephone Transmitter.

After investigating for over five years the properties of vibrating telephone diaphragms, Mr. Felix Gottschalk, of New York, has produced a transmitter that possesses some unique and valuable features. Instead of employing a loose diaphragm made of a dead metal, such as aluminum, which is commonly employed for the purpose, phosphor bronze is used, which is rolled to produce an initial tension. The diaphragm is then formed, without drawing the temper, into a pan-shaped disc, the projecting edge of which is securely clamped, leaving the central portion free to vibrate like a drum head.

A resistance cell of the ordinary type is connected to the center of the diaphragm by means of a spider-shaped member having a plurality of feet, which are soldered to the inner surface of the diaphragm. These feet being equi-distant from the center, pick up the sound vibrations at the maximum point.


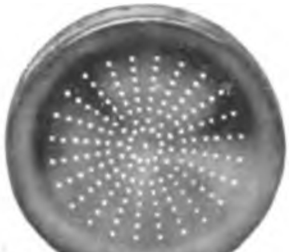

FIG. 1—TRANSMITTER COMPLETE. FIG. 2—VIEWS SHOWING GUARD AND DRAIN HOLE IN LOWER FL'GE. FIG. 3—DIAPHRAGM CELL.

Other details of construction, all very simple and easy of manufacture, result in an instrument absolutely water-tight. As the sensibility of the instrument is considerably increased by the improved diaphragm construction, it is possible to dispense with the usual mouthpiece as commonly employed. The mouthpiece consists of a flat, perforated metal guard, which is practically indestructible.

Being water-proof, this transmitter offers a perfect solution for the troubles met with in mine and railroad telephones, police boxes, testing sets, and instruments used in other exposed locations. It can be used in the operating rooms of hospitals, as it can be flooded or immersed in a sterilizing solution without injury. The cell, being in an air and water-tight chamber, cannot deteriorate, and being directly surrounded by the metal casing, interior air spaces being reduced to a minimum, the heat due to the passage of current through the carbon is rapidly dissipated. The mouthpiece can be thoroughly cleansed in a sanitary manner, and as it is flat, it will be often wiped off, which is not the case with the usual funnel-shaped mouthpiece.

FIG. 4—REAR VIEW, SHOWING TERMINALS.

In Fig. 2, which shows the instrument complete with shell, a large drain hole is noticed so that water and moisture can drain off the diaphragm. The diaphragm itself has no holes nor seams whereby moisture can penetrate to the interior. Heretofore, attempts have been made to water-proof the diaphragm by covering it up with thin sheets of celluloid or silk, which simply serve as culture mediums for bacteria, and hold the moisture, causing corrosion and impeding transmission.

From tests made in several of the university laboratories, and by Mr. H. R. Van Deventer, patent expert and author, Sumter, S. C., the instrument, in its commercial form, was, it is stated, found to average, from three to seven miles better in terms of standard cable than transmitters of ordinary construction.

FIG. 5—TRANSMITTER DISASSEMBLED.

FIG. 6—DIAPHRAGM WITHOUT GUARD.

Telephone Set for Limousines.

At the Automobile Show, recently held in Madison Square Garden, New York, a feature attracting more than the ordinary amount of attention was the Western Electric "Chau-phone," a telephone set designed for use in limousine cars. The set may be installed in old as well as new machines, and is intended to replace the clumsy, unsightly, unsanitary and generally unsatisfactory speaking tube now in almost universal use for transmitting instructions from the occupant of the car to the chauffeur.

FIGS. 1 AND 2—MEGAPHONE RECEIVER AND TRANSMITTER.

The set consists of a hand transmitter, shaped somewhat like the familiar magnifying glass, a loud-speaking, megaphone-shaped receiver, a flexible transmitter cord and wire. To operate the telephone the regular car batteries may be used, as only a current of from six to eight volts is required.

FIG. 3—ILLUSTRATING APPLICATION OF TELEPHONE SET.

The transmitter contains a gravity switch, which closes automatically when the instrument is held, handle down. When not in use the transmitter is placed, handle up, in a pocket in the upholstery of the car. This prevents the wasting of battery current when the set is not being used for talking. The receiver may be placed, either for right or left hand drive, directly at the chauffeur's ear, and the design is such that by merely talking into the transmitter in an ordinary conversational tone every word will be heard by the chauffeur above wind and street noises.

Meeting of Association of Broker Telegraphers.

The annual meeting of the Association of Broker Telegraphers was held at the Astor House, New York, January 10, Mr. Thomas L. Mahan, chairman of the board of governors, presiding. The reports of the officers showed that the association had enjoyed a prosperous year, more new members having been admitted during 1912 than in any previous year, although the initiation fee was doubled a year ago. The association is in an excellent financial condition, with a good working balance in the treasury. The most important business transacted was the election of four members of the board of governors, for terms of six years, to succeed Messrs. R. M. Irwin, B. Normington, C. C. Youmans and W. C. Briggs, whose terms had expired. Messrs. Irwin, Youmans and Briggs were re-elected to succeed themselves, and Mr. David F. Baker to succeed Mr. Normington.

The board of governors now consists of Thos. L. Mahan, chairman; R. M. Irwin, vice-chairman; Chester L. Hall, secretary; J. B. McKeever, treasurer; W. E. Gilbert, W. C. Briggs, W. J. Shannon, S. J. Callahan, C. C. Youmans, E. A. Kane, C. C. Yott and D. F. Baker.

The primary object of this association is to secure for its members satisfactory positions at satisfactory remuneration, and while the association confines its work principally to New York City, it is willing to help its members in other cities as far as it can.

Bound Volumes of Telegraph and Telephone Age.

For those of our readers who desire to have the past year's issue of TELEGRAPH AND TELEPHONE AGE in a form in which they can readily preserve all of the copies for future reference we would recommend a bound volume. We are now able to supply these containing the twenty-four issues of 1912 for the nominal price of $3.50. There are several features in one of these volumes, which comprises nearly 900 pages of reading matter, which are alone worth much more than the amount asked. The most important series of articles during the year was the "Course of Instruction in the Elements of Technical Telegraphy," which is widely studied and highly commended. These articles, together with the series by Mr. Willis H. Jones entitled, "Some Points on Electricity," are worth many times the price of the book. We have also published articles by the best-informed authors upon the developments in wireless telegraphy, and, in fact, there will be found recorded in this book all of the important improvements in the wireless art during the past year. The use of the telephone for train dispatching has largely increased since January, 1912, and we have kept pace with its development by presenting to our readers many articles upon this subject, written by some of the best-posted men in the railway and telephone world. Those interested in any branch of the telegraphic industry will find much valuable information in one of these bound volumes. A copy of this work will be sent to any address, upon receipt of price, $3.50, by J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

SELF-INDUCTION OF RELAYS.—The self-inductance of a relay with its coils in parallel is one-quarter of its value with the coils in series.

BUSINESS NOTE.

Cable Trouble?—Get a Wireless Cable Tester. Sent on trial. Electric Specialty Mfg. Co.—Cedar Rapids, Iowa.

Our Subscription Contest.

The contest for subscriptions to TELEGRAPH AND TELEPHONE AGE, which began November last, was, according to the terms, closed on January 31. The announcement of the results will be published in our issue of February 16.

The contest has been well supported, and the winners of the various prizes will derive some satisfaction in the knowledge that while they have made a financial gain themselves, they have been instrumental in spreading good among the ranks. TELEGRAPH AND TELEPHONE AGE is a paper that is worthy of the patronage of every telegraph, telephone and railroad man, and every employe who has interest in his work should read the paper diligently, for it will keep him posted as to what is going on in telegraphy and telephony.

At the time of going to press with this issue January 29, the contest stands as follows:

Mr. H. H. Dengler, Postal, Chicago, $104.00; Misses M. Wright, Western Union, Chicago, $50.00; G. G. Amber, Western Union, Philadelphia, $39.25; Messrs. C. F. Bartlett, Postal, St. Louis, $27.75; W. C. Hair, Western Union, Atlanta, Ga., $17.75; D. F. Brown, Western Union, Washington, D. C., $16.00; A. Watkins, Western Union, Richmond, Va., $16.00; L. A. Ott, Postal Company of Texas, Dallas, Tex., $13.50; J. A. Vogt, Postal, Baltimore, Md., $13.50; A. E. Krumling, Western Union, Toledo, O., $12.80; W. W. Umsted, Western Union, Omaha, Neb., $10.50; G. C. Moeser, Western Union, Oklahoma City, Okla., $10.00.

Meetings of Associations, Societies, etc., During 1913.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, at St. Louis, Mo., May 20. Secretary, P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION, at New York, March 12. Secretary, M. J. O'Leary, 195 Broadway, New York.

MAGNETIC CLUB, New York, April 10. Secretary, W. B. Dunn, 253 Broadway, New York.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS, at Watertown, N. Y. Secretary, Clarence R. George, city electrician, Houston, Tex.

OLD-TIME TELEGRAPHERS AND HISTORICAL ASSOCIATION AND SOCIETY OF THE UNITED STATES MILITARY TELEGRAPH CORPS, at Detroit, Mich., August 25, 26 and 27. Secretary of the Old-Timers, F. J. Scherrer, 30 Church street, New York; secretary of the Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

LETTERS FROM OUR AGENTS.

NEW YORK POSTAL.

MISS AUGUSTA DAY, operator for this company at the Hoffman House, New York, died at Flushing, L. I., January 11.

NEW YORK WESTERN UNION.

Mr. Chas. H. Howley, assistant chief, City Line, was married to Miss Margaret McCourt, on January 22, at Hoboken, N. J.

Mr. Wm. L. Ives, vice-president of the Society of the United States Military Telegraph Corps, and formerly of the Eastern Division this office, has recovered his health, but has retired from active service. The "Senator," as he was familiarly called, will be missed by his colleagues, and especially his co-workers on circuit 151 of the Eastern Division, which wire he satisfactorily covered for a period of twenty-five years.

Mrs. A. J. Gillman, wife of Andrew J. Gillman, died on January 19. A delegation consisting of employes of the various departments attended the funeral on January 22.

Geo. A. Kerr, an old-time telegrapher, died on January 24, at his residence in Bloomfield, N. J.

Telegraph and Telephone Age

No. 4 NEW YORK, FEBRUARY 16, 1913. Thirty-First Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Rectifiers

A rectifier, as the name implies, is a device for making right something that is initially wrong in order that it may become useful. An electrical rectifier transforms an alternating current into a direct current.

There are types of rectifiers manufactured, viz., mechanical, chemical, and the mercury-arc, each of which possess special advantages, or merit, under certain conditions, yet the principle of operation is much the same in all.

Rectifiers are particularly adapted for use in suburban and country localities, since alternating currents only are available in such places. Consequently, at garages rectifiers are necessary in order to obtain direct currents for charging the batteries of electric vehicles and for supplying other comparatively small demands. For the same reason telegraph companies are installing rectifiers in many of their medium-sized offices where necessary. A few words concerning the construction and general principles involved in the operations of rectifiers should therefore be interesting as well as instructive.

THE MERCURY-ARC RECTIFIER.

All mercury-arc rectifiers consist of an air-exhausted glass vessel containing two graphite rod electrodes for the anodes and one mercury cathode as shown at A, A¹, and B in the accompanying illustration. There is also a small starting electrode, C, and two normal reactance coils in addition to the resistance connected to C.

An anode is the terminal of an electric supply out of which the current flows into the liquid of a decomposition cell.

The cathode is the terminal into which the current flows, hence the anode is always connected with the positive terminal and the cathode with the negative.

In the mercury-arc rectifiers the source of electric supply is the alternating current delivered to the

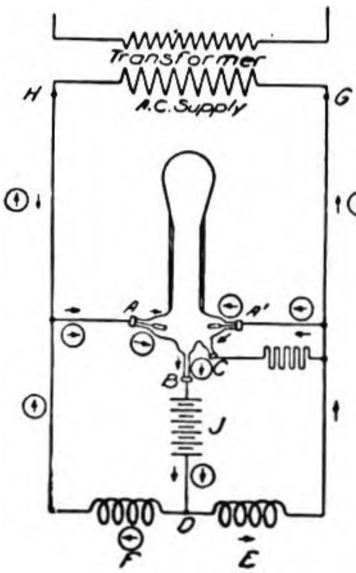

DIAGRAM OF MERCURY ARC RECTIFIER.

anodes by the transformer, hence the anode on one side of the tube must always be positive at the time the other is negative, because the direction of the current in the two wires connected to H and G, respectively, is opposite. Consequently, regardless of whether the positive wave appears at H or G (in fact, it appears at both alternately), it finds an electrode on that side, which becomes an anode, out of which the current flows into the conducting gas (mercury vapor) in the tube, and thence to the cathode. As these alternations take place at an exceedingly high rate of speed, there is consequently a practically continuous flow of positive current into the cathode.

Theoretically, we should not expect to obtain in direct current e.m.f. more than 5 per cent of the electric energy expended on account of utilizing only half of the full wave, but by utilizing the induced energy developed in the reactance coils it is possible to increase the efficiency somewhat. The reactance coils are also necessary in order that the supply current itself can maintain the cathode in a continuous state of excitation, otherwise mercury vapor could not be generated, and operation would at once cease.

OPERATION.

As may be seen in the accompanying illustration each anode is connected to separate sides of the alternating current supply, while the cathode B is connected to the storage battery to be charged.

As the alternating current causes each anode to become positive alternately, and on the side the positive wave is at the moment flowing, direct current necessarily must continue to flow from one or the other into the common cathode through the conducting vapor intervening, and thence into the storage battery. The arrows shown in the diagrams indicate the direction of the charging currents during each reversal of polarity.

It is evident, therefore, that no matter which terminal of the transformer coil becomes positive the current finds the anode on that side ready to convey it through the vapor to the cathode as long as the cathode is kept in a state of excitation.

After the current passes through the storage battery and one half of the reactance coil, it continues to the negative terminal of the transformer coil. When the alternating current reverses the operation is just the same, except that the positive wave of the alternating current is now on the right-hand side, and the current flows by way of anode A^1 through cathode B, storage battery, left-hand-side reactance coil, F back to terminal H.

The question has been asked why, in view of the fact that mercury vapor is a conductor, and fills the glass tube, the alternating current does not take the short route between anodes A and A^1, instead of that through the load and longer route through cathode B, storage battery, and the reactance coil. Inquiry discloses the fact that this point has not been conclusively determined. The logical explanation, however, is that the distance between the two anodes is so much greater than that between either anode and the cathode B, that the arc invaribly forms between one of the anodes and the cathode, and, once started, offers the route of least resistance. Before a rectifier can be operated by an alternating current the air-exhausted tube must be filled with mercury vapor. For the purpose of generating such vapor, the cathode consists of mercury which develops vapor only during the period of its electric excitation, hence to start such excitation an additional electrode C, connected in series with a resistance, is required. By rocking the tube so as to form a mercury bridge between the cathode and C, a slight arc is formed which starts excitation, resulting in the generation of the vapor.

As it would be impracticable to maintain excitation by this means alone, it must be continued by the current itself after it once starts to flow. This is accomplished by means of the reactance coil as it discharges into the cathode during that period of the reversals when the e.m.f. of the alternating current is nearly zero.

The electrical efficiency of this type of rectifier is high, aided as the cathode is by the accumulation of the stored-up charge of the reactance coils. In this and some other respects it has a decided advantage over chemical rectifiers in being able to deliver larger current without damage due to overheating.

CHEMICAL RECTIFIERS.

Chemical rectifiers depend upon the electrolytic action of solution in coating two aluminum rods with a film of hydroxide or equivalent which has the property of preventing the passage of a positive current between such rods, or from either rod to the lead plate. Consequently, if the lead plate is connected to the line, storage battery or other load, a pulsatory direct current will flow into such load, due to the half wave which is not opposed by the film-coated rods.

As only half of the wave is utilized, it follows that the intake of chemical rectifiers is at least double its output. In practice, the output is usually less than fifty per cent of the energy expended owing to the internal resistance of the cells and other causes.

The direct-current voltage may be increased, however, by placing two or more jars in series or by means of a different ratio of winding of the transformer coil. In order to do this a transformer consisting of as many separate windings as there are jars to be added is required.

The electric output of chemical rectifiers is therefore somewhat less than that of mercury-arc rectifiers, especially where large currents are required; yet for circuits demanding small currents, and in which the load does not vary to any great extent, chemical rectifiers have given, and still are giving, satisfactory results.

Like other apparatus, rectifiers are satisfactory or otherwise, according to the intelligence displayed in their selection and handling.

Each type has its own advantages and weaknesses, which should be studied and understood before installed for operation.

One weak point common to all types is that their efficiency decreases as the load increases, consequently for quadruplex operation, where the load is variable owing to alterations in the value of the current required by the "short" and long end," rectifiers have not proved altogether satisfactory, yet duplex operation is possible.

Again, great care should be exercised to see that the jar is not overloaded. If this precaution is not taken the aluminum rods are liable to be burned out. After a chemical rectifier has been idle over night, or even for a few hours, a recoating of film is required before placing it in service, and the instructions for accomplishing this should be faithfully followed, otherwise a loss of energy, and even damage, may result.

Finally, the solution itself is sometimes an important factor when considering the ultimate cost of installation and operation. Each charge for some types of rectifiers cost from three to five dollars, while others may be charged for a great deal less.

The length of time a charge will last depends, of course, upon the amount of current passing through it, but it does not follow that a high-price charge is relatively of longer life than some of the others; yet, as a rule, they do last longer, and usually increase the current capacity of the jar.

Telegraph and Telephone Patents.

ISSUED JANUARY 21.

1,051,109. Telephone System. To E. R. Hobbs, Buhl, Ida.

1,051,113. Telephone. To P. L. Jensen and E. S. Pridham, San Francisco, Cal.

1,051,118. Telegraphic Recording Instrument. To E. T. Keim and W. W. Alexander, Denver, Col.

ISSUED JANUARY 28.

1,051,599. Telegraph Converter. To I. Kitsee, Philadelphia, Pa.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, February 11:

American Telephone and Telegraph Co.	132
Mackay Companies	81
Mackay Companies, preferred	67
Western Union Telegraph Co.	72

PERSONAL.

MR. P. V. MEHAN, of Grand Rapids, Mich., in renewing his subscription for another year, writes: "TELEGRAPH AND TELEPHONE AGE is bread and butter to me."

MESSRS. GERARD SWOPE AND A. L. SALT, general sales manager and general purchasing agent, respectively, of the Western Electric Company, New York, have been elected vice-presidents of the company.

MR. THOMAS A. EDISON celebrated his sixty-sixth birthday on February 11. He was the guest of a family dinner party in the evening, which was arranged by Mrs. Edison. Mr. Edison stopped work long enough to attend the function.

MR. THOMAS M. ROBERTS, formerly professor of electrical engineering at Delaware College, has been appointed chief electrical engineer of the Edison Storage Battery Company, Orange, N. J., to succeed Mr. Walter E. Holland, resigned.

BRIGADIER-GENERAL JAMES ALLEN, chief signal officer of the United States Army, retired from active service February 13, having reached the age of 64 years, and completed forty-one years of military service. During the war with Spain General Allen severed the Cuban telegraph cables.

MR. HAROLD BILLE, managing director, Creed, Bille & Company, Ltd., Croydon, London, England, inventors and manufacturers of the Creed Printing Telegraph System, arrived in New York a few days ago on business connected with the introduction of his system in this country. Mr. R. J. Young, representing the Creed Printing System, has been in New York for some months in the interests of his concern.

MR. VINCENT D. GREENE, manager of the American District Telegraph Company, Chicago, Ill., is an old-timer well remembered by those who worked in the Cleveland, Ohio, office in the late sixties and early seventies. He was night manager there, and afterwards occupied a like position in Cheyenne, Wyo. Later he became city electrician at Toledo, Ohio, and subsequently superintendent of the old Central Union Telephone Company. Mr. Greene is a native of Fremont, Ohio.

MR. ANDREW CARNEGIE is the author of an interesting article in *The Independent* of February 13, entitled "The Baseless Fear of War." Mr. Carnegie's attitude toward war is well known, and he is opposed to the proposition to increase the American army and navy. The present standards, he states, are ample and more than ample. "We have no enemies;" he says in conclusion, "all nations are our friends and we are friends of all."

THE CABLE.

CAPT. F. H. LARNDER, R. D. Legatte, watch officer, and J. Himmelman, boatswain's mate, of the Commercial Cable Company's steamer "Mackay-Bennett" were, on February 8, at Halifax, N. S., presented with a loving cup, a pair of binocular glasses and a gold watch, respectively, by the Dominion Government, in recognition of their gallantry in rescuing the crew of the disabled schooner "Caledonia" on the Georges Banks a year ago.

TRANSMITTING PICTURES OVER ATLANTIC CABLE. —Dr. Korn, of Berlin, Germany, the inventor of the well-known system of transmitting pictures to a distance over electric wires, intends to take up the question of using the system upon the Atlantic cable. He is also considering the matter of coming to America to apply the system between New York and San Francisco.

CABLES BETWEEN KONGO AND EUROPE.—There are five cable connections between Kongo and Europe, four of them via Brazzaville and Libreville, French Kongo, by wireless, and thence by cable, and the fifth via St. Paul de Loanda, Angola, by wireless, and thence by cable to St. Vincent and Lisbon. The cable rate from Boma to New York City is approximately $1.60 a word, varying slightly with the route selected.

MASTER DAVID RATTRAY, the nine-year-old son of David Rattray, cable operator at Hazel Hill, N. S., recently saved Ernest Burstall, son of superintendent Burstall, of the Hazel Hill station of the Commercial Cable Company, from drowning. Burstall broke through the ice while skating, and had sunk twice when young Rattray, with great presence of mind, crawled out on his hands and knees on the thin ice, and rescued the drowning boy.

CABLE VS. WIRELESS.—Major Archer-Shee, member of the British House of Commons, testified before the committee appointed to investigate the government contract with the Marconi Company, that as a result of two tests he was firmly convinced that the cable is not only superior to the wireless system in the transmission of messages, but much speedier. He also stated his conviction that Great Britain was far behind America in wireless matters. He never opposed the adoption of wireless for the purpose of defence of the empire, but he believed the cables would be better and more efficient.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. E. REYNOLDS, assistant to the president, is on a trip of inspection through the Eastern Division.

MR. CHAS. C. ADAMS, vice-president, was in Pittsburgh on February 7-8 on business of the company.

MR. C. P. BRUCH, vice-president of the company, was in Washington, D. C., a few days ago on business connected with the service.

MR. HAROLD G. DAVIS, of the printer department, is in Philadelphia in connection with the printer service.

MR. J. A. MEADE has been transferred from operating room at 253 Broadway to the office of the division engineer, Eastern Division, New York.

NEW POSTAL TARIFF BOOK.—The 1913 tariff book of the Postal Telegraph-Cable Company has just been issued. It contains 650 pages, besides several pages of maps of lines of the Commercial Cable Company and connecting cable systems throughout the world. General instructions as to money transfer service are printed on green paper; rules, rates and instructions governing the dealing with cablegrams on pink paper, and the Book of Rules on yellow paper, these distinctive colors greatly facilitating ready reference. An improvement in the make-up of the book is the use of two columns to the page, instead of one column as heretofore. This was made necessary, because of the growing bulkiness of the volume. The entire book has been rearranged, with much advantage in handling and reference. Mr. Isaac Smith, superintendent of tariffs, is entitled to much credit for the design and production of the new book, which, to even a casual observer, bears evidence of great care in its execution.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

MR. VAIL'S YACHT AGROUND.—The yacht "Speedwell," owned by Mr. Theo. N. Vail, president of the Western Union Telegraph Company and the American Telephone and Telegraph Company, while on her way to New York from England on February 3, ran aground at Calshot Spit, opposite Cowes, Isle of Wight, but was floated soon afterward. The "Speedwell" is 193 feet long, 27 feet beam and draws 13 feet 6 inches of water. She is rigged as a three-masted schooner. On the arrival of the "Speedwell" at New York, Mr. Vail will take a cruise in the West Indies.

MR. A. C. CRONKHITE, district commercial superintendent, Indianapolis, Ind., announces the following changes in his district: Mr. M. D. Renfroe has been appointed manager of the Saint Marys, Ohio, office. Mr. E. L. Johnson, formerly manager at Greenfield, Ind., has been appointed to a clerkship in superintendent Cronkhite's office. He is succeeded at Greenfield by Mr. R. A. Bartholomew, of Winchester, Ind.

MESSRS. L. H. BECK and R. W. Gray, division plant superintendents at Atlanta, Ga., and San Francisco, Cal., respectively, were recent New York visitors on company business.

MR. F. C. DOWD has been appointed district commercial manager of the 854 Broadway district, New York, vice Frank Spree, transferred to the 270 West Twenty-third street district.

MR. W. H. DAVIS has been appointed manager of the Direct United States Cable office at 81 New street, New York, vice G. W. Fasher, transferred as cable solicitor. uptown.

MR. A. H. HICKERSON has been appointed manager at 1398 Broadway, New York, vice C. F. Seelman.

MR. J. D. FELSENHELD has been transferred from the traffic department to the 854 Broadway district as solicitor.

MR. W. S. FOWLER, formerly chief clerk to Mr. E. M. Mulford, when the latter was division commercial superintendent at New York, has been appointed special agent, and attached to the office of Mr. E. M. Mulford, general manager of the Gulf Division, with headquarters at Dallas, Tex.

S. M. CULLINSON, aged 47 years, attached to the executive offices, New York, committed suicide February 3. He had been with the company since 1903. He had been despondent for some time as a result of long illness.

MR. W. A. STOKES, district manager second district, Southern Division, Atlanta, Ga., has been appointed manager of the Macon, Ga., office.

MR. SAMUEL GRAY, manager at Wilmington, Del., has been appointed cashier of the first district, Gulf Division, with headquarters at Dallas, Tex. He is succeeded at Wilmington by Mr. A. C. Forrester, who was manager at Annapolis, Md.

NEWPORT NEWS OFFICE.—The new office of the Western Union Telegraph Company at Newport News, Va., is located in the largest office building in the city, on the main thoroughfare. A photograph of the exterior shows a very neat and attractive office. The force, besides the manager, consists of two operators, two clerks, a bookkeeper, six messengers and a collector. Mr. T. A. Worthington is manager of the office, and is justly proud of his new quarters and staff.

C. Friedlander, Supervisor of Wire Service, New York.

Mr. Charles Friedlander, whose appointment as supervisor of wire service for the Western Union Telegraph Company at New York, was announced in our issue dated January 16, was born in Cleveland, Ohio, in 1884, and entered the telegraph service at Canton, Ohio, in January, 1901. Later he became associated with the American Telephone and Telegraph Company at Chicago as testboardman, afterwards becoming assistant chief testboardman. Later he was appointed division supervisor of the leased wire service of the same company, which position he held at the time of his recent appointment to the Western Union service.

THE TELEPHONE.

Mr. Lawrence J. Shay, of Worcester, Mass., manager of the leased wire and circuit department of the New England Telephone and Telegraph Company, has been appointed manager of the newly created telegraph department of that company attached to the staff of the general manager, Boston, Mass.

Independent Telephone Convention.—The sixteenth annual convention of the National Independent Telephone Association will be held at the Hotel LaSalle, Chicago, February 18 to 20.

Telephone Rates in Mississippi.—The Mississippi Railroad Commission has directed that representatives of every telephone company in the State appear before it on March 4, to show cause, if any exists, why rates should not be reduced.

Telephone Bond Issue.—The stockholders of the American Telephone and Telegraph Company, at a special meeting in New York, on January 31, authorized the board of directors to issue and sell $67,000,000 4½ per cent 20-year convertible bonds.

Damage to Telephone Lines by Blizzard.—As a result of the blizzard in western New York early in January, fourteen hundred telephone poles were blown down and broken. The estimated cost of replacing the damaged property is about $125,000. Between Rochester and Avon every pole of a seventy-wire line, for a distance of about five and one half miles, was blown down, about two hundred and seventeen poles in all.

The Boston Plant Chapter of the Telephone and Telegraph Society of New England will hold its second annual show in that city, on the evenings of April 2 and 3. This year's production will be a musical review entitled "The Minstrel Regatta." Mr. Charles E. Ames, Winter Hill, Mass., is chairman of the show committee, and Mr. Gordon S. Wallace, Boston, is secretary of the chapter.

Examining Condition of Heart by Telephone.—The cardiograph, as used in Johns Hopkins hospital in Baltimore, Md., permits the examination of heart action at a distance by means of the telephone. It is stated that an examination can be made by a physician 500 miles from the patient. A suggested plan is to lease a long-distance telephone line for about twenty minutes for the purpose of conducting such examinations.

The New Telegraph-Telephone Building in New York.—The Walker-Lispenard building which is being erected in New York for the joint use of Western Union Telegraph Company, the New York Telephone Company and the American Telegraph and Telephone Company, will be fully completed and ready for occupancy in the spring. The building is seventeen stories high, and each floor contains about thirteen thousand square feet.

Wireless Telephone Experiments in Japan.—While the steamer "Keemuu" was passing out of Yokohama (Japan) harbor recently, Mr. Herbert S. Peet, the wireless operator, heard singing in his telephone. It appears that experiments in wireless telephony were being conducted at the laboratory of the Department of Communications at Tokio, and the singing which was heard by Mr. Peet was a part of the test. Mr. Peet says the singing was surprisingly distinct.

Speed of Telephone Operators in New York State.—In a statement issued by the Public Service Commission, second district, New York, in regard to tests made by it of the speed of telephone operators in all parts of the State, says this with reference to the New York City service: New York City does not get the fastest service, but the greater city exchanges show an even average that is highly commendable for what is admittedly the largest telephone system in the world. In individual cases in small cities where there is but a single central office a faster service is sometimes rendered, but New York has a dependable service with a high average speed, and a marked improvement over the record for 1911.

CANADIAN NOTES.

Mr. W. J. Rooney, whose appointment as superintendent of plant, telegraph department, Grand Trunk Pacific Railway, Winnipeg, Man., was announced in Telegraph and Telehone.Age, February 1, was born in Toronto, Ont., May 22, 1882. He entered the service of the Electric Light Company, Toronto, as a junior, October 19, 1896, and resigned January 17, 1903, to accept a position in the construction department, Great North Western Telegraph Company at Toronto. He subsequently severed his connection with that company to take service in the telegraph department of the Grand Trunk Pacific Railway. Since that date he has been actively engaged in construction work at the front for the last three years as general foreman.

Mr. Rooney in his new position will have entire charge of construction and maintenance telegraph and telephone lines Grand Trunk Pacific Railway.

Mr. H. Hulatt who, as announced in Telegraph and Telephone Age of February 1, was recently appointed commercial and traffic superintendent, telegraph department, Grand Trunk Pacific Railway, also superintendent of time service at Winnipeg, Man., was born in London, England, February 15, 1883. Previous to entering the service of the railway company he had considerable commercial and journalistic experience in Europe and Canada. He entered the service of the Grand Trunk Pacific Telegraph Company at Winnipeg in 1907 as private secretary to Mr. A. B. Smith, manager of telegraphs; was promoted to chief clerk January 1, 1910, and has been Mr. Smith's chief assistant in the organization and operation of the Grand Trunk Pacific commercial telegraph system, and time service department. Mr. Hulatt will have jurisdiction over operation of railway and commercial telegraphs, as well as the time service department.

RADIO-TELEGRAPHY.

Dr. Valdemar Poulsen and Prof. P. O. Pedersen have been decorated by King Haakon, of Denmark, with the Gold Medal of the Danish Order of Merit for their work in wireless telegraphy and wireless telephony.

Radio Treaty Ratified.—The United States Senate has ratified the treaty of the London radio-telegraph convention held last summer.

Women Wireless Operators.—It is stated that over thirty women have passed the regulation wireless examinations at San Francisco, Cal., but that their appointments have been withheld on the ground that men would be more dependable in a crisis.

Long Distance Wireless.—The wireless operator of the United States Army at Eagle, Alaska, recently heard the government station at Key West, Fla., sending a message to Mare Island, Cal. The distance between Key West and Eagle is over 4,000 miles.

Wireless Stations in Peru.—A fund of $100,000 has been appropriated by the Peruvian Chamber of Deputies for the erection of wireless stations at Arequipa and Puerto, Maldonado, and a station will be erected at Paita out of the surplus income from the wireless system.

Resonance in Wireless Telegraphy.—In an article by Mr. W. H. Eccles, an English electrical engineer, the author concludes that there is not much room for improvement over the modern spark methods of wireless telegraphy in respect of transmission of energy from the sending antenna to the receiving antenna.

Convicted of Wireless Frauds.—J. B. Dickinson, C. H. Beauchamp and William A. Bomar, charged with using the mails to defraud in the sale of "wireless" stock in the Texas Collins Wireless Telegraph and Telephone Company, were found guilty in San Antonio, Texas, and sentenced to the Federal penitentiary—Dickinson and Beauchamp to two years, and Bomar to eighteen months.

The Marconi British Contract—The Marconi Wireless Telegraph Company, through Mr. Godfrey Isaacs, managing director, has made another request to the Postmaster-General of Great Britain, that his company be released from its contract with the British Government. In the application it is stated that the company is being inconvenienced from the fact that it has $1,500,000 tied up, pending the outcome of the negotiations. It is stated that unless the Postmaster-general definitely confirms the contract by March 1, Mr. Marconi may consider the contract void.

Wireless on the Amazon.—Wireless stations have been recently installed to connect the cities of Porto Velho, on the Madeira River, and Manãos, on the Amazon River, Brazil. The two stations are identical in equipment, and are provided with facilities for the transmission of 5,000 words per day. The transmitting aerial of the Manãos station is supported on four 217-foot steel masts, the receiving wire being carried over them to a short mast at the receiving house. The transmitting aerial of the Porto Velho station is carried on two pairs of masts, of a height of 220 and 200 feet, respectively. The earth plate system is made of a number of metal plates buried near the power-house, and a system of radial wires laid on the surface of the ground under the aerial.

Large Contract for Erection of Wireless Stations.—The Marconi Wireless Telegraph Company of America has awarded a contract to the J. G. White Engineering Corporation of New York, for the construction of eight powerful wireless telegraph stations for the trans-Pacific system. The stations will be located in pairs, a receiving and a sending station, thirty miles apart, so that the incoming and outgoing messages will not interfere with one another. The stations are to be placed at Oahu, in the Sandwich Islands; Tamales Bay and Bolinas, Cal.; near Belmar, N. J., and one in eastern Massachusetts at a point to be definitely selected later. These stations, it was said, will not only permit the transmission of messages across the Pacific, but will greatly increase the capacity and speed of the service between New York and London. The range, it was estimated, would vary from 4,000 to 6,000 miles for each station. The antennæ at each station will aggregate eighty-two miles in length, and the "grounding" will require forty miles of underground, or plowed-in wires. The power plant of these stations will be arranged to give a thousand horse-power spark.

Telefunken Atlantic Service.—Mr. H. Bredow, managing director of the German Telefunken Wireless Telegraph Company of Berlin, is in New York to take up the question of establishing a transatlantic wireless service between the United States and Europe. It is intended to open the Nauen station, near Berlin, for regular public service. At present a new tower at that station, approximately 900 feet in height, is under construction. The company began tests on January 11 with a provisional antenna (aerial) only 400 feet high, and at the very first attempt the signals sent out from Nauen were distinctly received by the station at Sayville, L. I., belonging to the Atlantic Communication Company, New York. Furthermore, the messages transmitted from Sayville were, it is stated, received at Nauen so as to be distinctly legible even though the station at Sayville operated with only about 45 hp. The station at Sayville, which was not originally designed for establishing transatlantic communication, being intended for the delivery of messages to ships at sea, combined with the transmission of regular news service and weather reports, has nevertheless reached ships at distances of over 3,000 miles. Mr. Bredow has brought with him the lastest inventions of Count Arco and his staff of assistants. Arrangements have been made between the German Telefunken Company and the Atlantic Communication Company for the testing of the new inventions at the plant at Sayville.

Cable Splicing.

The following rules governing cable splicing represent the practice of the Postal Telegraph-Cable Company, as set forth in "official diagrams of the Postal Telegraph-Cable Company's apparatus and rules governing the construction and repair of lines."

SUBMARINE CABLE SPLICES.

Turn back the armor strands in the usual way and lash the cable ends in proper position for splicing, making sure of proper alignment. When this is done the conductors are ready to be spliced. Lay a conductor of one cable end against a corresponding conductor of the other, draw out all slack so that they lay side by side and parallel, now cut in about the center of the splice to be, both conductors with one cut of the pliers. This will leave the conductors at just the desired length; that is, so the ends just meet, no more and no less. Now trim back the insulation on these ends and bevel the rubber in very much the same way as a pencil is sharpened, leaving one inch of the copper conductor exposed. Untwist the strands and clean each separately, exercising care to remove as little of the tin from the copper as possible. Lay the strands back in their former position and tin well with soldering iron.

The conductors are to be joined by means of a copper sleeve made from thin sheet copper which has previously been tinned on the side which is to form the inner surface of the sleeve. This is cut so as to make a sleeve two inches long and wide enough to not quite wholly wrap the conductor, so that a slight gap or slit about one-sixteenth of an inch wide is left along the sleeve for the admission of solder. Pass the conductors through the opposite ends of this sleeve until both ends meet in the center.

Turn the sleeve so that the gap is on the upper side and then sweat the whole together by applying a soldering iron to the under side of the sleeve and if necessary add more solder through the gap or slot. Treat each conductor in this way until all are joined and an equal tension on all the conductors will be the result, which cannot easily be obtained by any other method. A joint made in this way has the further advantage of enclosing all strands so that none can turn back and perforate the insulation, as occasionally happens in the ordinary twisted splices. When soldering, rosin is the only flux to be used. Acids or salts cause corrosion, while soldering pastes or sticks contain an oily or greasy compound which decomposes the rubber insulation.

To make the rubber patch, pure gum should be used. First scrape with a clean knife the rubber surfaces to be patched, then cover with a thin coating of rubber cement, using preferably the little finger for this purpose, which should be clean and dry. Allow the cement to dry one or two minutes until most of the naphtha has evaporated from same, after which apply the pure gum in the following way: Cut the sheet gum into strips about three-quarters of an inch wide and eight inches long. The grain of the pure gum must positively run crosswise with the strip, otherwise good results cannot be obtained. Wrap the joint with this tape, keeping it stretched almost to a breaking point, reverse each wrap until the joint has been insulated to a thickness slightly above the diameter of the regular insulation and allow it to lap over the original insulation about two and one-half inches from the splice, making the total length of the patch about seven inches. When this is done the whole should be firmly pressed together with the fingers or the palms of the hands, so as to make all the layers unite with each other and with the original insulation. Wrap the whole with one layer of Manson tape to protect the rubber from mechanical injury.

While the patching rubber is being applied, the temperature of the air should not be below 75 degrees Fahrenheit, and if the air is at all cold the work can be easily performed over a charcoal furnace. Applying heat directly to the splice by means of a hot iron or flame must never be resorted to. The conductors are now ready to receive their bed of jute. When this is done the armor wires are lapped, served and the ends turned up and cut off in the usual manner.

The rubber cement should be made by dissolving in naphtha or gasoline some pure gum for patching. This should be done before starting work and a supply kept on hand in a bottle, as it takes some little time to dissolve.

UNDERGROUND CABLE SPLICES.

Remove lead from the cable ends for a distance that will allow of the connecting of the different wires conveniently. This will depend largely upon the size of the cable to be spliced. Slide over each conductor of one or the other cable ends a cotton sleeve about three inches long and then connect each wire of one cable to the corresponding wire in the other, being guided by the marked wire placed for that purpose in each layer. Draw the cotton sleeve over the joints as fast as they are made. After all conductors are connected, boil out by pouring hot paraffin over the whole. When this is done, wrap all the conductors snugly together with white cotton tape about one inch wide, then boil out with paraffin again; after which slide the lead sleeve in place and wipe same to cable in the usual way; place the sleeve in a horizontal position, make two perforations on opposite ends and upper side of the sleeve. Fill the joint with boiling paraffin through one of these holes until the air bubbles cease coming out at the other hole, which indicates that all moisture has been expelled from the joint: seal the holes with solder and the joint is complete.

In underground cable repairs when a cable has been opened at a joint or otherwise and it is found desirable to leave the joint temporarily unfinished, it should be protected from moisture by passing the lead sleeve over the unfinished joint and wrapping the ends of same to the cable with a waterproof tarred tape one and one-half inches wide and known as P. B. tape. This will keep the moisture out for a number of hours. If it is not feasible to draw the lead sleeve over the joint, wrap the whole tightly with several layers of P. B. tape. Cotton sleeving for insulating the joints is furnished on spools. This should be cut into lengths of four inches, boiled in paraffin, allowed to cool, then forced over a lead pencil. This forms it into a firm cylinder which the conductors will readily pass through.

When making the copper splices care should be exercised to see that the twisted joint lays snugly against its conductor, so that it cannot puncture the cotton sleeve and become crossed with a neighbor.

If cotton sleeves are not available then white cotton tape three-quarters of an inch wide can be used. Cut the tape about ten inches long, wrap the joint and fasten the end of the tape by passing it under the last lap. This makes a securer job than do the cotton sleeves, as there is absolutely no danger of crosses, for the copper joint cannot puncture the several thicknesses of the closely meshed tape; but the additional length of time it takes to make a splice in this way over that made with cotton sleeve makes it undesirable, especially in large cables.

When it is desired to loop through wires out of a main cable into an office or test box, the splice where the spur or subsidiary cable leaves the main cable must be made as follows:

Fasten the conductors in the subsidiary cable in pairs; that is, tie two adjacent conductors together, or better still, pass them through a cotton sleeve. Pair off in this way all that are to be used as loops, then cut a through wire in the main cable, connect both ends of this severed wire to the two conductors of a paired off loop in the subsidiary cable, doing the same to all conductors that are to be looped at this point. When all conductors are spliced, finish the joint in the usual way.

Should the subsidiary cable be wrecked or a fire occur at its terminal, open the joint just described, cut off the (previously paired off) subsidiary conductors and connect straight through, the resulting two ends of the main cable conductors.

It is obvious that in this way every wire can be cut through straight without the customary testing and consequent delay at perhaps a very critical period.

With this method the transposition of through wires is hardly possible.

SINGLE-WIRE JOINTS.

Joints on all outside and inside wires, including all call circuit wires, must be wrapped with tinfoil before taping.

All wires directly connected to earth, dynamos, accumulators, or to an electric light system, must be soldered.

AERIAL CABLE SPLICES.

Cut back the rubber insulation two or three inches, clean the conductors well, make an ordinary twisted joint, using care to splice all conductors, so that each will carry the same amount of strain. Then wrap the copper joint with tinfoil. The best thickness for this is a medium light tobacco foil which will roll about 3,000 to 3,150 square inches to the pound. Then scrape the rubber insulation clean and apply cement and wrap with pure gum as described in the submarine splice. If the cable has many conductors the joints should be staggered over a space of twelve or fourteen inches, so as to not make it too bulky in one place. To seal the cable, lay strips of Manson tape lengthwise over the splice and allow to lap the original outside covering of the cable six or eight inches. These strips should lay all around the cable and are intended to add tensible strength to the splice. Wrap the whole with two layers of Kerite tape and finish with one or two layers of Manson tape, then varnish or paint with any good weather resisting compound.

Institute of Radio-Engineers.

The February meeting of the Institute of Radio-Engineers was held at Columbia University, New York, on Wednesday the fifth. Mr. Frederick A. Kolster, of the United States Department of Commerce and Labor, Radio Service, presented an interesting paper on the effect of distributed capacity in inductance coils for radio signalling.

Copies of the first number of the Proceedings published by the new Institute have been distributed. The Standardization Committee reports progress, and anticipates publication of a list of symbols and definitions agreed upon within a short time. The next meeting will be held March 5.

Postmaster-General Hitchcock Again Recommends Public Ownership of Telegraphs.

Postmaster-general Frank Hitchcock in his annual report, in complete form, renews the recommendation made in his last annual report for government ownership of telegraphs. He says: "In the last annual report, the opinion was expressed that the telegraph lines in the United States should be made a part of the postal system and operated in conjunction with the mail. It is believed that under proper management such a consolidation would result in important economies, and thus permit the adoption of lower telegraph rates. Now that a postal savings system has been established and a parcel post provided for, there would seem to be no better opportunity for the profitable extension of our postal business than through the adoption of a government telegraph system."

POLLAK-VIRAG HIGH-SPEED TELEGRAPH SYSTEM.—The Pollak-Virag system of rapid telegraphy is being practically demonstrated at a hotel in New York, by Mr. Antoine Pollak, the coinventor with the late Prof. Virag, of the system, who recently arrived in New York from Hungary. Forty thousand words an hour is the speed claimed for this system. Transmission is accomplished by means of perforated paper tape, and the messages are received on sensitized photographic paper which is developed automatically, the characters being in ordinary handwriting.

The Use of a Milliammeter for Testing Wires.*

BY JOHN A. KICK.

The usual method in testing for telegraph line trouble is to place a 250-ohm or 300-ohm relay in the affected circuit and observe the action of the relay while the circuit is being opened or grounded at the test stations. This method of testing for a case of trouble on a line which is practically insulation perfect requires very little skill, as the action of the relay is decided.

During rains and at other times when the insulation is low, a wire chief is required to use keen judgment in making deductions based on the action of the relay.

The special high wound relay has been used for testing line troubles ever since there has been a wire chief's position. Some wire chiefs are so skillful from long practice that they make astonishingly few errors. Although the relay test is an old friend, it is by no means the reliable method which is at hand at almost all wire chiefs' stations. "Seeing is believing," and the nearer the approach to a real photograph of the nature and location of line troubles the nearer the ideal method.

A medium for conveying to the wire chief a near photograph of the nature and location of wire trouble is the milliammeter. By its aid a wire chief will secure results not possible by the relay method. Placing a milliammeter in the line circuit at the home station at once a current reading in milliamperes is noted when the circuit is closed. Unless the circuit is to a dead ground at some point between the terminal and the testing point, the wire chief can actually see, by the action of the needle, the result of an open or ground test at any station on the circuit.

As an illustration, let us assume that a certain line has a resistance of fifteen ohms per mile with twelve stations five miles apart, and having 150-ohm relays. Also that a normal working current of seventy milliamperes is produced by an equal voltage at each terminal. That is, a voltage at each end which will produce the normal working current to a ground at the ohmic half-way point on the line or will produce half or thirty-five milliamperes to a ground at the distant terminal.

Next assume that an operator reports losing or being unable to raise some one or more offices on the circuit. The wire chief going in on the circuit with the milliammeter, notes normal reading to the battery and zero to ground. The indications thereby are that the line is grounded at its ohmic center. The next test will be made with stations near that position on the circuit.

Assuming that the wire chief noted 45 milliamperes to battery and zero to ground, he will know that the line is grounded approximately midway (in ohms) between the ohmic center of the line and the distant terminal. Also a current reading of approximately 140 milliamperes would indicate a ground at about the midway point between the home station and the ohmic center of the line.

*From Telephony.

It will be noted that the nearer the trouble to the home office, the more conclusive the indications as the current rises in increasing steps to the successive stations approaching the testing station.

Testing for an open on a line with a heavy escape by having the stations ground the wire, no current change will take place to a ground beyond the trouble, but to a ground between the wire chief and the open a current change would take place, the needle of the milliammeter advancing to indicate the current to a ground.

In testing for a cross, a relay is placed in circuit with either of the crossed wires. The several test stations are asked to open that wire until the trouble is located as between two stations, by observing that at one station the relay falls back and to the next it does not.

In using a milliammeter there is no possibility of a false test by reason of a current leak, as the observer can see an indication of current change, however slight, to each test which would in any wise change the multiple circuit effect produced by a cross. By the constant use of a milliammeter, a wire chief becomes acquainted with each wire, that is, the normal current on each wire, the current from the distant terminal, the locality of foreign influences, cross leaks, leaks to ground, current readings to ground at test stations, and other characteristics.

Where gravity battery is maintained at the distant terminal, the wire chief can keep a daily check on the current output and advise maintainers when the battery needs attention.

Assuming a wire chief making morning test on all wires, starts from one end of his board and successively places his milliammeter in the line circuits, noting the current readings with battery regular, then to his ground from the distant terminal battery. If both are normal, the circuit will be found all right. But if the first reading shows normal current and the second zero, the line is grounded at the non-voltage point.

Where two unequal batteries are supplied, that is, say 180 volts at one terminal and 100 volts at the other, then the non-voltage or normal current to ground position will shift from the ohmic center of the line toward the lesser voltage. Should the meter show less than normal and zero to battery and ground respectively, the circuit is grounded beyond the no-voltage point, the probable location being indicated by the current reading.

The no-voltage point on the line is the point where a ground will show normal current to both terminal batteries. That is, a 5,000-ohm line with 150 volts at one terminal and 100 volts at the other would show normal current with a ground at 3,000 ohms from the 150-volt battery and 2,000 ohms from the 100-volt battery.

The milliammeter is used to good advantage in quadruplex and duplex work in adjusting the current conditions in the line and local. By placing the distant quadruplex set to a ground and the home milliammeter under the quadruplex wedge, a reading of both long and short ends can be made. With the home set to ground the distant set can be tested to ascertain the effective output.

Complaints are made of "light to one pole" and by the use of the milliammeter the cause can often be located. After wiring up an office equipment a milliammeter test for the current conditions in the various circuits will frequently develop the fact that irregular conditions exist and by this knowledge the fault is cleared.

There is a certain amount of care necessary in handling a milliammeter as it is a delicate instrument and can be burned out or the indicator badly bent by its being placed in a circuit carrying current considerably in excess of the capacity of the instrument. However, few delicate testing instruments are injured by experienced wire chiefs. Their experience is the result of practice and during this practice period, some expense of repair may be incurred. This should be gracefully paid and charged to education. A short circular on "How to use" is worth a whole volume of "How not to use" and "Don't."

A line with twenty selectors operating on six milliamperes will require 120 milliamperes of current from the main signal battery. By placing the milliammeter in one side of the circuit with the signal relays closed the current can be read. With a fixed current value of say six milliamperes for each station, and an output of the calculated total current, it is assumed that each bridge is actually receiving the six milliamperes, but a milliammeter test of the current in each selector under operation is interesting and inspectors could make an occasional test of each bridge with good results.

When There Were no Electrical Measuring Instruments.

In 1861 electrical measuring instruments were practically unknown, or were only then coming into use in the British postal telegraph department and by railway companies, said Mr. William McWhirter before the Scottish Local Section of the Institution of Electrical Engineers, recently held in Glasgow, Scotland. Generally there were no means whatever of locating a fault on telegraph lines, and the reports of faults to the linemen consisted in the intimation that a contact or earth existed upon certain lines between test boxes probably fifty miles apart. For the measurements of currents no instruments existed, and such attempts as were made were merely guesswork. So long as batteries, instruments and lines were of high resistance, it was possible to form some idea of the battery condition by using an ordinary detector galvanometer, but when railway train-signalling, requiring the use of considerable currents, was introduced, then the resistance of the instruments and circuits was kept low, and proper testing (owing to the lack of some instrument measuring the units) was wanted very badly. The first attempt to remedy this was by the introduction of a galvanometer graduated in units called chemics. This was based upon the well-known law that in electrolysis a known current would always liberate a definite weight of metal from any metallic solution, the amount, of course, varying with the metal used. An instrument introduced was divided in the usual way to read to tenths of the unit of current, but the telegraph inspectors and linemen had great difficulty in recording the reading correctly. This was overcome by using an extra scale, divided up and marked with the words, "Very good," "Good," "Fair," "Requires Attention," and "Bad." The galvanometer was wound to 100 ohms resistance, so as to represent an average circuit, including the instruments, line, earth, etc., and when applied to the battery terminals, at once showed the condition of the cells. This rough arrangement was very successful, and reduced faults by nearly ninety per cent. For testing the insulation of telegraph lines, which had to be checked daily, the post-office had introduced a form of tangent galvanometer, with shunts, etc. This instrument was not suited for quick and reliable work, and so a form of galvanometer was introduced, which was graduated to read in volts, webers and ohms. It proved to be a most useful instrument for general tests.

Useful Information for Way-Station Operators.

After lightning storms the lightning-arrester should always be examined to see if any damage to it has ensued. If so, it should be attended to at once. If that kind of lightning-arrester is used in which a thin sheet of paper separates the ground from the line plate, the paper ought to be renewed, whether damage is apparent or not..

In bad weather the relay spring should always be pulled up before the key is opened, to ascertain whether anyone is using the line.

The motion of the relay armature lever should be kept as small as possible, and the local contact points of the relay kept clean. The armatures, both of the relay and sounder, must never be allowed to touch the cores of the magnet.

Every binding screw about the office ought to be examined occasionally to see if it is tight, as the good working of the entire line often depends on this. Every loose connection introduces a high resistance into the circuit of which it forms a part.

When the instruments are working satisfactorily they should be left untouched.

If the instrument table be covered with an oilcloth or like covering, a space should in all cases be cut clear for the key, so that the latter will rest on the table. Many escapes have been traced to an oilcloth tablecover.

All instrument pivots should be just tight enough to prevent lateral play. This applies both to keys and sounders.

Mr. B. D. Snyder, of the Mackay Telegraph and Cable Company, Dallas, Tex., writes: "No telegraph or telephone men who are alive to their interests and work should be without your valuable journal."

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - Publisher

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

E. B. SHERBURNE, Advertising Manager.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, FEBRUARY 16, 1913.

Co-operation.

In these days of combinations and concentration of effort, the development of the co-operation idea between employer and employe is a healthy sign, and if logically and sincerely carried out, will be of mutual benefit.

It is not many years ago that the relations between employer and employe seemingly had no common bond. The employer in most cases regarded his duty toward his employes ended when he paid the latter his wages, and the employe was justified in thinking his employer devoid of sympathy. But now all this is changed. The employer is giving more attention to the welfare of the employe, and the latter in turn is more and more safeguarding the interests of the employer—in other words, the two are beginning to understand each other better, and are co-operating.

The most prominent examples in co-operation are found in the present-day conduct of the affairs of the two telegraph companies and the telephone companies. The officials and the employes are frequently brought together on a social equality, through conferences, club dinners and other like means, with the result that all imaginary barriers are being gradually broken down, and the two are getting to know each other better. Each has learned that both working together in harmony can produce results that would be impossible were any distrust or indifference allowed to exist between them. Lack of understanding and sympathy between the two parties naturally produces friction in their relations and harmony is out of the question under such circumstances. It is the case of a house divided against itself.

The two telegraph companies and the telephone companies have learned in recent years the value of co-operation, as between officials and employes, and they are now reaping the benefits of its application. The employes, on the other hand, feel much better disposed toward the companies, because they realize that their interests are being recognized, and that faithful service on their part will bring substantial reward. The benefits offered by the companies tend to increase the cohesion in the employing organizations, and bring about a nearer approach to the realization of the Golden Rule.

The frequent meetings of a social and business character, which bring the officials and employes together are bringing about highly beneficial results to the companies' interests. The employes are brought face to face with the officials, and become personally acquainted with them, and vice versa; the officials learn more about the employes through personal contact than they otherwise could, and each learns that the other is human, and that they have interests in common.

Co-operation is nothing more than understanding practiced. Divided or conflicting interests cannot be brought into harmonious and co-operative relations. The companies certainly are doing their share to better the conditions of their employes, and the least the employes can do is to second the companies' efforts by performing the best service that is in them.

New Wireless System.

J. G. Balsille, an English electrical engineer is the author of a new system of wireless telegraphy. The transmitting system consists of the usual turned alternator circuit supplying a transformer, the secondary of which supplies an oscillating circuit. This is across a variable capacity in the antenna, there being no variable coupling. The oscillating circuit contains two capacities, which are arranged symmetrically in each connection to the antenna. There is also a reactance, and in shunt to the secondary of the transformer is the spark-gap, consisting of a plate and nozzle, unidirectional impulses being obtained by an air blast through the latter at 100 pounds to 105 pounds per square inch. In operation the constants of the exciting circuit are so adjusted that it has no distinctive frequency of its own, in order that the radiator may freely oscillate in its own period. The receiving antenna is of the looped type, the extremities of which are connected to earth. One or both legs include a variable condenser around which is shunted a closed oscillating circuit, tuned to the oscillating frequency of the received waves and provided with a variable inductance forming the primary of a transformer. The secondary of this transformer is included in a detector circuit, adapted to be tuned to the group frequency of the received waves. The receiver may thus be tuned to receive from any particular transmitter, working on the two-tone principle and emitting two distinct wave trains of different frequencies, but having a certain predetermined group, frequency. The circuit is formed with a variable reactance in each leg. Two adjustable condensers are adapted to be varied coequally with two condensers included in closed oscillation circuits, each of which forms a shunt to the adjustable condensers. These circuits are adapted to be tuned in resonance with the absorbing loop and therefore oscillate in the oscillation frequency of the received waves. The variable inductances included in each shunt circuit, form the primaries of a transformer, the secondary of which forms part of a detector circuit. This is consequently responsive to any oscillation frequency in either shunt circuit through the inductive coupling.

Telegraph and Telephone Engineering and Efficiency.

Mr. Henry G. Stott, past-president of the American Institute of Electrical Engineers, recently addressed the Schenectady section on "Engineering and Efficiency."

"Tredgold," he said, "defined engineering as 'the art of directing the great sources of power in nature for the use and convenience of man.' Efficiency may be defined as the art of obtaining the maximum output from the minimum input."

Mr. Stott then analyzed the relations between the two, keeping in touch as much as possible with the work of our own times.

"Take telegraphy, for example," he said; "it is difficult (if we follow Tredgold's definition of engineering) to see any connection between telegraphy and efficiency, as we have defined it; and the same argument applies to telephony and many other branches of general engineering, such as sanitation, surveying and military engineering, etc.

"We have all become so accustomed to the use of the word 'efficient' that instinctively we feel that, while these illustrations may be true, yet *per se* these various branches of engineering may be carried on in a more or less efficient manner. This instinctive feeling is a recognition of the fact that our original definition of engineering was lacking in that it ignored the economic factor which now plays such an important part in the engineer's work.

"The moment we recognize the economic factor, we immediately see that telegraphy and telephony are most highly efficient, as they save enormous amounts of time, and it is probably no exaggeration to say that the average business man's efficiency has been improved at least ten per cent by their use, which virtually means that a man now can accomplish as much in ten years as he formerly did in eleven, when the telephone and telegraph did not exist."

New Patent Bills.—Representative Buckley has introduced in the National House of Representatives two bills dealing with patent matters. One is a substitute for the other in that it combines the provisions of both bills. It is known as H. R. 28,286, and amends Section 4,931 of the Revised Statutes so that design patents may be granted for the term of seven years, or for fourteen years, as the applicant may elect. Section 4,934 of the Revised Statutes is also amended so that the fees will be as follows: On filing each original application, except in design cases, $20, and upon issue, $20; in design cases, $15 for a seven-year grant and $30 for fourteen years; for applications for reissue, $30; upon filing disclaimer, $10; on first appeal from primary examiners to examiners-in-chief, $10; on every appeal from examiners-in-chief to the commissioner, $20; for certified copies of patents, 10 cents per 100 words; for recording assignments, agreements, power of attorney or other paper relating to a single invention, 300 words or less, $1; over 300 and under 1,000 words, $2; for each additional 1,000 words, $1, and for each additional invention included in one writing, 25 cents; drawings at the reasonable cost of making them.

Transcontinental Telephone Line.

Engineers of the American Telephone and Telegraph Company are now estimating how many of the company's poles across the continent can be used for the transcontinental circuit, which will be equipped throughout with the new Pupin coils. There will be two of these coils to each eight miles of circuit, with the result that perfect conversation between New York City and San Francisco may be easily carried on. The copper wire will weigh 940 pounds to the mile of circuit. This, multiplied by 3,500 miles, gives a total of 3,290,000 pounds.

"As a commercial proposition it is yet to be determined whether the New York-San Francisco line will be a great success," said vice-president N. C. Kingsbury recently. "It is our experience that the more distantly people are separated the less they communicate, and then there is another difficulty that may militate against our new enterprise in a commercial way, and that is the difference in time between New York and San Francisco. As a result, when a merchant in New York gets to his office at 9 o'clock in the morning and wishes to talk business with a San Francisco customer, he finds that it is 6 a. m. in San Francisco, and he has to wait three hours until the average San Francisco merchant gets to his office. Consequently, the time of cross-country conversation will be limited to about five hours during the business day."

Corporation Regulation in Michigan.—There are now four bills before the Michigan House of Representatives and Senate providing for the repeal of the Giles law, which places supervision of telephone corporations in the hands of the State Railroad Commission.

Public Service Bill in Pennsylvania.—A bill creating a utilties commission has been introduced in the Pennsylvania Legislature.

Public Utilities Commission in Texas.—A bill has been introduced in the Texas House of Representatives to create a public utilities commission in that State.

Course of Instruction in the Elements of Technical Telegraphy—XXXIII.

(Copyrighted.)

(Continued from page 80, February 1.)

[We began in our issue for October 16, 1911, the publication of a course of instruction in technical telegraphy. The course, which was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, is published for the benefit of those of our readers who desire to fit themselves for better positions in their vocation. It is elementary throughout and is divided into chapters, following one another in logical order.

The course has received the hearty commendation of telegraph officials and experts for its scope and accuracy and its sound practicability. In each chapter examples are presented in order to illustrate the application of the rules to practical cases, and each chapter is followed by a series of questions pertaining to the subject of the chapter, to be worked out by the student in order to review his progress. Back numbers containing these valuable articles can be obtained on application, at 10 cents per copy.]

CONTACT.

To locate a cross on two wires, one of which only is known, the fault is generally treated as a ground, and tested for in the manner already described.

For example, calling No. 2 the foreign wire (Fig. 30), New York, treating the fault as a ground, requests Syracuse and then Buffalo to open the wire, and finds that with the line interrupted at the latter station, his (New York) relay does not respond, but remains closed, showing the fault to be between Buffalo and Syracuse. If the cross is between two

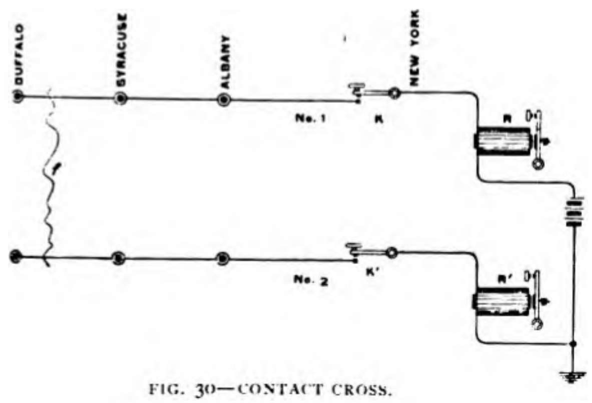


FIG. 30—CONTACT CROSS.

known wires, such as Nos. 1 and 2 in Fig. 30, the first step is to throw the least important wire (say No. 2) out of circuit by disconnecting it at New York and Buffalo.

This clears No. 1, since the current cannot now get to earth through the cross, No. 2 wire being open both sides.

Syracuse is then called up and instructed to open No. 1. This being done, New York puts his battery to line by closing K, and grounds No. 2 wire through its relay R¹.

If R¹ does not close now, there is no contact as far as Syracuse, and that station is told to restore No. 1 wire.

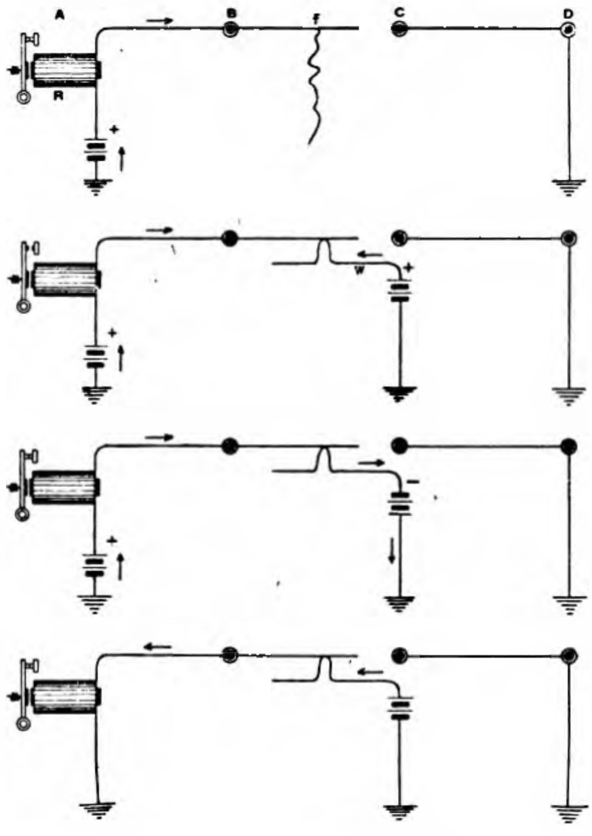
Buffalo is then requested to open No. 1, and R¹ immediately closes in response to New York's No. 1 battery, as this is now the only route by which the current can reach earth.

This locates the cross between Syracuse and Buffalo, and the faulty section of No. 2 should be replaced with a good wire, or, failing that, No. 2 should be disconnected at Syracuse and Buffalo—the nearest stations on each side of *f*—to insure the insulation of No. 1 wire.

SWINGING FAULTS.

Swinging faults may be caused by a wire swinging to ground, as at *f* in Fig. 31, or by swinging to another wire, as in Fig. 32.

As there is nothing to indicate at the testing station whether the wire is swinging to a ground or



FIGS. 31, 32, 33 AND 34—SWINGING CROSSES.

(The reference letters in Fig. 31 apply to corresponding points of Figs. 31, 32, 33 and 34.)

to a cross, as the swing to another wire is technically called, A assumes it to be the former, and, inserting test relay R in the circuit, requests C to open the faulty wire. Every time the swinging wire touches ground R closes and A knows at once that the fault is between him and station C. B is then instructed to open the wire, and if no hits appear now the trouble must be between B and C.

But this simple test, though all-sufficient in this particular case, might be wholly inadequate, if not actually deceptive, if the conditions are as represented in Fig. 32, where the line instead of swinging to ground strikes or is struck at *f* by a wire, w, carrying from some unknown source a current of the same polarity and approximate strength as the testing current. Then with the wire open at C as before, and the battery applied at A, the latter's relay will evince little or no disturbance, because the potential at the point of contact is approximately the same as the potential at A. If the unknown current, however, happens to be one of opposite polarity to that of the testing current, the potential of the foreign wire at *f* will be negative while the potential at A is positive, and the swing would then of course become apparent on the relay (Fig. 33).

But had the swinging wire been originally put to ground, as in Fig. 34, a current of either polarity from a foreign source would have disturbed the testing relay, and the wire chief would not only know from this simple operation that the swing was between A and C, but also that the wire was swinging to a cross.

Many chiefs adopt the latter form of test to begin with, while others apply and reverse the testing battery, sending first a powerful current of one polarity to line, succeeded by another of opposite kind, one or the other of which is depended upon to develop the trouble—whatever its nature—without the necessity for going to ground.

In the case of an intermittent fault occurring at such long intervals as to preclude the probability of localizing by methods already given, the wire might be cross-connected with a clear wire, as in Fig. 35.

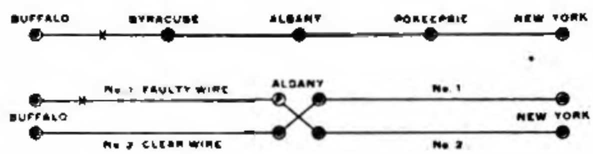


FIG. 35—INTERMITTENT FAULT.

New York instructs Albany to cross-connect the swinging wires, as shown in the figure, and then watches closely the working of both wires at his end. If the trouble now appears on No. 2, in place of No. 1 as before, the trouble must be beyond Albany. Albany then restores the wires to their original positions and the next station, say Syracuse, is requested to make the cross-connection, when, if New York still finds trouble transferred to No. 2, the fault must be between Syracuse and Buffalo.

(To be Continued.)

Touch Telegraph.

Mr. W. B. Lasscell, of Sparkill, N. Y., a forty-niner of the telegraph, suggests that "touch" telegraphy might be advantageously employed as a means of communicating intelligence to the deaf and blind. "To do this, however," he states, "the patient must first learn the telegraph alphabet—learn to read it by the sense of touch, and learn to write it with the aid of a pencil or any other instrument, or even by the finger."

Mr. Lasscell states that it is possible and practicable to greatly increase the value and application of the method by simply stringing a wire around a room, and having a low-voltage battery in circuit; then with the class sitting in insulated chairs, and taking hold of the wire, the monitor could give the pupils needed directions or instructions, and also the news of the world by means of light electric shocks.

Electrostatic Capacity of a Circuit.

When a quantity of electricity flows through a line in the form of a current, the first portion of the current is retained or accumulated upon the surface of the wire, in the same way that a charge is retained or accumulated upon the surface of a Leyden jar. The quantity accumulated depends (1) upon the length and diameter of the wire, (2) upon its distance from the earth, and (3) upon the insulating medium that separates it from the earth. Thus, in the case of a submarine cable, the conductor of which is insulated with gutta-percha or india-rubber, and is maintained in very close proximity to the earth, a very considerable charge is held by the wire. An overground wire is insulated in air, and though it is maintained at a considerable distance from the earth, yet it is in close proximity to other wires, or to buildings or trees, which are in connection with the earth, and it also retains a charge. In fact, it is found in England that the charge retained by twenty miles of ordinary line wire is about equal to that retained by one mile of cable of average dimensions. This power of retaining a charge is called the electrostatic capacity of the circuit.

Now, what are the effects of this electrostatic capacity? In the first place, it absorbs all the electricity of a short momentary current, and prevents the appearance of any current at the distant station. And as it absorbs the first portion of every current sent, it has the same effect as if it retarded or delayed the first appearance of the current at the distant end. Thus, the apparent velocity of the current is diminished more or less in proportion to the capacity of the circuit. In a circuit of very low capacity, the current appears practically instantaneously at the distant end; but on a long or a submarine circuit there is sure to be considerable capacity and consequent retardation. Thus, between Europe and America, on an Atlantic cable, the current is retarded four-tenths of a second.

In the second place, when a current is sent through the circuit, the whole of this charge upon the wire must either be withdrawn or neutralized before a second charge of opposite sign can be accumulated upon it. This discharge may occur as a current flowing out at each end of the earth, in which case one part of the current—called the return current—flows back to the sending station, and the other flows out at the receiving station, so prolonging the primary current. If one end of the wire, say the sending end, be disconnected, all the charge flows out at the distant end, and the prolongation of the current is increased. Again, the charge may be neutralized by a reverse current, which may be sent from the receiving as well as the sending end.

Thus, it is seen that the effects of electrostatic capacity are to produce retardation at the commencement of a current and prolongation at the end.

Mr. J. C. McGrew, manager Western Union Telegraph Company, Jamestown, N. Y., writes: "You did the right thing in renewing my subscription. I not only find the Age of great value to me in my work, but very interesting."

Directive Wireless Telegraphy.*

BY F. ADDEY, B.SC., A.M.I.E.E.

An ordinary wireless station radiates its waves in all directions, and receives signals from all directions. For many purposes this is a great advantage. In certain circumstances, however, it is desirable to limit the transmitted signals to a definite line, or to receive only those signals which come from a particular direction, and to meet this requirement several directive systems of wireless telegraphy have been devised.

In Marconi's original patent of 1896 he describes the use of parabolic mirrors for directing the waves along a definite line, and so increasing the range of communication in that direction. The use of mirrors, however, is only possible when their dimensions are large compared with the length of the waves with which they have to deal. With the wave-lengths used in present-day wireless telegraphy it would be quite impracticable to build mirrors large enough, and it has been necessary to devise other methods of solving the problem of directive wireless telegraphy.

In 1899 S. G. Brown invented a directive system in which two vertical aerials, half a wave-length apart, were used. These aerials were thrown into oscillations differing in phase by half a period by having their lower extremities joined to a spark gap and induction coil. No earth connection was used. Interference occurred between the two sets of waves thus set up, and the resultant maximum radiation took place in either direction in the plane of the aerials.

For receiving, two aerials, half a wave-length apart, and joined at their lower extremities through a coherer, were used. These aerials were erected with their plane pointing towards the distant station. When signals were received, oscillations were set up in the aerials differing in phase by half a period, and which, therefore, helped one another in the connecting path through the coherer. Thus, the signals were recorded.

In the same patent S. G. Brown described an arrangement in which, instead of aerials, plates buried in the earth half a wave-length apart were used. The maximum radiation occurred along the line joining these plates.

In 1904 Braun patented a directive system in which two aerials half a wave-length apart were employed, but in which the lower extremities of the aerials were earthed, and the oscillations in them excited, through inductive couplings, from a closed oscillating circuit.

In 1905 Marconi invented a directive aerial shaped like the letter L turned upside down. Such an aerial was found to radiate or receive best from a direction opposite to that in which the horizontal portion of the aerial pointed.

In 1907 Bellini and Tosi invented a system in which two non-earthed vertical aerials half a wave-length apart were used, in which the oscillations, which differed by half a period in phase, were excited through an inductive coupling from a closed oscillating circuit. These two inventors, by the addition of a third aerial half-way between the two original aerials, in which oscillations were set up, differing by a quarter of a period in phase from those in the other two aerials, were enabled to suppress the radiation in one direction in the plane of the double aerial, and thus to confine the radiation to one definite direction.

The Telefunken Company has produced a directive aerial shaped something like the letter W turned upside down, with very wide angles. The transmitting apparatus is joined to the middle point. Such an aerial is found to radiate least in its own plane.

Recently Kiebitz has performed some experiments with wires erected on poles only about three feet above the ground, and earthed at each end. Transmitting apparatus is joined to the center of the wires, and, as in the case of the S. G. Brown earthed system, this arrangement radiates best in the direction of the wires.

There are many useful applications of these various directive systems. The simplest is that of increasing the range of a station in a particular direction. In the case of land stations where the working is always with some other land station or always in a particular direction, directive aerials can be usefully employed. Inverted L-aerials are used for this reason at the large Marconi stations used for transatlantic working.

Another very important application of directive working is the taking of the bearings of one wireless station from another. There are two distinct methods by which this may be done. The directive apparatus may be fitted on land, and the direction of the ship observed from the shore station, and communicated to the ship by wireless, or the ship may be provided with means for taking the observations herself. The necessity of erecting a number of aerials pointing in different directions could be avoided by erecting a single aerial, and providing means by which it could be turned into any desired position. But such an arrangement would be very clumsy, to say the least. Belini and Tosi have, however, devised an arrangement by which a resultant aerial, so to speak, can be rotated, while the actual aerial system remains fixed.

The Telefunken Company has devised an arrangement by which the ship can herself observe the bearings. On shore sixteen directive aerials are erected in the direction of the points of the compass. A continuously rotating switch joins the transmitting apparatus successively to the various aerials. Immediately before the transmitting apparatus is joined to the N-S aerials it is joined to a non-directive aerial. The operator on the ship is provided with a stop-watch, the hand of which makes one revolution in the same time as the rotary switch makes one complete turn. When he hears the signal from the non-directive aerial he starts the watch, the hand of which then follows the movement of the switch. When the strength of signals falls to

*Abstract of paper read before the Metropolitan Center of the Institution of Post Office Electrical Engineers, London.

a minimum the watch is stopped. It will be remembered that the Telefunken directive aerial radiates least in its own plane, and therefore the minimum sound occurs when signals are being sent on the aerial pointing towards the ship. The dial of the watch is marked with the points of the compass to which the aerials point, which are joined to the corresponding contacts on the switch, and thus the bearing of the station from the ship is indicated by the hand of the watch.

The Marconi Company has recently devised a modification of the Bellini-Tosi system, in which the dimensions have been so much reduced that the aerials can be fitted on a ship.

To provide points from which bearings may be taken, the French Government is building wireless lighthouses, or "radiophares," round the French coasts. These installations will be in continuous operation, and each radiophare will emit a distinct signal which will distinguish it from other similar installations. The wave-length and power used have been so chosen that these continuously working radiophares will not interfere with commercial wireless stations.

Another useful application of directive arrangements has been made in the Marconi duplex system. Two stations, one for transmitting and one for receiving, are provided at each end, each fitted with inverted L-aerials. The receiving station is also provided with an additional directive aerial known as a balancing aerial, so placed as to pick up signals from the transmitting station. A receiving transformer having two primary coils, one joined to each aerial, is used, and arrangements are made that the effects produced in the aerials of the receiving station by the signals from the corresponding transmitting station neutralize one another. The signals from the distant point, however, affect the main receiving aerial more strongly than they do the balancing aerial, and thus the detector is actuated.

Sounder Silencers.

Mr. Donald Murray, of London, England, inventor of the Murray printing telegraph system, was the first to suggest a "sounder silencer" based on the utilization of the principle of charging a condenser very slowly through a high resistance.

Sounder silencers, says *The Post Office Electrical Engineer's Journal*, of London, are associated with telegraph repeaters.

They are fitted at offices where several repeaters are installed, and their object is to prevent the sounders, with which each repeater is equipped, from responding to the signals passing over the line under ordinary conditions. In the absence of silencers the two sounders on a duplex repeater would reproduce all the signals passing in both directions, and it will readily be understood that the attendants at a repeater station would have to exercise continuous vigilance in order to recognize and to attend to the calls for aid, which are occasionally sent them by terminal stations in difficulties, if the voice of the appealing sounder were merged in the clatter of ordinary traffic on the adjoining repeaters. The fitting of silencers obviates this inconvenience. The arrangement must provide means by which a terminal station can, at will, bring the sounder at the repeater station into circuit to receive a call when attention is required. In all forms of silencer which the post-office has used this operation is accomplished by holding down the signalling key for a period of about twenty seconds, and thus sending a prolonged "marking" signal through the relays on the repeater board.

In the device suggested by Mr. Murray, the actuation of the main line "leak relay" by the working signals closes the circuit of a local battery of eighty volts through a resistance of one megohm and a condenser of 4-mf. capacity. When the relay tongue falls back against the "spacing" stop, on the cessation of a signal, the condenser discharges through a special relay, but the duration of an ordinary signal is too short to allow the condenser to take up a sufficient charge to affect the relay when discharged through it.

The prolongation of a "marking" signal for about twenty seconds will allow the condenser to become charged to nearly the full voltage of the battery. When the tongue of the relay falls back on the cessation of the signal the condenser will discharge directly through the special relay with maximum effect. It was intended that the relay should be adjusted to respond to this discharge, and that it should be furnished with a mechanical locking device, which would retain the armature in the closed position, and so maintain the circuit of the local sounder until the relay is reset by hand to its normal open position. A trigger was arranged in such a position that it would be mechanically actuated by the tail-piece of the armature bar of the sounder in such a way as to overturn a balanced ball race, and so close a contact in the sounder circuit. This form, however, was not considered entirely satisfactory, and further efforts were made to simplify and improve it. In the later form adopted the contact is normally held open by a pin resting on a trigger, which is struck away by the tail-piece of the sounder armature bar in response to the kick from the charged condenser. The closing of the contact short-circuits the condenser and megohm resistance, and thereafter permits the sounder to reproduce freely the signals passing through the leak relay. The trigger is reset by a finger-piece, which can also be used to throw back the trigger and bring the sounder into circuit at any time when the repeater attendants may wish to supervise the working of the line.

This form of silencer is constructed to act as a stand for the sounder. The megohm resistance consists of a thin layer of graphite sealed between two strips of ground glass with tinfoil end connections. The purpose it has to fulfill does not, of course, call for a very accurately standardized resistance.

Only one battery is used and there is no permanent current, or permanent voltage strain upon the condenser or the megohm.

Concrete Telegraph and Telephone Poles.

BY J. W. LEE, JR., PENNSYLVANIA RAILROAD COMPANY, PHILADELPHIA, PA.

The meadows section of the Pennsylvania Railroad entrance to the New York terminal station is a five mile continuous strip of semi-tital meadow swamp-land except for a short section of rock outcropping at Snake Hill. Across this section, and adjoining the track embankment, during the year of 1910, a concrete pole line was erected for telegraph and telephone purposes.

The poles were designed to carry six standard ten-pin cross-arms, and sixty open aerial wires, and two 1½-inch diameter lead cables supported by 7/16-inch diameter steel messenger strand. It was desired to make this line entirely secure against probable interruption by severe storms or fires in the swamp reeds. The character of the ground for foundation was bad, and after much consideration it was decided to substitute the concrete for a wooden pole line, which would be indequate for the existing conditions, while on the other hand, though somewhat experimental and perhaps somewhat more costly, the concrete poles would provide a safe and durable construction, as well as low maintenance cost.

In this section 202 poles were erected. They were spaced from seventy feet to 135 feet apart, with an average standard span of 120 feet, the variations in spans being due to the numerous railway and highway crossings. The heights of the poles above the ground vary from twenty-five feet to fifty feet, and they are from thirty-five feet to sixty-five feet in total length. The poles have eight-inch tops, and are square in cross-section, with chamfered corners and with a taper of one-half inch in five feet. The 1-2-4-concrete mixture of which they were made was assumed to have an ultimate unit strength in compression of 2,200 pounds, the reinforcement being composed of mechanical bond bars tied together into a square skeleton frame. This reinforcement was placed in horizontal frames or moulds, and the concrete mixture was poured in and carefully tamped, the concrete covering the iron frame to a depth of about one inch on the outside. The average number of poles made per day was six, and they were left in place for approximately sixteen days to season or dry out.

After a number of experiments it was found best to set the poles in pits excavated in the marshy stratum. These pits were generally about nine feet square and five feet deep, and a timber grillage was placed around the base of each pole, and about five feet below the top of the ground. This grillage consisted of six track cross-ties bolted together, and to the pole, and partly planked over by three-inch rough lumber. The pole which projected below the grillage was pointed at the butt, and was jetted down by compressed air into the sandy layer, so that the grillage would rest at the bottom of the pit. The pits were then back-filled with rock and clay. The poles were erected by means of a 100-ton steam crane with a ninety-foot jib, which was operated from the main track, the line being located about eighty feet from the track, the track through this section being on top of the fill ranging from twenty-five to thirty-two feet above the surface of the meadows.

The gross weight per pole, exclusive of grillage and cross-arms, varied from 5,300 pounds for a thirty-five foot pole to 17,300 pounds for poles sixty-five feet in length.

In addition to this pole line, another concrete pole line was erected later on the Williamsport division, between the west side of the Susquehanna River, just east of Northumberland passenger station, and the west end of the Northumberland freight yard along the westward main track; 150 concrete poles were used, ranging from thirty-five to fifty-five feet in length. These poles are similar in design to those used on the Hackensack meadows with the exception that they are one inch less in cross-section, with a correspondingly smaller iron frame or reinforcement. The line at this point was not designed to carry a large number of wires as was the line on the meadows. The conditions under which they were erected were also more favorable, due to the earth being solid and the poles being in closer proximity to the track. In both cases the line is well guyed. The time has been too short to show any signs of depreciation.

Entertainment at Oklahoma City.

The first meeting of the Western Union Employes' Social Club, of Oklahoma City, Okla., was held January 25, and was an enjoyable affair. The membership of the club is made up of employes of every department of the company, each department contributing its share of entertainment. Addresses were made by Messrs. A. R. Lingafelt, district commercial superintendent; H. G. Robinson, manager, and J. R. Guyer, operator; and vocal and instrumental music was rendered by Misses Bernice Clark, Esther Wallace, and Messrs. J. Jordan, R. Minnick and O. Ecks. The hall was appropriately decorated. The feature was a telegraph line constructed in the regulation manner, with a miniature telegraph office at one end of the hall, wherein were displayed the standard signs, blanks, illuminations, etc. The entertainment was concluded with a dance.

Among those present were district commercial superintendent A. R. Lingafelt and wife, Mr. D. W. Crawford, superintendent of construction in Oklahoma, manager H. G. Robinson and wife, night chief operator R. N. Long, assistant chief operator Fred Nelm and Mr. Charles Clark, cashier.

The committee consisted of Charles Clark, chairman; F. M. Nelm, secretary. Reception: Messrs. Hardy and Thomas and Misses Becker, Clark, Morris, Ayers, Putty, Merchant, Milam and Johnson.

TELEGRAPHY BETWEEN SOUTH AMERICAN COUNTRIES.—Telegraphic communication has been opened between Caracas, Venezuela, and Lima, Peru. The state lines of Columbia, Ecuador, Venezuela and Peru are interconnected.

Protection and Preservation of Standing Telegraph and Telephone Poles.

Practically all poles fail at the ground line because of decay, and on account of this weakening at the base, have to be replaced or cut off and reset, while the top portion is still sound.

In what is known as the "Lamb" pole treatment, says Mr. E. A. Sterling, in *Canadian Electrical News,* the decay which has already started is rendered innocuous, and the ground-line portion of the pole is then sealed with an impervious preservative coating, which prevents the evaporation of the preservative previously applied and prevents further decay by entirely excluding air and moisture.

The whole process is simple and inexpensive, and consists of first removing the soil around the base of the pole to a depth of two to two and a half feet, and scraping or cutting off of the decayed portions of the wood. A hot brush treatment of coal-tar creosote is then applied liberally, which kills the living organisms of decay and penetrates the outer tissues of the wood. A fireproof casing is then placed around the pole, the upper portion extending about six inches above the ground line, and the lower portion from eighteen inches to two feet below, making a total length of from two to two and a half feet. This casing is held out from the pole by spacing rods, which leave about one-half inch opening between the pole and the casting at the solid portions, and a greater space where decay has occurred.

After the casing is in place, the soil is tamped in at the bottom up to the base of the casing, and inside of the form is poured a hot preparation of pitch, which will yield a distillate of high-boiling and high-gravity creosote oil. The pitch, after it hardens, will form a perfect bond with the creosoted surface of the wood, and entirely prevent the entrance of air, moisture, or other agencies favorable to decay, and at the same time prevent the evaporation of the creosote which was applied by brush treatment to the decayed surface. The creosote in the pitch acts as an additional toxic agent in destroying and preventing all forms of decay. Experiments have shown that this pitch filler will not only form a perfect bond with the wood and remain in absolutely close contact in all climatic changes, but it also entirely fills all surface cracks, and, to a slight degree, penetrates the wood. After the pitch has been poured in, and has cooled, the soil is thrown back around the pole and tamped tight, and a protective fireproof covering or a cap of cement is applied; or, if the filler is poured to within only about two inches of the top, the edges of the fireproof casing can be bent over and tacked to the pole, thus obviating the use of a cement cap.

Under average conditions, one year's increase in the life of a pole will pay for the treatment. The average pole (cedar) has a life of about ten years, and the cost of replacement is averaged at $10; hence the annual charge on a four per cent compound interest basis amounts to about $1.25 per pole. If properly treated at the ground line, a conservative estimate places the increase in life at from five to ten years.

Communication by Telegraph With Moving Trains.

Two systems of induction telegraphy for communication with moving trains have been proposed, namely:

(1). The electrostatic induction system.

(2). The current induction system.

In the electrostatic system, one condensing surface consists of a wire placed along the road so as to come as near to the top of the cars of the moving train as possible. The other condensing surface is formed of the metal roofs of the moving cars. Each condensing surface is connected to suitable instruments and batteries, and to earth. The line wire at the fixed station is connected to the earth through a ground plate, and the metal roof of the car to earth through the wheels and track. Under these circumstances, variations in the charge of either of the condensing surfaces produce inductive impulses that are received by the other surface; telegraphic signals are sent and received in Morse characters, but, instead of the ordinary telegraphic receiver being employed, a telephone is used.

In the current induction system the fixed wire is placed in a circuit near the track, so as to be parallel with a coil of insulated wire placed on the car which receives the inductive impulses. The coil of wire on the train is connected with instruments and batteries as a metallic circuit. The line wire is also connected with batteries and receiving and transmitting instruments.

In the current induction system, as invented by Phelps, the fixed line consists of a No. 12 copper wire placed inside a wooden strip laid on the roadbed between the tracks.

A coil composed of some ninety turns of No. 14 copper wire passes through a tube suspended longitudinally under the car, the upper parts of the coil passing through the car, and being hung up along the sides over the windows.

Receiving instruments, consisting either of Morse sounders or of telephones, are connected in the circuit of the moving coil. The transmitting key, instead of merely making and breaking a battery circuit, throws a buzzer into or out of action, whereby a musical sound is produced in the telephone as long as the circuit is kept closed.

A difficulty experienced in actual practice in the case of any induction system is where more than a single line wire or conductor is employed on account of the confusion arising from the mutual induction of the lines on one another, thus causing "cross talk."

MR. J. A. CRAWFORD, district commercial manager, Western Union Telegraph Company, Nashville, Tenn., writes: "Your action in renewing my subscription meets my approval, and as an expression of my appreciation I am enclosing herewith two dollars, which will reimburse you, not for the AGE, but for your trouble in notifying me. You know the AGE cannot be measured by dollars and cents."

Morse Electric Club Dinner.

Over 250 prominent telegraph and telephone officials and employes were present at the annual dinner of the Morse Electric Club, which was held on February 1, at the Hotel Savoy, New York.

Mr. Belvidere Brooks, vice-president of the Western Union Telegraph Company, and the newly elected president of the club, acted as toastmaster. Addresses were delivered by Messrs. Newcomb Carlton and Thomas F. Clark, vice-presidents of the Western Union Telegraph Company; Union N. Bethell, president of the New York Telephone Company; N. T. Guernsey, associate counsel, American Telephone and Telegraph Company, New York; and J. P. Spanier, Continental representative of the Western Union Telegraph Company, Naples, Italy.

The dinner was an excellent one, and much enjoyed by all. At its conclusion president Brooks called a recess for a few minutes for social intercourse, and all appreciated the opportunity to greet old friends and make new ones.

Much gratification was expressed at the presence of Mr. Theo. N. Vail, president of the Western Union and American Telephone and Telegraph Companies. Although he made no formal address, Mr. Vail held a little reception at his place at the speaker's table during the intermission, which gave his friends an opportunity to congratulate him on the recovery from his recent illness and his apparent robust condition. He was the recipient of much quiet praise for his activity in connection with comprehensive pension plan recently put into effect.

Each speaker took occasion to pay a well-deserved tribute to the honored guest of the evening, Mr. J. B. Van Every, vice-president of the Western Union Telegraph Company, who has been president of the club since its organization, and who has retired from that office.

Mr. Clark spoke of his many years of association with Mr. Van Every, and of the invaluable services rendered the company by him, and of his high personal qualities, adding, in a humorous vein, "Van's good qualities are many, but his stubbornness always bothered me when he differed with me on any questions of policy; and it was especially irritating, because of the fact that nine times out of ten he was right."

Mr. Union N. Bethell, the next speaker, after a running talk the humor of which put all in a receptive mood, spoke in a more serious vein of the problems of administrative policies which are confronting business interests at the present time.

"It is difficult to be prosperous and not arrogant," said Mr. Bethell. "The word 'monoply' is an odious term at the present time, but I sincerely believe that there is little danger ahead for the man of right principles. As a matter of fact, in the telephone business, monopoly simply means the greatest good to the greatest number, and if every one of our officials will take this as his motto and try earnestly to live up to it, I believe that we will receive justice and consideration from the people and their representatives. We must see that our corporation is truly great in that it carries out, not only its written, but its moral obligations. By fair dealing only can we make our company a truly great organization."

Mr. Newcomb Carlton made an appeal to the man in the ranks to show what was in him, and so provide for the filling of vacancies higher up.

"Our theory of organization to-day is that things shall happen from the bottom instead of from the top," said Mr. Carlton. "We have great opportunities for the man of the right character."

Mr. N. T. Guernsey, associate counsel of the American Telephone and Telegraph Company, pointed out that the very business life of the United States was dependent upon efficiency in the telephone and telegraph service.

"Take away the telephone and the telegraph," said Mr. Guernsey, "and 'big business' would be at a standstill. In view of this great responsibility for the public welfare, which rests upon the shoulders of those who conduct the business of message transmission, it is highly essential that they should stand on the side of equity and justice, and that ethical principles should govern, rather than those rules of conduct which are sometimes the resultant outgrowth of uncontrolled power. There are few sensible men who will not recognize that the business of the country can be best transacted by a close linking of those means of intercommunication which are as essential to the country's commercial existence as are the credit system and the railroads. The business interests of the country are in a transition stage. Many minds are at work attempting to square the circle of industrial relations, and they will find that there will be little antagonism left when once all are agreed that we must work together for the common good, and that to the corporation or the individual which serves the best will come the greatest measure of prosperity."

Mr. J. P. Spanier compared some of the features of the American telephone and telegraph systems with those of the government-owned systems which exist in Europe. He told of the many delays to which patrons are subjected under the latter regime, and concluded with the statement that government ownership had not been as successful in practice as its theoretical advocates sometimes assert.

Good music, both vocal and instrumental, was a feature of the evening. The speaker's table was adorned with a centerpiece of pink rose buds, and the table-cloth was draped with streamers of wide scarlet ribbon.

Those present were:

New York—W. J. Ackerly, M. C. Allen, W. J. Austin, G. W. E. Atkins, H. G. Atwater, U. N. Bethell, F. H. Bethell, B. Brooks, G. R. Benjamin, J. L. Brady, C. J. Bresnan, G. N. Butz, J. R. Beard, T. D. Bowen, C. A. Bauer, J. A. Berry, B. Bernstein, A. R. Brewer, A. T. Benedict, H. G. Bates, Samuel C. Bowman, B. C. Bellows, J. J. Boelsen, L. D. Beall, E. E. Brannin, E. T. Burrill, Newcomb Carlton, Thos. F. Clark, P. J. Casey, F. E. Coyle, S. R. Crowder, E. P. Clifford, E. V. Cox, P. O. Coffin, A. R. Carmichael, R. E. Chetwood, A. Carlson, J. W. Connolly, T. F. Clark, J. J. Clunan.

T. Conaty, A. E. Chandler, C. G. Du Bois, F. R. Devereaux, H. Durland, W. J. Dealy, H. J. Dealy, F. N. Dealy, C. J. Donovan, R. Drehner, Lewis Dresdner, Michael Dresdner, J. A. Dierks, F. E. D'humy, H. W. Drake, M. Durivan, Edward Everett, J. W. English, J. D. Ellsworth, T. J. Farrell, S. E. Fitzgibbon, T. E. Fleming, T. F. Flynn, W. N. Fashbaugh, C. H. Fuller, J. D. Felsenheld, C. Friedlander, F. E. Fitzgibbon, David Fuchs, W. S. Fowler, J. F. Fairlamb, J. B. Foster, N. T. Guernsey, E. Y. Gallaher, E. P. Griffith, Stanley Gross, A. H. Gregory, W. S. Gifford, J. J. Ghegan, G. Green, D. J. Gallagher, C. H. Gaffeney, S. R. Guarisco, E. F. Howell, H. M. Heffner, G. K. Huntington, Wm. Holmes, C. A. Harvey, M. J. Hayden, F. C. Halstead, W. J. Higgins, A. A. Hartley, C. R. Hurley, M. W. Hamblin, S. B. Haig, J. A. Hill, Gardner Irving, C. C. Johnson, C. Jacobson, W. L. Jacoby, J. E. Jenkins, H. E. Jones, F. Kitton, M. H. Kerner, A. C. Kaufman, C. A. Kilfoyle, Alex. Kline, F. S. Lewis, Harry Lupka, H. W. Ladd, J. W. Ladd, W. C. Merly, C. McKay, G. H. Messner, R. F. Martin, L. McKisick, C. B. McCann, R. L. McCann, Col. W. A. Murray, R. F. Murphy, G. D. Milne, Wm. Marshall, T. C. Miller, W. H. Mathews, W. M. Morrissey, A. Montequin, Jos. Maxwell, J. F. McGuire, J. Morison, T. A. McCammon, H. A. Moody, W. A. McAllister, H. N. McKinney, F. R. Martin, R. J. Murphy, E. E. Morison, J. C. Nelson, A. Nachmann, F. G. Nelson, J. F. Nathan, Thos. Nathan, M. J. O'Leary, I. Perner, C. P. Pollack, D. Peterson, M. A. Porter, W. S. Porch, J. D. Price, J. M. Phelan, J. Piccolo, M. E. Pierce, S. T. Plimpton, M. Quinlan, J. J. Riley, H. E. Roberts, C. E. Rafford, L. Roth, M. W. Rayens, M. C. Rorty, Jas. Robb, Dan Roth, W. H. Rost, W. D. Schram, A. G. Saylor, E. B. Saylor, Geo. Schreiner, T. J. Smith, J. A. Sweeney, E. B. Sherburne, G. F. Stainton, F. J. Sheridan, W. A. Sawyer, D. Skelton, T. G. Singleton, Jay Simons, H. Blair Smith, L. G. Smith, P. J. Sullivan, F. J. Scherrer, C. R. Tilgham, J. B. Taltavall, Theo. N. Vail, J. B. Van Every, W. L. Vater, H. F. Van Every, J. L. R. Van Meter, C. H. Wilson, Allen Woodle, A. G. Waring, J. S. Wiley, S. M. Williams, J. C. Willever, K. W. Waterson, W. P. Waters, D. B. White, A. O. Wallis, J. J. Wilkinson, Jr., G. M. Yorke.

Albany, N. Y.—J. A. Jamison, Jr., W. H. Van Zandt.

Atlanta, Ga.—L. H. Beck, J. P. Edwards, J. J. Hoefman.

Baltimore, Md.—V. J. Albert.

Boston, Mass.—C. F. Ames, F. W. Barth, W. G. Chase, P. F. Harrington, P. W. Johnson, C. B. Kelley, A. M. Pearson, L. J. Shay.

Chicago, Ill.—T. W. Carroll.

Cleveland, Ohio—W. C. Adams, W. T. Lloyd, F. V. Sackett.

Hartford, Conn.—E. J. Murray.

Jersey City, N. J.—J. B. Bertholf, F. A. Mombert.

Naples, Italy—J. P. Spanier.

Newark, N. J.—Dr. W. Holmes, C. H. Mulford.

North Adams, Mass.—W. F. Orr.

Oswego, N. Y.—J. P. Doyle.

Ogdensburg, N. Y.—A. R. Porte.

Passaic, N. J.—C. F. H. Johnson.

Philadelphia, Pa.—F. D. Byrne, R. A. Black, Sheldon Custer, R. J. Meigs, J. W. Reed.

Pittsburgh, Pa.—E. A. Baird, T. J. Jones, G. H. Kendrick, W. W. Olheiser, A. C. Terry, W. J. Dodge.

Richmond, Va.—J. B. Cheatham, J. S. Calvert.

Springfield, Mass.—C. H. Simpson.

San Francisco, Cal.—E. A. Gray, R. W. Gray.

Schenectady, N. Y.—A. E. Reynolds.

Wilkes-Barre, Pa.—E. F. Cowell.

Washington, D. C.—W. H. Potter, H. F. Taff.

Wilmington, N. C.—W. P. Cline.

Not to Charge for Added Words.

The Public Service Commission, Second District, New York, has made an order requiring the Western Union Telegraph Company to discontinue the charge made to the Postal Telegraph-Cable Company for the word "via," and the name of the place where a message is transferred to the Western Union to be forwarded to a point not reached by the Postal lines. The order becomes effective March 1. The Western Union Company is required to advise the Commission by February 17 whether or not it will obey the order.

The Postal Company now receives messages at competitive points for points at which it has no office, but at which the Western Union has offices. The Postal transmits the message to its own office that is nearest to the point of delivery, and at such office transfers the message to the Western Union and pays for the transmission from there to the point of address, the Western Union charging the regular rate between the point at which it receives the message and the point at which it is delivered. In addition to this regular charge the Western Union charges for the words referred to.

On November 8, 1911, the Commission made an order directing the Western Union to desist from charging the Postal for the originating address and date upon transferred telegrams in all cases where no charge is made for the originating address and dates upon telegrams delivered to the Western Union Company originating at the point of transfer.

In the case now decided, and also that decided in November, 1911, the Commission held that the charge exacted was unjust and discriminatory.

It was shown that the Postal Company makes no charge for extra words on transferred messages, that the Great Northwestern Telegraph Company makes no such charge, and that by reason of the discrimination against it by the Western Union it had been obliged to discontinue transmitting messages part way, because the extra charge together with the local charge of the Western Union amounted to more than was received for the message.

Permanent Exhibit of Telephone Apparatus.

An exhibit of historical and modern telephone apparatus and electrical supplies was recently inaugurated by the Western Electric Company at its New York offices. It is in three sections.

The historical section shows the development of the telephone from its earliest stages up to the present time. The smoked glass records of sound waves made by Alexander Graham Bell in 1874, using the human ear as a transmitting diaphragm, and thus proving that diaphragms would transmit sound waves; parts of Bell's original telephone of 1876, mounted to make a complete model, and numerous instruments showing the gradual improvement in design. Included in the historical collection, which is composed partly of apparatus loaned by the American Telephone and Telegraph Company, and partly of Western Electric apparatus, are the switchboard used by Mr. Bell in opening the New York-Chicago line in 1892, and the receivers and transmitters used at the opening of the New York-Denver line in 1911.

FIG. 1—PERMANENT TELEPHONE EXHIBIT

FIG. 2—PERMANENT TELEPHONE EXHIBIT

The modern apparatus section contains switchboards, magneto and central battery, each switchboard having wired to it a number of telephone sets, so that service demonstrations may be made to visitors.

In another part of the exhibit room every system of interphones is represented, and there is also a complete line of representative telephone train-dispatching apparatus in operative condition.

Miscellaneous telephone apparatus, such as combined jacks and signals, keys, lamps, lamp sockets, jacks, cords, plugs and repeating coils, as well as representative pieces of telegraph apparatus, are exhibited in a large glass show-case.

In other show-cases are samples of all the various supply lines manufactured and distributed by the company.

The exhibit, arranged with the co-operation of the American Telephone and Telegraph Company, is intended to be of a permanent character, and as new apparatus is placed upon the market, or new supply lines added, representative samples will be exhibited.

The Telephone in Forest Fire Protection Service.—Probably the most extensive fire protection service in the world is now maintained by the United States Government in the national forest areas of the West, by means of telephone lines. There are about three thousand miles of these telephone lines in the State of California alone, according to the district forester at San Francisco, who estimates that this mileage represents an expenditure of about $120,000. The telephone lines of the service are one-wire, grounded lines, and 90 per cent of the mileage is strung on trees. So far, little trouble has been experienced in carrying the wire in this way. It is the policy of the service to place a telephone in hotels, and even private dwellings, wherever its installation will materially assist in transmitting news of conflagrations in the forest areas. The service has co-operative arrangements with owners of private lines within and adjacent to the national forests, which permit of the extension of the system far beyond the limits possible if the means of communication were confined to government lines alone. In return for the help of the population in sending messages and assisting in the fighting of fires, the government allows its lines to be used by private parties for the ordering of supplies, transmission of urgent messages, etc., and settlers, campers, hunters and prospectors have been quick to avail themselves of this privilege.

Mental Anguish Suit.—A suit for $3,000 on account of mental anguish suffered by the sender of a message has been brought against one of the telegraph companies. The basis of the suit was a two hours' delay in the delivery of a message conveying information of the death of a distant relative.

Prof. Morse's Silver Key.

BY J. F. SKIRROW, ASSOCIATE ELECTRICAL ENGINEER, POSTAL TELEGRAPH-CABLE COMPANY, NEW YORK.

I recently came into possession of a key made of silver, with an ivory knob, which was the personal property of Professor S. F. Morse. I obtained it when the personal effects of the late A. G. Davis, of Baltimore, Md., were disposed of after his death.

The history of the key, according to Mrs. A. G. Davis, is that the instrument was presented to Prof.

PROF. MORSE'S SILVER KEY

Morse by a circle of admiring friends, and that it was used by him in his work for some years. Just before his death he distributed a few of his personal effects, and presented this instrument to Mr. Davis.

The key is mounted upon a black walnut base, which shows pronounced finger mark effects on and alongside the key knob. I am informed that Prof. Morse used this key in teaching Mr. Davis how to telegraph, and that these finger marks were caused by Prof. Morse's use of the key.

Tone and Pitch in Telephony.

Differences in tone or pitch are due to differences in the number of vibrations per second, or in the lengths of the waves produced; the shorter the waves, the greater the number of vibrations per second, and the shriller and more acute the tone or pitch.

Differences of intensity or loudness are due to differences in the amplitude of the sound waves, or to the difference in the amount of energy charged on the medium through which the sound waves are moving.

Differences in the quality or timbre of musical sounds are due to differences in the character and intensity of the additional tones called overtones.

A NOVEL INVITATION TO SAN FRANCISCO.—Messrs. C. A. Tomlinson, of the Western Union Telegraph Company, and J. J. Varcoe, of the Pacific Telephone and Telegraph Company, San Francisco, Cal., have started a book on a trip around the world, containing greetings and an invitation to telegraphers of every nation to visit San Francisco in 1915. It will first go to Honolulu, thence to Peru, Brazil and other South American countries; to Australia, Java, the Philippines, Japan, Russia, China, India, Europe, Newfoundland, Quebec, Chicago, Seattle and finally back to its orginating point.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What qualities of electrical conductors affect the value of currents traversing them?

What is the reciprocal of resistance called?

What devices comprise a complete apparatus for electrical measurements?

Are all of these instruments required for ordinary measurements?

What other instruments are used in electrical measurements?

Describe the general features of the construction of the tangent galvanometer as suggested on page 45 and succeeding pages.

Describe also the general features of the construction of the rheostat as suggested on page 51 and succeeding pages.

Having provided himself with the necessary demonstration apparatus, what is the first thing to do in investigating the laws of the electric current?

What effect is produced on the needle of the galvanometer by a variance of the number of battery cells in series?

In what ratio is the effective strength or quantity of current?

What is the meaning of the term, "parallel series"?

Of multitude series?

Of parallel?

What is the effect on the galvanometer needle of placing the cells in the various relations above enumerated?

What is the effect on the galvanometer needle of passing the current through a considerable length of copper wire?

From the last experiments, what two fundamental facts are developed respecting the electric current?

What is the relation existing between the quantity of the electric current and the resistance of the transmitting medium?

With respect to their ability to conduct electricity, into what two general classes may all substances be divided?

Are these terms absolute?

Name five good conductors and five good insulating materials.

(To be Continued.)


KERITE
POLICY OF INSURANCE
DAYS KERITE
KERITE
KERITE is the best policy. Its use insures against those interruptions to service, so costly in the end, that are due to a small saving in initial installation outlay.
KERITE is specified wherever the *best* is recognized as the *cheapest*
DAYS KERITE
KERITE INSULATED WIRE & CABLE COMPANY
General Offices, 30 Church Street, New York
Western Office, Peoples Gas Building, Chicago

THE RAILROAD.

Mr. F. F. Riefel, superintendent of telegraph, New York Central Lines, Cleveland, Ohio, announces that the telephone has been substituted for the telegraph on the St. Mary's branch of the Toledo and Ohio Central Railway. The telegraph is retained on the Corning division of that road, however.

New Grand Central Signal Tower.—The largest railway signal tower in the world is that at the new Grand Central station opened in New York, on February 1. It controls seventy-nine acres of track. The tower building is four stories high, and contains 400 levers for the suburban service and 362 levers for the express lines. To each forty levers one man is assigned, who works under the instruction of a train director. Electric indicators disclose errors made in manipulating the switches.

Railway Telegraph Superintendents at Edison Works.—A feature of the entertainment of the Association of Railway Telegraph Superintendents during their convention in New York last June, was a trip to the Edison works at West Orange, N. J. While there, a group photograph was taken by Mr. Edison's photographer of the members and their families who formed the party. Copies of these photographs are now being distributed with the autographs of Mr. Thomas A. Edison, H. G. Thompson and E. E. Hudson.

Appreciated Act of a Wabash Tower Man.—Mr. W. B. West, the tower operator on the Wabash Railroad at McGee, Ind., rendered a gratuitous service recently that called forth many compliments. A death message had been filed on a Saturday night for an office that would not reopen until Monday morning. Mr. West, on learning the nature of the message, offered to take it and deliver it on his motor cycle to the addressee, who lived up the road about seven miles. The message was thus delivered, and Mr. West's generous act won him much praise.

Association of Railway Telegraph Superintendents.

The joint committee of the Eastern and Western Divisions of the Association of Railway Telegraph Superintendents will meet in Chicago, in March. The date will be announced later. Much business of special importance and interest is to be presented at this meeting for the consideration of the members, and it is probable that there will be a large attendance. The arrangements for the annual convention of the Association, which is to be held in St. Louis, Mo., May 20, will come up for discussion. Mr. P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill., is secretary of the Association. Messrs. Charles Selden, superintendent of telegraph and general inspector of transportation, Baltimore and Ohio Railroad, Baltimore, Md., and E. A. Chenery, superintendent of telegraph, Missouri Pacific Railroad, St. Louis, Mo., are the chairmen, respectively, of the Eastern and Western Divisions of the Association.

Annual Dinner of Directors of Serial Building Loan and Savings Institutions.

The annual dinner of the board of directors and the advisory committee of the Serial Building Loan and Savings Institution took place at the Astor House, New York, on the evening of February 6. President Ashton G. Saylor acted as toastmaster, and called upon everyone present for his opinion as to the best methods of making the institution more useful to the interests it serves. Mr. Saylor had considerable to say on the subject of loan associations. He reminded each member of the board of his personal responsibility in the management of this institution, which was the custodian of three-quarters of a million of dollars belonging to investors who were members of the telegraph and telephone fraternities. This was a trust that could not be minimized, and he hoped that the previous conservative management of the institution would always be maintained, and that every safeguard would surround the investments of the institution which has accomplished so much during the twenty-eight years of its existence in behalf of the interests it represents. Over five millions of dollars is the amount that this saving and loan institution has invested, and not one dollar has been lost. The institution has never failed to pay less than five per cent interest on deposits, and it charges six per cent to borrowers who desire to purchase homes, the money to be returned in small monthly installments, equal in amount to the rent.

Letters of appreciation and congratulation for valuable services rendered the institution were ordered sent to Mr. James Merrihew, the first president of the institution, and Mr. Edward F. Cummings, one of its first directors.

Among those present were: A. G. Saylor, James R. Beard, Edwin F. Howell, Thos. M. Brennan, Wm. J. Quinn, E. E. Brannin, C. A. Kilfoyle, Henry W. Pope, Thos. E. Fleming, M. J. O'Leary, J. T. Laidlaw, M. S. Cohen, James F. McGuire, Allen Woodle, J. B. Taltavall, C. P. Bruch, Edward Reynolds, E. S. Butterfield, E. B. Saylor, M. W. Rayens, John T. Mulhall, John T. Delaney.

OBITUARY.

J. C. O'Connor, aged 67 years, a former telegrapher and builder of the jetties at Galveston, Tex., and of the Eastern and Texas Central Railroad, died in Paris, France, recently.

C. T. Tannery, aged 42 years, chief lineman of the Postal Telegraph-Cable Company in the Middletown, N. Y., district, died January 29. He was formerally an operator for the same company.

Telegraph and Cable Offices Damaged in City of Mexico Fighting.—The telegraph and cable offices in the City of Mexico were damaged during the fighting between the Federal and rebel troops on February 12. Shells tore large holes in the walls of the building in which the cable office is located, but the Mexican operators continued their work as though nothing unusual was taking place.

Telephone History of the Louisville and Nashville Railroad.*

BY CLIFFORD WELDON.

Since 1907, when the first telephone train-dispatching circuit was installed on the New York Central & Hudson River Railroad lines from Albany to Fonda, N. Y., there has been a steady increase in the number of railroads, both in the United States and Canada, which have adopted this type of equipment.

After the first few trials telephone circuit installations had been operated long enough to permit of a definite and decisive comparison between the telegraph and telephone methods of handling train movements, there remained little doubt in the minds of the railway officials concerned as to the part which the telephone was to play in the future of this very important branch of railway operation.

The advantages in favor of the telephone, which were immediately apparent to those who observed the first trials closely, are that it is more flexible, quicker, safer, and more reliable. In addition to these, it makes possible better discipline and co-operation, as well as providing a means for officials, not familiar with the Morse code, to exercise supervision and obtain immediate and accurate information in case of emergency.

Some of the factors which increase the traffic capacity, and, therefore, make for economy in the telephone method of operation are:

First. The time of calling stations, sending orders and receiving train reports is so greatly reduced (30 to 50 per cent) that the time gained is available for the dispatcher in better laying out his work, planning meeting points and handling the endless amount of detail which the position requires.

Second. Dispatchers are more efficient, due to the fact that they are relieved of the mental and physical strain attending the continual operation of the Morse key, which has a most damaging effect on the nervous system, and frequently results in what is known as operators' paralysis.

Third. Through the use of the portable and siding sets train crews may get into communication with the dispatcher, and receive their advance orders directly from him. This has proven a most valuable branch of the service, especially in advancing freight trains which have taken a siding some distance from a station or tower. Also, during the night, when, on some roads, part of the stations are closed. In this latter case the train conductors may be provided with keys, and in that way have access to the dispatching telephone.

Fourth. The dispatch and exactness with which reports of progress on clearing up wrecks and repairing breakdowns is given to the dispatcher, thus allowing him to determine as to the handling of other trains, routing them over other roads, etc.

These advantages were so patent that the progressive railroads in the United States made preparations to replace, as rapidly as possible, the telegraph equipment by the telephone and selective signalling telephone systems. Some idea of the rapid spread of the use of the telephone may be gained by stating that there are at present installed telephone circuits for handling train movements over approximately 65,000 miles of railroads in the United States and Canada.

One of the most progressive railroads in this country is the Louisville & Nashville Railroad, which covers the great central south from St. Louis and Cincinnati to the Gulf. This road, covering as it does the States of Indiana, Illinois, Tennessee, Kansas, Ohio, Virginia, West Virginia, Alabama, Georgia, Louisiana, Florida, Mississippi and North Carolina, with a network of tracks, is destined to play a most important part in the development of this very important territory.

The Louisville & Nashville Railroad Company recognized at the outset the advantages to be obtained by the use of the telephone, and in 1909 installed its first telephone train dispatching circuit from Louisville to Cincinnati. The results obtained from the operation of this division were so satisfactory that plans were immediately made to extend the telephone and selective signalling system. To-day the Louisville & Nashville operates approximately 4,600 miles of road and of this there is equipped for telephone train-dispatching service approximately 2,539 miles.

The greater portion of this telephone operated mileage is covered by both train and message circuits. The installation of the two parallel circuits provides sufficient facilities to operate under the most trying traffic and service conditions. All of the telegraph and telephone work on the Louisville & Nashville has been for years under the personal direction of Mr. R. R. Hobbs, superintendent of telegraph. The very competent and efficient manner in which Mr. Hobbs has conducted the telephone and telegraph work for his road is demonstrated by the efficiency of the service over which he has supervision. Mr. Hobbs has taken every advantage of the outside wire plant, which has been so constructed as to make possible the use of simplex and phantom service over the train and message wires. This additional simplex and phantom service is obtained without any increase in the outside wire plant and with but a very slight cost for the apparatus necessary at the terminal of the circuit.

* *Telephone Engineer.*

Western Electric Company in 1912.

The sales of the Western Electric Company for 1912 will be between $71,000,000 and $72,000,000, which is slightly more than in 1906, the previous largest year in the company's business. The increase has been in American sales outside of the Bell System, which have increased about 100 per cent over 1906, and in European sales, which were the largest in the company's history. The Board of Directors has established two additional vice-presidents in the company's organization, and has appointed to those newly created positions Mr. Gerard Swope, general sales manager, and Mr. A. L. Salt, general purchasing agent.

MUNICIPAL ELECTRICIANS.

Development of the Association.

The growth of the International Association of Municipal Electricians in late years has been rapid, and its development has been watched with much interest by those concerned in municipal affairs. The membership is composed of municipal electricians in all sections of the United States, in Canada and in Brazil, and the association is becoming more and more technical each year, as fire alarm and police signalling develops along more scientific lines.

The members are giving much thought and attention to the advancement of the service they represent.

The association is headed this year by a leader in thought and action, and if energy can accomplish anything, the association, under the leadership of Mr. John W. Kelly, jr., will become of first importance in its relation to municipal government.

At last year's convention at Peoria, Ill., president Kelly announced that the "Question Box" was to be revived. The value of the "Question Box" in organizations of this character is perhaps not fully appreciated. It is the means of bringing out a great deal of information of practical value to the members, and it should be utilized to the fullest extent.

The association was organized in Brooklyn, N.Y., in 1896, and its influence has been felt ever since in the development of municipal electrical affairs. The interest that is being taken in the work of the association is everywhere evident. Last December an informal meeting was held in Philadelphia, and so successful was it from a practical point of view that president Kelly was requested to arrange for similar meetings in other cities from time to time.

Arrangements for the Watertown, N. Y., convention this year are receiving the attention of the officials and committees, and it is urged that as many of the members as possible attend this meeting, because it will be a most profitable one. Mr. Clarence R. George, Houston, Tex., is secretary of the association, and will be glad to furnish any further information regarding the association and its work, and the Watertown convention.

Fire Alarm Wires Underground.—The fire alarm telegraph wires in Webster, Mass., are to be placed in the underground conduits of the New England Telephone and Telegraph Company.

New York Fire Alarm System.—Fire Commissioner Johnson, of New York, in his annual report to Mayor Gaynor, asks for an appropriation of $2,850,000 for a new fire alarm system in all the Boroughs of the city.

Close of Our Subscription Contest.

The results of the subscription contest which has been in progress for the past three months—November and December, 1912, and January this year—are as follows:

First prize, $25.00, awarded to Mr. H. H. Dengler, Postal Telegraph-Cable Company, Chicago, who sent in subscriptions to the amount of $107.00.

Second prize, $15.00, to Miss G. G. Amber, Western Union, Philadelphia, who remitted $90.00.

Third prize, $10.00, to Miss M. Wright, Western Union, Chicago, $64.25.

Fourth prize, $5.00, to Mr. C. F. Bartlett, Postal, St. Louis, Mo., $27.75.

Fifth prize, $5.00, to Mr. W. C. Hair, Western Union, Atlanta, Ga., $17.75.

Mr. Dengler and Misses Amber and Wright are to be commended for their enterprise and interest in the contest. They are systematic and painstaking in their method of doing business, and the effect of these qualities is shown in the results of their work.

A contest of this character is beneficial to the contestants individually, even to those who fail, because it tends to develop methods of accomplishing results which would not otherwise be acquired.

The contest was a success from every point of view, and those who captured the prizes are entitled to much praise for the zeal displayed in their efforts to lead.

To those who failed to secure one of the prizes we wish to tender our thanks for their earnest efforts, and we hope that they will meet with better success in case another contest is undertaken and they take part in it.

Sunday Deliveries in Virginia.—According to a court decision in Norfolk, Va., telegraph companies are not compelled in Virginia to deliver telegrams on Sunday, except in cases of charity, religion and necessity, sickness coming under the latter designation.

L. J. Shay, Telegraph Manager, New England Telephone and Telegraph Company, Boston, Mass.

Mr. Lawrence J. Shay, whose appointment as telegraph manager of the New England Telephone and Telegraph Company, Boston, Mass., is announced in another column of this issue, was born in Haydenville, Mass., May 18, 1867, and entered the telegraph service in January, 1882, at Mt. Carmel, Conn. He remained with the telegraph until March 28, 1889, when he entered the telephone service as night operator, later becoming chief operator. He has continued to advance, filling successively the positions of cashier, chief inspector, wire chief, acting manager, special agent, toll service inspector, manager leased wire and circuit departments, and finally reaching the position of telegraph manager, attached to the staff of the general manager of the New England Telephone and Telegraph Company at Boston. Mr. Shay will, in addition to his duties

L. J. SHAY, BOSTON, MASS.

as telegraph manager, continue as manager of the leased wire and circuit departments and have charge of all telegraph leases and the testing of the telephone toll circuits. Mr. Shay since entering the telephone service has devised improved apparatus for testing both local and toll circuits, the most important of which was a combination telephone and telegraph testboard to meet the requirements of the New England Telephone and Telegraph Company, which has since been adopted by the American Telephone and Telegraph Company, as the Standard No. 4. He also developed many improvements in the methods of handling toll traffic. In the early 90's, while experimenting in the Worcester district to relieve toll traffic congestion, he originated the "toll center" idea, which is now the universal practice.

Pensions for Military Telegraphers.

In the present congested condition of legislation in Congress it is probable that the consideration of the bills intended to pension the military telegraphers who served in the United States Army during the Civil War will have to be postponed until the next session. The bills, however, are in a favorable position before the committees having them in charge, and favorable action at a near day is looked for.

Rapid Telegraphing.

The Chicago and St. Louis Western Union offices contain several telegraphers who are phenomenal as high-speed senders and receivers, and their rapid work is so common that it has almost ceased to be regarded as anything extraordinary. It is so remarkable, however, that it should go on record, and what was started as a casual investigation of a reported feat in high speed work has brought to light many other achievements of like character.

Among the rapid telegraphers at Chicago we name the following:

A. E. Tyler, Fred Proctor and A. J. Burkart. It is stated that Mr. Burkart transmitted 1,967 words in thirty-one minutes from Peoria, Ill., to Mr. Tyler.

Mr. Proctor recently reported a prize-fight from South Bend, Ind., making up the report himself directly on his key and transmitting it to Mr. Tyler. He thus sent 1,800 words in thirty minutes, which was a remarkable feat when it is considered that he at once performed the functions of both reporter and operator. The newspaper which received the report put it into type without alterations, and gave the telegraph company great credit for it, but said nothing about the operators who performed this remarkable achivement.

It is claimed that Mr. Proctor can send 4,200 words in an hour to Mr. Tyler. He is regarded by his colleagues as the best and fastest operator in the world. He is on the regular force in the Chicago office, and is an all-round newspaper man, having filled various positions in editorial rooms.

Messrs. E. W. Springer and Andrew Wachter sent to San Francisco on different days 589 messages in eight hours and 610 messages in eight hours and ten minutes, respectively. This is remarkable speed when it is considered that there are four or five repeaters on this circuit. These men handle an average of 525 messages per day.

Mr. M. J. Duggan, on January 16, this year, on a St. Louis wire handled 703 messages in eight hours and thirty minutes, including ninety day letters. The receiving operator at St. Louis was R. E. Norman. One day in July, 1907, Mr. Duggan transmitted 835 messages to operator Salak in St. Louis in nine hours.

Other older records are by W. H. Marshall, of Chicago, and Arnold Mackler, of St. Louis, who exchanged between them on a bonus wire 4,248 messages in six days, an average of 708 per day, or 78 per hour, for the week.

These records Mr. C. H. Finley, chief operator, Chicago, informs us are authentic. "We are proud of these men," says Mr. Finley, "and very much appreciate not only their remarkable ability, but their spirit of co-operation in emergencies."

Philadelphia Telephone Society.

The eighty-seventh meeting of the Philadelphia Telephone Society was held at Scottish Rite Hall, in that city, Tuesday evening, February 4. Many officials and some 1,500 employes from every section of the Central Division of the Bell organization were present.

The meeting was opened by president H. C. Kunkle, superintendent of plant, Eastern Division. Two hundred and sixty-six new members were enrolled at this meeting, the largest number admitted at one time in the history of the society.

Mr. F. H. Bethell, president of the Bell Telephone Company of Pennsylvania was the principal speaker of the evening. He was introduced by Mr. J. H. Hons in a few well-chosen remarks, although, as Mr. Hons said, Mr. Bethell needed no introduction. The enthusiastic and prolonged applause which greeted "our president" when he mounted the platform plainly showed the place he retained in the hearts of all the employes.

Mr. Bethell, after congratulating the society and its various committees on their splendid organization, spoke on various subjects, and concluded his address by asking the employes to continue doing their best, and in so doing would in the end bring victory.

He was followed by Mr. H. F. Thurber, vice-president of the company, New York. Mr. Thurber related the story of the origin of the telephone societies and how the realizations have far exceeded the most optimistic expectations of the originators, the good feeling created by personal acquaintance being a big factor in co-operation.

Mr. Ford Huntington, treasurer of the company, was next called upon. He was surprised at the large attendance of the employes of the Central Division, and complimented them on their progress and enthusiasm, which, he said, seemed to refute the appellation of "Sleepy Philadelphia."

Mr. M. H. Buehler, vice-president and general manager of the Chesapeake and Potomac Company, Baltimore, Md., and Mr. L. H. Kinnard, vice-president and general manager. of the Bell Telephone Company of Pennsylvania, also made a few remarks. The latter, who was recently elected vice-president, was given an ovation.

At the conclusion of Mr. Kinnard's address, the gathering adjourned to another room, where an excellent performance was given by the Blue Bell Orchestra and Glee Club. These two organizations are composed entirely of employes of the American Telephone and Telegraph Company, and associated companies in the Eastern group, the Western Electric Company and the Western Union Telegraph Company.

Much credit for organizing the musical entertainment in the limited time allotted is due to Prof. Hotz, singing director, and Mr. Shannon, an employe of the Bell Company, musical director.

The attendance was composed of employes from the Bell Telephone Company of Pennsylvania, the American Telephone and Telegraph Company, the Delaware and Atlantic, and the Diamond State Telephone Companies, the Western Electric Company, and the Western Union Telegraph Company, and all expressed much pleasure with the meeting and entertainment.

Among the out-of-town visitors were the following: New York—F. H. Bethell, Ford Huntington, J. S. Wiley, H. F. Thurber, F. L. Devereux, J. A. Stewart, T. P. Sylvan and Messrs. Allen, Carpenter and Sherwood. Baltimore—M. H. Buehler, J. R. Y. Savage, F. C. Kenworthy and George H. Warren. Harrisburg, Pa.—J. L. McKay. Reading, Pa.—C. W. Symons; also many other Bell employes from Pittsburgh, Harrisburg, Trenton, Wilmington, Atlantic City and other points in the division. The committee in charge was composed of P. C. Staples, F. I. Daly and J. L. Kilpatrick, chairman.

Facts About the Modern Dry Cell.

The manufacture of the common dry cell engages the attention of forty or more separate companies and the magnitude of the industry is little appreciated by those not familiar with it, says the *Electrical World*. A year's production of dry cells in this country approximates over $10,000,000 in value. At the present time it is probable that over 50,000,000 standard 2.5-inch by 6-inch batteries are manufactured yearly, 5,000,000 flash-lamp batteries consisting of approximately 15,000,000 single cells 13/16 inch by 2 5/16 inch, and about 2,000,000 other cells of special sizes. The present type of dry cell consists of (1) a zinc container, or negative pole, (2) a paper, or porous partition, between the positive and negative poles, and (3) a positive pole comprising a rod of carbon surrounded by a mixture of manganese dioxide, ground carbon and electrolyte. The zinc container is rolled from zinc 0.020 inch thick; the paper partition may consist of three layers of thin blotting-paper or a single layer of heavy pulp board; the positive pole mixture consists of pyrolusite (85 per cent manganese dioxide), 100 parts by weight; ground coke, eighty parts; artificial graphite, twenty parts; sal ammoniac, twenty parts, and zinc chloride seven parts. The manganese dioxide acts as the depolarizer; the ground carbon which is next to the paper separator collects the current at the periphery of the mixture and conducts it by means of the other carbon particles to the center carbon plug; the graphite is employed to reduce the internal resistance; the sal ammoniac is the electrolyte, while the zinc chloride is used only to improve the life of the cell by reducing local action. The zinc container is the most expensive part of the cell, and the total manufacturing cost has been given by one authority as approximately eight cents per cell.

SNOWSTORM DAMAGE TO WIRES IN ENGLAND.—During recent snowstorms in the northeastern part of England, 1,600 miles of telegraph and telephone wires were down, and for several days Newcastle-on-Tyne was practically isolated except for the limited underground service.

The Collins Overland Line to Europe.

In 1860 Perry McD. Collins, American commercial agent to Russia, conceived the idea of building an overland telegraph line from the United States via Behring Strait and Asiatic Russia, to Europe. Prominent Americans entered into the project with great zeal, Secretary of State W. H. Seward being among them. The proposition to construct the Russian-American Telegraph was submitted by Mr. Collins to the Western Union Telegraph Company, September 28, 1863, and he requested the acceptance of his project to connect Europe and America by the way of Behring Strait, and offered to transfer his rights and privileges if his proposition were accepted within twenty days. The terms were unanimously accepted by the board of directors, and steps were immediately taken to start the enterprise. Following were the officials of the expedition: Charles S. Bulkley, engineer-in-chief. Land Service—Frank N. Wicker, chief; Henry P. Fisher, surgeon-in-chief; Scott S. Chappel, chief quartermaster; Geo. M. Wright, adjutant and secretary; John F. Lewis, chief draughtsman: Frederick Whymper, artist; Eugene K. Laborou, chief interpreter; Lawrence Conlin, chief carpenter. American Division—Edmund Conway, chief; J. W. Pitfield, agent. British Columbia—F. A. A. Billings, assistant quartermaster; Henry Elliott, clerk; Frank L. Pope, chief-of-explorations in British America; J. Trimble Rothrock, first assistant; James L. Butler, second assistant; Ralph W. Pope, operator; Robert Kennicott, chief of explorations in Russian America; W. H. Ennis, first assistant; Thomas C. Dennison, quartermaster; Lewis F. Green, engineer. Siberian Division—Serge Abasa, chief; Geo. Kennan, quartermaster; J. A. Mahood, chief of explorations in lower Siberia; Richard J. Bush, secretary; Collins L. MacRae, chief of explorations in upper Siberia; A. S. Arnold, quartermaster; Alexander Harden, interpreter.

Work was being prosecuted with great vigor when the "Great Eastern" succeeded in establishing cable connection between Europe and America. The overland line was at once abandoned, and all the men and fleets engaged in the work were recalled. The Western Union Telegraph Company assumed the loss.

MAINTENANCE OF BATTERIES.—In the maintenance of gravity batteries, fresh water should be added as often as necessary to keep the zincs in the cells completely immersed at all times, and blue vitriol should be dropped into the jar as it is consumed, care being taken that it goes to the bottom. The blue color of the liquid should be kept as high as the top of the copper, but must never reach the zinc. When the quantity of sulphate of zinc in solution becomes too great, a portion of the top of the liquid should be drawn with a syringe and replaced with clean water. A hydrometer is convenient to test the strength of this solution. When the specific gravity is less than 15 degrees there is too little sulphate of zinc; when it is 30 degrees or over, there is too much in solution, and it should be diluted. When the zincs become coated with sulphate so as to interfere with the action of the battery they should be taken out, scraped clean, and washed. A zinc should last at least two months. A main line battery should not consume more than one and one-half pounds of sulphate of copper per month per cell, and a local not more than two pounds per month.

Ball of Boston Mutual Aid Society.

The annual ball of the Boston Telegraphers' Mutual Aid Society was held January 31, and was largely attended.

Mr. J. B. Gatins, president of the society, introduced Mr. Denny Martin, of Pittsburgh, Pa., as a past-member of the society and one of the pioneer telegraphers of the United States.

President Gatins and Mrs. Gatins received the guests, with the assistance of J. J. Hannon, vice-president; W. H. Sullivan, secretary; C. A. Hart, assistant secretary; and F. M. Kelliher, sergeant-at-arms. Floor director P. J. Molloy and his wife led the grand march.

As usual, this annual event brought together fully one thousand prominent telegraph people.

Telegraphers of Today.

An excellent opportunity is offered to telegraph people in general to become acquainted with over 600 prominent telegraph officials and others identified with the telegraph, the railroad, the submarine cable and press associations of the past generation, through their portraits and sketches of their careers as published in "Telegraphers of Today."

This work was issued in 1894 and includes photographic engravings and biographical sketches of all the individuals connected with the interests mentioned at that period, many of whom have passed away from their earthly labors. The younger generation, however, will find much of interest in looking upon their portraits and reading of their achievements in life. Many of them are still alive and in harness in the telegraph and other fields of activity.

Mr. J. J. Ghegan, president of J. H. Bunnell & Co., New York, who recently received a copy, expresses his appreciation of the work as follows: "Copy of 'Telegraphers of Today' received. I casually saw a copy of the book when first published, but never had I an idea that it was so beautiful, interesting and historically accurate. It should be of great interest to telegraphers with any sentiment in their make-up. It is magnificent, unique, and I truly pity those of the fraternity who fail to secure a copy before the edition is exhausted. Kindly send me five additional copies. I can use them to good advantage."

This book, which is 11½ x 14 inches in size, was originally published at $5 per copy, but in order to close out the remaining copies we offer them at $1 per copy by express, charges collect.

Address orders to J. B. Taltavall, Publisher, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

BUSINESS NOTES.

Mutual Investment Association of the Postal Company, New York.

The annual meeting of the Mutual Investment Association of the Employes of the Postal Telegraph-Cable Company, New York, was held at 253 Broadway, February 1.

The balance sheet for 1912 shows the association to be in a highly prosperous condition. There are 146 members, or shareholders, and the value of each share on February 1 was $357.44. The assets show cash in bank and on hand, $1,592.77; investments, $28,414.75; loans and accounts receivable, $39,930.31—Total, $69,937.83, which is $5,375.09 in excess of liabilities.

In his annual report to the members, Mr. Edward Reynolds, treasurer, emphasizes the value of membership in the association, as an encouragement to thrift.

"We have done much," he says, "to develop the habit of saving systematically, as evidenced by the fact that we have retained our full membership. Our success has resulted in the formation of similar associations in other cities.

"In addition to the savings deposited with our association, a number of our members have been encouraged to invest additional savings in building loan associations and in outside securities.

"Through the fund created by the deposits of our enrolled members, we have been enabled to carry on a successful warfare against the salary loan concerns, that for years preyed upon our people. This work, which at the outset was regarded as of secondary importance has, I think, become our most important business.

"We have stamped out the 'loan shark' evil in New York City and are dealing with it effectively in all the large cities throughout the Postal system. We have won the confidence of the staff and their co-operation in this work. We have steadfastly adhered to the plan of making all loans an a basis of six per cent per annum interest without demanding a pledge, thus placing the borrowers upon their honor."

Mr. Reynolds in closing his report, states that the association is in a sound, healthy condition.

The Mutual Investment Association of Chicago has been organized, and is now in full operation. It is patterned after the New York association, and is meeting with hearty support.

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, Telegraph and Telephone Age, 253 Broadway, New York.

Meetings of Associations, Societies, etc., During 1913.

Association of Railway Telegraph Superintendents, at St. Louis, Mo., May 20. Secretary, P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill.

Telegraphers' Mutual Benefit Association, at New York, March 12. Secretary, M. J. O'Leary, 195 Broadway, New York.

Magnetic Club, New York, April 19. Secretary, W. B. Dunn, 253 Broadway, New York.

International Association of Municipal Electricians, at Watertown, N. Y. Secretary, Clarence R. George, city electrician, Houston, Tex.

Old-Time Telegraphers and Historical Association and Society of the United States Military Telegraph Corps, at Detroit, Mich., August 25, 26 and 27. Secretary of the Old-Timers, F. J. Scherrer, 30 Church street, New York; secretary of the Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

Telephone Pioneers of America, at Chicago, Ill., October 16 and 17. Secretary, Henry W. Pope, 30 Church street, New York.

T. M. B. A. Assessment.—Assessment No. 547 has been levied by the Telegraphers' Mutual Benefit Association to meet the claims arising from the deaths of P. Harrison, J. G. Geddes and L. L. Meloche at Brooklyn, N. Y.; A. J. Locke at Claremont, N. H.; S. S. Stevens at Providence, R. I., and Augusta Day at Flushing, N. Y.

Prince Edward Island's Vote for Wilson.—During the last presidential election a fund was made up in a certain small hamlet to defray the cost of getting the returns. The operator, who was not experienced in that line of work, prepared the results in a tabulated list of States, in which appeared, "For Wilson, Prince Edward Island, 14."

The Telegraphers' Mutual Benefit Association, 195 Broadway, New York, enables telegraph and telephone employes to provide for their families life insurance in reasonable amounts, at a cost so low as to be within the reach of all. It has already paid beneficiaries of deceased members $1,650,000, at an average annual cost per $1000 of about four cents a day, and has also accumulated $328,000 Reserve Fund securely invested to provide against excessive cost in the future. Membership is easily acquired and cannot be invalidated during life for any cause except failure to pay the necessary mortuary calls.

Telegraph and Telephone Age

No. 5 NEW YORK, MARCH 1, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Household Electrical Appliances.

Before the novice attempts to install household electrical appliances, such as burglar-alarms, call-bells, etc., it would be well to acquire at least a general knowledge of the meaning of the principal terms used by manufacturers in describing the circuits and the manner of installing the various apparatus.

For instance, references are usually made to "metallic" circuits, "open" circuits, and "grounded" circuits. Batteries are also classified as "open" or "closed" circuit batteries. Sometimes they are further qualified as being "quantity" batteries, "constant current" batteries, etc.

Obviously a knowledge of why different types are selected for different classes of circuits should guide one in making a proper selection of material for his outfit.

OPEN CIRCUIT BATTERIES.

Batteries are divided into two principal classes: (1) those which are able to furnish a practically constant volume of current in the circuit for continued service, and (2) those which furnish a contantly diminishing volume as the time of service lengthens.

The former type are called closed circuit, or constant-current batteries, because they will operate efficiently on constantly closed circuit. The latter are called open-circuit batteries, because it is necessary that they be disconnected from the circuit, that is, left open when not in use in order to recover their normal strength after an extended period of continuous operation.

All dry batteries belong to this class, while the

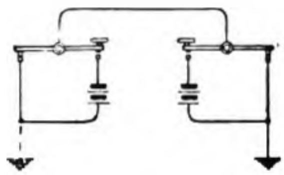


FIG. 1—OPEN BATTERY CIRCUIT.

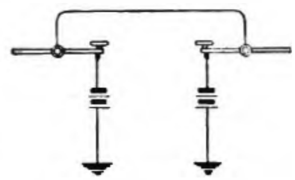


FIG. 2—CLOSED BATTERY CIRCUIT.

bluestone gravity battery represents the highest type of the closed circuit cell.

The reason why dry batteries grow weaker while closed is that the liberated gases developed within the cell (due to chemical action) settle on the electrodes, and by thus covering much of the metal sur-

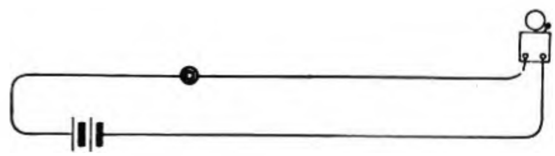


FIG. 3—SIMPLE BELL CIRCUIT.

face diminish the intensity of the cell's action. To make matters worse, the two gases thus accumulating on opposite plates constitute a battery in themselves having positive and negative poles of its own, which exert their strength in direct opposition to that of the battery itself. Consequently, we have a

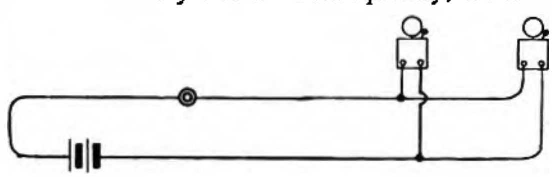


FIG. 4—CIRCUIT WITH TWO BELLS AND ONE PUSH BUTTON.

"counter electromotive force" within. The cell is then said to be "polarized."

OPEN AND CLOSED CIRCUITS.

To meet these limitations of batteries we must

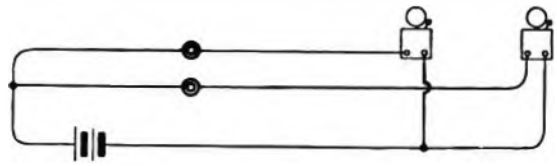


FIG. 5—TWO BELLS AND TWO PUSH BUTTONS.

construct what are called open or closed battery circuits.

Fig. 1 shows the wire and battery connections of an open circuit. In this circuit the battery is open and idle at all times except while a signal is actually being made. The word "open" refers to the battery, not the line—the latter being closed at all times, either through the battery or through the ground terminals.

The primary object of open-battery circuits is to avoid unnecessary expenditure of electric energy. Example: A burglar or fire-alarm battery so connected may not be called into service for several months or a year, hence. there is no waste. Had the closed-circuit plan shown in Fig. 2 been installed, energy would have been expended during the entire period.

The electromotive force of each dry cell is about one and one-half volts, that of a gravity cell one volt, while storage cells furnish two volts each when fully charged.

A knowledge of these facts is necessary in order to determine just how many cells are required for the services demanded. For bell and buzzer circuits between rooms in the house two cells of dry battery are usually sufficient, and four or six ohm bells are used.

BELL OR BUZZER CIRCUITS.

The manner of arranging and connecting the apparatus in these circuits depends upon what one wishes to accomplish. If it is desired to ring a bell in one room from a push-button located in another, the connection may be made as shown in Fig. 3.

In this case you would require two cotton-wrapped copper wires of the same length, one push-

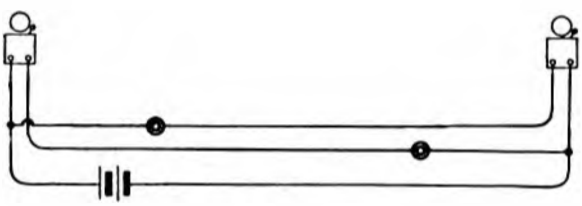


FIG. 6—RETURN CALL CIRCUIT.

button, one bell, and one or two cells of dry battery. Just twist the two wires together in rope form, and string them along the surbase (or wherever is most convenient) between the room in which the bell is located and the battery. Then connect the two conductors to the two binding-posts of the bell and the opposite ends of the conductors to the battery terminals. All that then remains to be done is to cut one of the conductors where the button is located and connect the ends to the terminals of the button. This will constitute a metallic circuit and stand open at all times except while the button is being pressed.

If two bells are to be rung simultaneously from one push-button the second bell may be connected across the two wires without cutting either of them, as shown in Fig. 4.

When it is desired to ring two bells separately, without increasing the battery, two push-buttons and a third wire are required, and the connections may be made as in Fig. 5. In this case the left-hand connections of both push-buttons are joined by wire to the same pole of the battery, while the right-hand posts connect with the left-hand terminals of the bells.

In the arrangements so far shown no means are provided for sending in a return call or signal to indicate that the original signal was heard. When such a signal is desired the circuit may be arranged, as shown in Fig. 6.

There are of course various other methods of arranging the circuits, but the examples illustrated, together with the general information given, should encourage novices to make a few home experiments, and, incidentally, stimulate the desire for further electrical knowledge.

Telegraph and Telephone Patents.

ISSUED FEBRUARY 4.

1,051,894. Special-Call Telephone System. To A. E. Keith, Hinsdale, Ill.

1,051,989. Harmonic Party-Line Telephone Ringer. To C. J. Erickson, Chicago, Ill.

1,052,162. Sanitary Telephone Mouthpiece. To J. McCausland, Providence, R. I.

1,052,219. Automatic Telegraphy. To P. B. Delany, South Orange, N. J.

1,052,330. Primary Battery. To G. S. Engle, Providence, R. I.

1,052,443. Telephone-Receiver Holder. To A. Orzechowski, Stamford, Conn.

ISSUED FEBRUARY 11.

1,052,513. Telegraph System. To E. Pope, Quebec, Canada.

1,052,548. Telegraph Transmitter. To J. E. Wright, New York.

1,052,849. System of Radiotelephony. To W. Schleemilch and P. E. Pichon, Berlin, Germany.

1,053,042. High-Speed Telegraph System. To C. Kindley, Chicago, Ill.

1,053,048. Selective Telephone-Call System. To O. N. Lindsey, Senatobia, Tenn.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, February 24:

American Telephone and Telegraph Co.	132
Mackay Companies	84
Mackay Companies, preferred	68
Western Union Telegraph Co.	66½

PERSONAL.

Mr. Thomas A. Edison has, according to a dispatch from St. Petersburg, accepted an invitation to visit Russia. He will be the guest of the Grand Duke Alexander Michaelovitch.

Mr. Godfrey Isaacs, managing director of the Marconi Wireless Telegraph Company, of England, has begun a libel action against Cecil Chesterton, editor of *The New Witness*, London, on account of articles in that publication directed against Mr. Isaacs primarily in his capacity as managing director of the Marconi Company, but also against him in a personal sense.

ANNOUNCEMENT has been made of the engagement of Miss Myrtle M. Reed, daughter of Mr. Robert T. Reed, formerly superintendent of the Western Union Telegraph Company at Seattle, Wash., to Mr. William Lyle Dudley. Miss Reed has just returned from Europe, where she has been for the past two years studying music.

MR. DAVID HOMER BATES, secretary of the Society of the United States Military Telegraph Corps, New York, gave a lecture February 15, before the Synagogue House, New York, entitled "Personal Reminiscences of Lincoln and the Telegraph Office." Mr. Bates was manager of the War Department telegraph office during the civil war.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. EDWARD REYNOLDS, assistant to the president, has returned from a trip of inspection through the Eastern Division.

MR. E. B. PILLSBURY, general superintendent, New York, has returned from San Juan, Porto Rico, where he spent his vacation. He was the guest of Major Read, of the United States Army, living at Castle San Geronimo, within the fortifications. Mr. Pillsbury inspected the insular telegraph and telephone lines and central offices. The equipment, he says, is patterned after the American systems, and they are a credit to those who installed and managed them. Mr. Pillsbury found the operators and others identified with the service of a high grade of ability and intelligence. The Spanish operators use typewriters with great facility. The system operates 62 stations, and last year handled 247,680 telegrams. Commissioner John A. Wilson, of the Interior Department, who has charge of the telegraphs and telephones of Porto Rico, entertained Mr. Pillsbury at breakfast. Mr. Wilson was formerly superintendent of construction of the Southern Division, of the Western Union Telegraph Company, and was later superintendent of the Pittsburgh and Allegheny Telephone Company at Pittsburgh, Pa. He is doing splendid work on the highways and other public works in Porto Rico.

MR. M. M. DAVIS, electrical engineer and chief engineer of telephones, New York, started this week on a trip to Chicago, Omaha, Denver and several other points in the Western Divsion, on company business.

MR. M. F. GEIGLE, formerly chief clerk to superintendent C. F. Leonard, has been appointed manager of the messenger department, New York, vice John Hennessy, deceased. Mr. J. C. Geigle, succeeds his brother M. F., as chief clerk to superintendent Leonard.

MR. J. F. MICKEL, of the Altoona, Pa., office, has been appointed manager at Warren, Pa., to succeed W. F. Zarman, resigned to accept a position with the Travelers' Insurance Company at Erie, Pa.

MR. H. T. MASON, assistant chief operator at Albany, N. Y., has been advanced to the position of chief operator, vice C. C. King, deceased.

MR. J. HOFFMAN has been appointed manager of the Orange, N. J., office to succeed Mrs. H. L. Ditmas.

ATTEMPTED ROBBERY IN NEW YORK.—While Mr. W. H. Michener, manager of the Fulton Market office of this company, was on his way to the main office on February 18 to deliver his receipts for the previous day, he was attacked by Fred Hilpl, a former messenger in the Fulton Market office, with a view to robbery. Hilpl called at Mr. Michener's office, and told his former employer that he had prospered, and induced Mr. Michener to ride with him in an automobile to the company's headquarters with the money. At the corner of Broadway and Fulton street the young man murderously attacked Mr. Michener with a chisel, but the latter called for help and Hilpl was arrested. Mr. Michener received a chisel cut on the forehead.

C. C. KING, aged 66 years, chief operator for this company at Albany, N. Y., died of pneumonia on February 15. He had been in the service of the company for twenty-seven years. Among those who attended the funeral were Messrs. E. Reynolds, assistant to the president, and E. Kimmey, superintendent, New York. The officials and employes sent handsome floral pieces. The services were held in the Masonic temple, the pall-bearers being past-masters of the lodge of which the deceased was a member.

AN UPTOWN OFFICE has been opened in Pasadena, Cal., separate from the one at the Southern Pacific station. Mr. M. Rosenquist is manager.

GIRL MESSENGERS IN OMAHA.—Seven girl messengers have recently been employed in the Omaha office of this company. Mr. G. A. Wolf, manager, states that if the experiment proves successful he will employ more girls. The girls do not work nights. They will be taught telegraphy and thus fitted for advancement. The experiment has been endorsed by the Woman's Club.

MAGNETIC CLUB DINNER.—The twenty-fifth anniversary of the Magnetic Club will be celebrated by a dinner at the Broadway Central Hotel, New York, April 19, the club having been organized April 19, 1888. The privileges of the club are being extended to all past-members, and a programme of special interest will be prepared.

DEMONSTRATION OF THE POLLAK-VIRAG SYSTEM OF HIGH-SPEED TELEGRAPHY.—The Pollak-Virag system of high-speed telegraphy was described and shown in practical operation at the meeting of the New York Electrical Society, February 17. Mr. V. Lorenc, an associate of Dr. Pollak, co-inventor of the system, gave an informal description of the apparatus, and was followed by Dr. Pollak, who gave a practical demonstration of its operation. An apparatus resembling the typewriter is used for the first operation in the transmission of the message. This instrument punches holes in a tape, after which the tape is placed in the transmitter and the message is delivered to the receiving station and automatically printed in ordinary script. A reception for President Henry L. Doherty was held in the rooms of the American Institute of Electrical Engineers after the technical part of the program had been completed.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

MR. THEO. N. VAIL, president of the American Telephone and Telegraph Company and of the Western Union Telegraph Company, left New York for Jekyll Island on February 24, where he will meet his yacht, the "Speedwell," and then cruise in the West Indies for two months.

MR. THEO. N. VAIL, in behalf of the American Telephone and Telegraph Company, has made a gift amounting to $25,000 to the Massachusetts Institute of Technology, Boston, to be devoted to the care, cataloguing and maintenance of the Dering electrical library presented to that institution by Mr. Vail last summer, also to the purchase of new books. It is stated that Mr. Vail will, in behalf of the company, later provide an endowment for research in electricity, and support it for five years.

MESSRS. NEWCOMB CARLTON and Belvidere Brooks, vice-presidents; G. M. Yorke, general superintendent of plant, and W. N. Fashbaugh, general superintendent of traffic, left New York, February 24, on a trip of inspection through the South. They will go as far as Texas, and will return to their offices in about three weeks. Mr. W. C. Merly, chief clerk to vice-president B. Brooks, accompanies the party.

MR. E. M. MULFORD, general manager Gulf Division, Dallas, Tex., was a recent New York visitor on company business.

MR. F. D. GILES, of the general manager staff, Eastern Division, New York, has returned from Halifax, N. S., where he has been for the past two weeks on company business.

MR. J. E. COX, for ten years night chief operator of this company at Chattanooga, Tenn., is now attached to the plant department of the company at Chicago.

MR. E. H. DAVIS, of Niagara Falls, N. Y., has been appointed manager of the Brattleboro, Vt., office of this company.

MR. E. PAYSON PORTER, a forty-niner of the telegraph, and the first person to ever use the typewriter in connection with telegraph work, which he did in the late sixties, has left New York City to make his home in Geneva, N. Y.

A. D. T. ANNUAL REPORT.—The report of the American District Telegraph Company, of New York, for the year ended December 31, 1912, shows gross earnings of $689.379, an increase of $81,626 compared with a year ago. Expenses were $575,-639, leaving net earnings of $113,740, compared with $110,569. All of the present officers were re-elected.

W. A. Stokes, Manager, Macon, Ga.

Mr. William Arthur Stokes, whose appointment as manager of the Macon, Ga., office was announced February 16, was born in Hampton County, S. C., May 6, 1865, and entered the telegraph service in Allendale, S. C., in September, 1883. He has since held various positions with the Western Union Telegraph Company and in the railway service. He was with the Central of Georgia Railway, and the Atlanta, Birmingham and Atlantic Railway prior to his last entrance into the Western Union service at Atlanta, Ga.

REHEARING IN THE "ADDED WORD" CASE.—The Western Union Telegraph Company has filed a petition with the Public Service Commission, Second District, New York, for a rehearing in the case of the Postal Telegraph-Cable Company against the Western Union in regard to the charge by the latter for the word "via" and the name of the transfer point when a message is transferred from the Postal to the Western Union lines to be forwarded to a point not reached by the Postal lines. If the petition is not granted the case will be carried up through the courts.

THE CABLE.

MR. T. F. FOLEY, cable supervisor Central Cable office, 16 Broad street, New York, has been promoted to be chief cable supervisor. Mr. H. C. Smart, of the same office, has been promoted to be cable supervisor to succeed Mr. Foley.

CABLE DIVIDEND.—The American Telegraph and Cable Company has declared the regular quarterly dividend of 1¼ per cent, payable March 1.

CABLE RATES TO AND FROM CHINA.—Negotiations between the Chinese Government and the cable companies have resulted in a reduction of fifty-three per cent in the cable rates between China and Europe. The new rate will be seventeen cents a word, American money.

THEORY OF THE SUBMARINE TELEGRAPH CABLE —Mr. Bela Gati, manager Royal Hungarian Telegraph and Telephone Experiment Station, Budapest, Hungary, has issued in pamphlet form a letter from him to a London electrical paper on "The Theory of the Submarine Telegraph Cable." It is a mathematical discussion of the subject.

NEW CABLE CONNECTION FOR PORTO RICO.—Permission has been granted by the United States Government to the French Cable Company, to divert one of its near-by cables to San Juan, Porto Rico. This will be an all-cable route to New York and to all parts of Europe, as well as to all parts of the West Indies, Brazil, Venezuela and the Guianas. At present the only cable outlet for Porto Rico business is via the West India and Panama Cable Company.

THE COMMERICAL CABLE COMPANY'S steamer, "Mackay-Bennett," Captain Larnder, is at present engaged in cutting out the Coney Island cables and joining them to the new Far Rockaway station. Four cables have thus far been transferred, and the work of transferring the remaining three cables is being proceeded with. The Far Rockaway station is now occupied. The facts concerning this work will be found in the annual report of the Mackay Companies, which is printed on another page of this issue.

CABLE-LETTER SERVICE TO HAVANA.—Cable-letter service has been extended to Havana, Cuba, by the Western Union Telegraph Company, taking effect March 1, on the basis of a charge of $1.00 for twenty words, and five cents for each additional word, written in plain language of the country of origin or destination. This means that messages may be written in English or Spanish. These rates apply between New York, Jacksonville, Miami and Key West as cable stations. The rate from inland offices will be somewhat higher.

SUBMARINE CABLE WITHOUT INSULATION.—The sending of telephone messages over a bare iron cable submerged in the sea has been successfully accomplished, according to a recent report. The experiment is said to have taken place over a cable laid between Seattle, Wash., and Vashon Island, a distance of eleven miles. Ordinary telephone apparatus was used, and the test resulted in the clear transmission of speech and the reproduction by megaphone of a phonograph record. Mr. Alfred Williams, an Englishman, of Seattle, who conducted the experiment, believes that transmission was made possible by the fact that the submerged cable was entirely sheathed with bubbles of hydrogen produced by a polarizing current.

S. J. Goddard, European Representative, Western Union Cable System, London.

Mr. Stanley J. Goddard, whose appointment as European representative of the Western Union cable system, with headquarters at London, England, was announced in our January 1 issue, was born in London in 1863. In 1880 he entered the office of a London firm which acted as auditor for the National Telephone Company. Later he became auditor of the accounts of the National and United Telephone Companies and performed this duty until he entered the service of the National Telephone Company in 1892. He was then appointed the head of a newly created audit department, and in 1893 he became assistant to the general manager, a position involving many details of all degrees of magnitude. During his occupancy of this position the company's affairs grew rapidly in volume, and many new business methods were introduced. In 1907 he received the appointment of general manager of the National Telephone Company, and under his administration the company introduced the principle of measured rate throughout its territory, and at the time of handing over the telephone plant to the British Post-Office, the majority of its subscribers were working on a measured rate basis. For the last year Mr. Goddards's energies, in conjunction with those of the other chief officers, have been engaged almost entirely on the arbitration with the government on the subject of the price to be paid for the company's plant, which was taken over by the government January 1, 1912.

CANADIAN NOTES.

Telegraph Business in Canada in 1912.

Over ten million messages transmitted in 1912 is the record of the telegraph companies of Canada, according to the annual report of the Canadian Railways and Canals Department. Of this number the Western Union Telegraph Company transmitted a number sufficient to give a revenue of $354,888 for the year. The value of equipment and real property possessed by the various telegraph companies amounted to a total of $184,149,677. Of the 168,017 miles of lines, 254 miles were underground and 689 miles submarine cable.

MR. W. J. CAMP, assistant manager of the Canadian Pacific Railway Company's Telegraph, Montreal, Que., states that telephone dispatching circuits are to be installed on the following divisions of that road as soon as the material can be obtained: Montreal terminals, 21 miles; Montreal to Mont Laurier and St. Therese to Ottawa, 261 miles; Ottawa to Prescott-Waltham-Maniwaki and Montreal (short line), 330 miles; Winnipeg to Souris, 149 miles; Calgary to Edmunton, 195 miles; Calgary to McLeod, 108 miles; Lethbridge to Crow's Nest, 101 miles; a total of 1,165 miles. This, added to circuits already installed, gives a total of 6,027 miles of telephone train-dispatching circuits on this railway system.

THE CANADIAN TELEGRAPH INQUIRY.—The final hearing of the general inquiry into telegraphs by the Board of Railway Commissioners for Canada was held in Ottawa, February 10 to 13, inclusive. Mr. G. D. Perry, general manager of the Great North Western Telegraph Company, Toronto, continued his evidence regarding that company and Mr. A. B. Smith, general manager of the Grand Trunk Pacific Telegraphs, Montreal, gave details of the operation of that company. The auditor of the Canadian Northern Telegraph Company gave evidence regarding its operation, and Mr. W. J. Camp, assistant manager Canadian Pacific Railway Company's Telegraph, Montreal, continued his evidence and cross-examination for that system. Argument by counsel was deferred to some future date to be set when counsel is ready, but no more evidence will be taken.

OBITUARY.

ALONZO D. CHAMPNEY, aged 71 years, a former telegrapher, died in Rockland, Me., February 5. He enlisted in the civil war, and was afterwards engaged in the drug business. He was in the Western Union service in Rockland for many years.

MR. FRANCIS W. JONES, formerly electrical engineer of the Postal Telegraph-Cable Company, New York, who with his wife is sojourning at West Palm Beach, Fla., for the winter, writes: "It gives me much pleasure to again renew my subscription to TELEGRAPH AND TELEPHONE AGE, as its semi-monthly perusal keeps me in touch with many old friends whom I hold in high regard, as well as affording me a glimpse of the wonderful progress that is being made in the world of electric communication."

THE TELEPHONE.

MR. THOMAS A. WATSON, Dr. Bell's associate in the early development of the telephone, recently repeated at Salem, Mass., his address delivered before the convention of the Telephone Pioneers of America in New York last November. In the audience there were fifty persons occupying reserved seats who attended the original lecture given by Dr. Bell in 1877, thirty-seven years ago. An abstract of Mr. Watson's address was published in TELEGRAPH AND TELEPHONE AGE, December 1, 1912.

MR. E. J. HALL, vice-president of the American Telephone and Telegraph Company, of New York, left for Florida on February 21, where he will spend a month. His headquarters will be at Miami.

MESSRS. W. T. GENTRY, president, and J. Epps Brown, vice-president and general manager of the Southern Bell Telephone and Telegraph Company, Atlanta, Ga., were in New York this week to attend the annual meeting of that company.

MR. H. J. PETTENGILL, an old-time telegrapher, and now president of the Southwestern Telegraph and Telephone Company, St. Louis, Mo., left that city on February 3, with a party of St. Louis business men on a special train and special steamer to visit Panama.

MR. F. O. BRIGGS, of Trenton, N. J., was elected a director of the Bell Telephone Company of Pennsylvania at the annual meeting in Philadelphia on February 19. Mr. Briggs succeeds Mr. P. L. Spalding, who recently resigned as vice-president of the company to become president of the New England Telephone and Telegraph Company at Boston, Mass..

MR. E. C. BRADLEY, vice-president and general manager of the Pacific Telephone and Telegraph Company, San Francisco, Cal., has resigned.

THE SOUTHWESTERN TELEGRAPH AND TELEPHONE COMPANY is reported to have purchased, for approximately $14,000, the Martindale (Tex.) Telephone Company's properties.

TELEPHONES IN CANTON, CHINA.—The Canton, China, government has closed a contract for a complete telephone system for that city, to cost $500,000. The Ericson system will be installed.

SOUTHERN BELL EARNINGS FOR 1912.—The report of the Southern Bell Telephone and Telegraph Company for the year ended December 31, 1912, shows net earnings of $2,703,669, an increase of $424,959.

THE UNITED TELEPHONE AND TELEGRAPH COMPANY has been incorporated in Maine with a capital of $10,000. The following directors are named: D. J. Schuyler, Chas. Weinfeld and Wilson P. Dysart, of Chicago.

CALL-WORDS FOR INSTITUTIONS.—It is proposed to request local telephone companies to substitute telephone call-words in place of numbers for public institutions, such as courthouses, fire headquarters, police stations, the various hospitals, post-offices, etc. It is claimed that this would be a great convenience to the public.

THE MAGNETO-TELEPHONE.—The magneto-telephone is in reality a species of electric-generating machine. The energy required to drive it is furnished by the speaker's voice, and the receiving instrument is a species of electric motor, which reproduces in its diaphragm all the motions of the diaphragm at the transmitting end.

SOCIAL GOSSIP TO BE LIMITED.—The business men of Shelbyville, Ind., complained that they were unable to obtain desired telephone connections. An investigation showed that the delays were caused, for the most part, by the carrying on of lengthy social conversations by women or young people. The manager of the telephone office has ordered that in such cases, service be shut off after the expiration of five minutes' conversation.

MOUNTAIN STATES TELEPHONE REPORT.—The annual meeting of the Mountain States Telephone and Telegraph Company was held in Denver, Col., February 11. The report of president E. B. Field for 1912 shows gross earnings, $6,844,576.25; expenses, $4,331,205.48; net earnings, $2,513,370.77. After deducting dividends for the year of $1,587,334 a surplus of $926,036.77 is left. Messrs. E. M. Burgess and Philip Hamlin were elected to fill the two newly created vice-presidencies.

TELEPHONE DIRECTORS ELECTED.—At the annual meeting of the Chesapeake and Potomac Telephone Company held in New York, February 17, Messrs. C. H. Carter, of Baltimore, Md., and Addison Candor, of Williamsport, Pa., were elected directors in place of W. S. Peirsol and P. L. Spalding, respectively. At the annual meeting of the Central District and Printing Telegraph Company held in Pittsburgh, Pa., February 13, Mr. R. M. Elliott, of Philadelphia, was elected a director in place of Mr. P. L. Spalding, who was recently elected to the presidency of the New England Telephone and Telegraph Company, with headquarters at Boston.

Convention of National Independent Telephone Association.

The sixteenth annual convention of the National Independent Telephone Association was held at the Hotel La Salle, Chicago, February 18 to 20. In his annual address at the opening of the convention president Manford Savage made the following statement concerning the telephone situation:

"After numerous experiments all over the country, the weight of public opinion is decidedly that large farms do not pay, and they are being cut up into small ones every year. Neither statutes nor decisions compelled the cutting up of these immense farms, but the inevitable law of farming operation forced it. I am quite convinced that the same thing is inherent in the telephone industry. We can be no more successful under economics, or under the law, in undue concentration than can the Bell."

Directors were elected for the coming year. They will meet in March to elect officers.

RADIO-TELEGRAPHY.

SIGNOR G. MARCONI is expected in New York early in March.

MR. GODFREY ISAACS, managing director of the Marconi Wireless Telegraph Company, London, England, has been invited to stand as Liberal candidate for Middlesex at the next parliamentary election.

MR. GEORGE S. DE SOUSA, traffic manager of the Marconi Wireless Telegraph Company of America, New York, was married to Miss Clementina Weyman, of Woodhaven, N. Y., on February 3.

MR. A. MOWAT, manager of the Marconi station at Tampa, Fla., has been promoted to the position of superintendent of the Gulf Division of the Marconi Wireless Telegraph Company, with headquarters at New Orleans, La., vice W. F. Wilcox. Mr. N. E. Albee, manager of the Norfolk, Va., Marconi station, has been placed in charge of the Tampa station.

MR. C. W. WATTERS has been placed in charge of the Mobile, Ala., Marconi station, vice R. H. Turner.

NEW MASTS AT GLACE BAY.—Steel tubular masts have replaced the old lattice towers at the Glace Bay wireless station of the Marconi Wireless Telegraph Company.

AMATEUR WIRELESS.—Reginald Glove, a boy of sixteen, living at Rotherham, England, is reported to have been able to transmit to and receive messages from points in Germany, on his amateur wireless apparatus.

NEW OFFICES FOR AMERICAN MARCONI COMPANY.—The Marconi Wireless Telegraph Company of America will move its executive offices to larger quarters in the new Woolworth Building, New York, early in March.

NEW MARCONI FACTORY.—The Marconi Wireless Telegraph Company of America has established a completely equipped factory at Aldene, N. J. A mast 210 feet high has been erected, and another of the same height is to be built for testing purposes.

THE MARCONI BRITISH CONTRACT.—Mr. H. Samuel, the British Postmaster-General, has replied to the request of the Marconi Wireless Telegraph Company to be released from its government contract, stating that he cannot admit that the government's delay has been such as to justify the company's withdrawal from its contract.

WIRELESS BETWEEN ASIA AND NORTH AMERICA.—Wireless communication is to to be established between Asia and North America by the United States and Russian Governments, which will use the Cape Nome, Alaska, and the Anadir, Kamchatka, stations respectively. This service, together with the existing transatlantic radio service, makes possible the transmission of wireless messages around the globe. The two stations mentioned are oneither side of Behring Sea.

WIRELESS BETWEEN ARLINGTON AND HONOLULU.—Wireless communication has been held between the United States Naval wireless station at Arlington, Va., and the Honolulu, H. I., station of the Federal Telegraph Company. The distance covered is 5,600 miles, and the operators were. C. F. Elwell, chief engineer of the Poulsen system, at the Arlington station, and S. S. Maddans, at the Honolulu station.

PORTABLE MILITARY WIRELESS SET.—Experiments with a new portable wireless outfit are reported from Alençon, France, which, if successful, will place the French Army in possession of a very convenient means of intercommunication between the various divisions of an army in the field. The different parts of the apparatus can be carried on the backs of three men, and, it is stated, can be assembled ready for use in three minutes' time.

RADIO-TELEPHONE EXPERIMENTS.—Professor E. L. Chaffee, of Harvard University, referring to the radio-telephonic experiments recently conducted by him, states that speech has been transmitted in a loud and distinct manner for a distance of thirty-five miles without the use of wires. Professor Chaffee also states that the system is exceedingly simple and practical, and that, while no definite experiments have as yet been made as to possible radius of transmission, he believes that the capacity of the apparatus used is as great as several hundred miles.

LONG DISTANCE WIRELESS TESTS.—Latest reports from the scout cruiser "Salem," which has been sent to the Mediterranean to test the transmission radius of the United States Navy wireless station at Arlington, Va., state that, at a distance of 1,200 miles from the Arlington station, distinct communication has been maintained. Weather conditions have been favorable to the experiment, and it is expected that a far greater distance will be attained before communication is cut off. The Narragansett Bay wireless station held communication recently with the steamship "Berlin," which had left Germany the previous day. The same station reports the reception of messages from the Mare Island, San Francisco, station.

WIRELESS COMMUNICATION THROUGH THE EARTH.—For the transmission of wireless messages through the earth rather than through air, the Germans recently established an experimental station at Belzig, consisting of six horizontal radial antennæ from 120 to 300 meters long, each earthed at the outer end and connected to the receiving instrument in the center. Not only were the signals from such as the Eiffel Tower, Norddeich and Poldhu, clearly audible, but British Admiralty messages from Whitehall could be read with ease. Since only one of the antennæ—namely, that extending in the direction of the sending station—picks up messages from it, there is little liability to confusion. The military value of the invention lies in the fact that no mast is required, and that it is merely necessary to lay out a wire in the direction of the sending station in order to communicate with it.

Latest Book on Wireless.

"Wireless Telegraphy and Telephony, Simply Explained," is the title of a recent book by Mr. Alfred P. Morgan. As is usual with most of the writers of books on radio subjects, the author makes his appeal entirely to the amateur and to the casual reader who desires to familiarize himself with the general principles of the science.

The book contains ten chapters as follows: I, Principles of transmission and reception; II, Means of radiating and intercepting electric waves; III, Transmitting apparatus; IV, Receiving apparatus; V. Tuning and coupling; VI, The dignity of wireless telegraphy; VII, The ear; VIII, The telephone; IX, The wireless telephone; X, General remarks.

The descriptive matter is sufficiently complete and comprehensive to give the student a good understanding of the wireless art in theory and practice, and is totally devoid of mathematics. Some good illustrations are used to show the analogy between familiar phenomena and wireless theory.

The book contains 154 pages and 156 illustrations, and besides the information on the two main subjects, there is a great deal of other matter of a kindred nature that will be found highly interesting and instructive. The reading and study of this volume will give one a good general knowledge of wireless telegraphy and telephony, as practiced today.

The price is $1.00 per copy, and copies may be obtained of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York. Books an any other electrical subject may also be obtained at the same address.

Economy in Wireless Messages.

A gentleman on an ocean steamer wishing to send a wireless communication to his wife, but desirous of keeping down the expense, referred her to the Bible passage, "Third Epistle, John 13-14."

Upon receipt of the message, his wife turned to the Bible and read:

"13. I had many things to write, but I will not with ink and pen write upon thee.

"14. But I trust I may shortly see thee, and we shall speak face to face. Peace be to thee. Our friends salute thee. Greet the friends by name."

The wife replied as follows:

"I. Timothy, 5, 23," which her husband translated as follows:

"Drink no longer water, but use a little wine for thy stomach's sake, and thine often infirmities."

Miscellaneous.

NEW MARCONI STATION IN WALES.—The Marconi Wireless Telegraph Company, of England, has started work on the new station at Towyn Bay, Carnarvon, Wales.

TELEPHONE SIGNALLING.—The system of metallic signalling has superseded the system of grounded signalling formerly used on trunk telephone lines, because of the heavy increase in earth currents due to the construction of electric railroads and high potential transmission lines.

WHAT A MAGNETIC FIELD WILL DO.—The telegraph sounder, the telephone transmitter, the electric motor and many other types of electrical measuring instruments are made possible, because of the one fact, that when an electric current is passed through a wire, it sets up a magnetic field about the conductor.

THE MARCONI HONOLULU STATION.—The new station of the Marconi Wireless Telegraph Company at Honolulu, H. I., it is stated will, when completed, be the largest wireless station in the world. It will communicate with San Francisco and to the Philippines. Mr. C. H. Taylor, of the London office, has gone to Honolulu in connection with the work, and Mr. N. H. Slaughter is supervising the construction of the station. The San Francisco station is being constructed under the supervision of Mr. A. H. Rau.

NEW MARCONI STATION NEAR NEW BRUNSWICK, N. J.—The Marconi Wireless Telegraph Company, of America, has purchased 100 acres of land one mile from New Brunswick, N. J., where it will erect the new transmitting station for the Atlantic service. The station at Belmar, N. J., will be used for receiving. The new station will use about 300 kilowatts of energy, and will have thirteen masts, each 400 feet high. Mr. F. M. Sammis, chief engineer of the company, states that work will be started on the new station as soon as the frost is out of the ground.

HEAT COILS IN TELEPHONE APPARATUS.—The heat coil is used for protection against excessive electric currents on telephone circuits in places where a circuit breaker or fuse would not be economical or satisfactory. The essential elements of the heat coil are a thin metal tube containing a small pin held in place by a drop of solder, which has a very low melting point. About the tube is wound a length of german silver wire. The pin is placed so as to hold a stiff spring from contact with a grounded plate. When an excessive current passes through the german silver wire the heat produced melts the solder and displaces the pin, thereby releasing the spring which grounds the line and prevents damage.

RADIO WAVE LENGTHS.—In a paper read by A. H. Taylor, of the University of North Dakota, before the recent meeting of the American Association for the Advancement of Science and Affiliated Societies, at Cleveland, Ohio, the following conclusions with regard to radio wave lengths were announced. An increase in the height of the aerial will cause a corresponding increase in the optimum wave lengths; an increase of power displaces the optimum wave lengths in the direction of longer waves; inefficient aerials will reduce the optimum wave lengths; an increase of absorption will produce an increase in the optimum wave lengths, as will also an increase in radiation efficiency produced by the use of a synchronous rotary spark gap.

Telephone Call-Word "Telegram" Ordered Discontinued in New Jersey.

In our issue for January 16, brief reference was made to the order issued against the New York Telephone Company by the New Jersey Board of Public Utility Commissioners, on the complaint of the Postal Telegraph-Cable Company, to discontinue the use of the word "telegram" as a call-word for the Western Union Telegraph Company. The order directs the New York Telephone Company to assign to the Postal Telegraph-Cable Company and the Western Union Telegraph Company call-words as used by other subscribers and in addition thereto to assign the word "Postal" as a call for the Postal Telegraph-Cable Company, and the words "Western Union" as a call for the Western Union Telegraph Company. The order of the board follows closely the order recently made following investigation of a similar complaint by the Public Service Commission of New York. The order of the New Jersey Commission goes beyond that of the New York Commission in that the New York Telephone Company is ordered to adopt and enforce the rule which will result as follows:

(*a*) If an inquirer asks of an exchange operator for telephonic connection with a telegraph company not subscribing to the exchange, the inquirer shall be informed of the fact of such non-subscription, and of the telegraph company, or companies, subscribers to said exchange, in the alphabetical order in which the names of such subscribing telegraph companies appear in the printed telephone directory.

(*b*) Where an inquiry is made for telephonic connection with a designated telegraph company, and said designated telegraph company does not answer promptly, the inquirer shall be apprised of the situation; and at the inquirer's request so to do, and so only, the exchange operator shall designate the other telegraph companies that can be reached through the exchange, naming them in the order indicated in (*a*).

(*c*) Where an inquirer informs the exchange operator of the inquirer's desire to transmit a telegram, but either fails to indicate the telegraph company to be employed, or expresses indifference thereto, the exchange operator shall desist from directing or advising or designating any particular telegraph company, and shall inform the inquirer that the inquirer must designate the telegraph company to be employed. The operator shall name the company or companies connecting with the exchange, in the same order as designated in (*a*) and shall connect only at the inquirer's specific designation of telegraph company.

THE ELECTRON THEORY OF MAGNETISM.—The University of Illinois, Urbana, Ill., has issued Bulletin No. 62, which contains a very elaborate and complete discussion of the electron theory of magnetism, by Elmer H. Williams, associate in physics. The article goes into the matter very thoroughly, and is a valuable addition to the literature on the subject.

New Method of Making Concrete Poles.

A new process of manufacturing round concrete poles has been patented by Robert M. Jones, of Denver, Col.

The forming machine consists, essentially, of two compression rolls and a belt. The pole is formed by rolling its constituents in the belt; no exterior forms are used. This machine is said to turn out products complete, in 35-foot lengths or less every fifteen minutes, at labor cost not to exceed $1.50 each. Although no forms are used, compression is retained. The rolling process in compression causes a superior tamping effect. The concrete mix is very dry, but the compression it receives brings water to the surface. The mandrel, which is covered with sheet steel made in two parts, remains in the pole until the concrete becomes set. The mandrel and the sheet steel covering, which form the core, are then removed; the pole rests in an undisturbed position from five to eight days.

The ratio of taper adopted is one inch in diameter for each six feet in length. The concrete wall is one and one-half inches in thickness; this arrangement as applied to a pole thirty-six inches in length, produces poles twelve inches outside diameter and nine inches inside diameter at the butt, and six inches outside and three inches inside diameter at the top. The reinforcement centrally located in the concrete wall is composed of 1/4, 5/16, 3/8, 7/16, or 1/2 inch square twist steel reinforcing bars, woven with steel wire warp at 6-inch intervals. The five sizes named will accomplish the desired differences in strengths for application to various service. Reinforcements consist of ten bars of any selected size the entire length, eighteen bars two-thirds of the length, and twenty-six bars one-third the length of the poles.

Pole-step sockets are embedded into the concrete wall of the poles, the steps being removed as the lineman comes down.

Poles and fittings may be produced any color desired. Facilities are provided for connecting cross-arms of wood or structural steel, and other fittings, to these poles in a substantial manner, or a steel-concrete cross-arm may be used.

TELEGRAPH AND TELEPHONE AGE AS AN ADVERTISING MEDIUM.—As a result of a want advertisement in TELEGRAPH AND TELEPHONE AGE, a gentleman desired a copy of an electrical book out of print for many years. He inserted an advertisement in TELEGRAPH AND TELEPHONE AGE, and received many replies. The want advertisement cost him $1.00. He was willing to pay $3.00 for a copy of the book he desired. He paid $1.00 for the advertisement, and secured three copies of the book he wished at $1.00 each. He retained one copy for himself and sold the other two for $2.00 each. He thus secured a copy of the book for nothing, and made a profit of $1.00 on the two books sold. In addition to this, TELEGRAPH AND TELEPHONE AGE took advantage of one of the offers, and obtained a copy of the same work for $1.00.

Protection of Telegraph and Telephone Wires Against High-Tension Currents.

In a paper read by Mr. H. B. Gear, of Chicago, before the convention of the Western Association of Electrical Inspectors, at St. Louis, Mo., January 28-30, that gentleman stated that the possibility of damage to the equipment of telephone and telegraph companies in case of a cross with high-tension lines, as well as the risk of the life of operators, renders very important the proper safeguarding of transmission lines. Various interests, such as telephone companies, telegraph companies and railroad companies operating telegraph systems have proceeded independently to establish specifications which to them seemed necessary to safeguard their equipment at points where they were crossed by transmission lines. Some of these have sought to secure protection by the use of wire cradles or networks suspended in such a way as to catch any broken wires. Some of the railroads have even required the use of a bridge of quite substantial construction to carry the conductors across their right-of-way. The cradle construction has been found objectionable in that the poles were overloaded by the extra weight, and the cradle was quite likely to cause trouble almost as serious as that which it was designed to prevent. The bridge construction, while so strong that it could not fall down, is prohibitively expensive for any except very important lines. The power companies in some cases have refused to provide any protection, claiming that their franchise rights entitle them to as free use of a highway as was accorded by the franchises of the telephone companies, and that the telephone companies should provide protection at their own expense if they considered it necessary. A situation of this class was brought to an issue during the past year between the American Telephone & Telegraph Company and one of the divisions of the Illinois Traction Company, at Lincoln, Ill. In this case a 33,000-volt line was brought along a street where it stood directly above a distributing line of the local Bell Company, some of the poles being so placed that the Bell Company's wires rubbed against them. The telephone company having first established its line on its right-of-way instigated legal proceedings to enjoin the railway company from operating its transmission line. The outcome of this litigation established a precedent which requires the power company to provide the necessary protective equipment to secure the safety of the telephone service.

Mr. Gear explained that the National Electric Light Association held a series of conferences during the year 1911, with representatives of the American Railway Engineering and Maintenance of Right-of-Way Association, the American Institute of Electrical Engineers, the American Electric Railway Association and the Association of Railway Telegraph Superintendents, with a view to establishing a standard specification for crossings which would be acceptable to these various associations and which could be used by all light, power and electric railway companies in making their crossings. These specifications for the most part were adopted at the conventions of these various associations held during 1911 and 1912. There are still some paragraphs which are under discussion and which will, no doubt, be agreed upon during the coming year. The specifications are based upon the general principle that it is more practical to increase the factor of safety of the line itself than to provide auxiliary protective equipment, which decreases rather than increases the factor of safety. The crossing is to be made so strong that it will not come down under the most severe weather conditions which are experienced in any part of the United States. The specifications cover all crossings over railroads and all crossings over telephone lines where the voltage is over 5,000. The transmission wires are to be carried across without turns and at such an elevation as to be above the telephone or telegraph wires. No cradles or bridges are to be used. The crossarms, however, are to be covered on the top with a metallic strip, which is securely grounded, so that the line will be put out of service by the automatic devices at the power house in case there should be a break in the conductor.

Clearances of not less than thirty feet above the rail and eight feet above telephone and telegraph lines are to be maintained. The conductors are to be of stranded copper not smaller than No. 4 B. & S. gauge, or not smaller than No. 1 if of aluminum. There are to be no joints in the crossing span. The poles are head-guyed each way in the span each side of the crossing to prevent wires sagging down in the crossing span in case they should break in any of the spans adjoining the crossing. The strength of the conductor must be sufficient to carry a load of half an inch of sleet under a wind pressure of eight pounds per square foot. The poles or towers must be of sufficient strength to support the strain when a part of the wires are broken.

Jointing Aluminum Wires.

Mr. J. M. Bradley gives, in the *Electrical Review and Western Electrician*, the following method for jointing aluminum wires:

"Cut the wires off square, and place them on a small slab of charcoal with the ends touching. Apply heat from a blow lamp on the two ends of wire. When they are red hot put on a flux made of aluminum hyrate and borax. Heat till wires get pasty: then place ends of wire firmly together. They should then unite freely. Draw off heat and let the wires cool. Then the joint will only want trimming. This joint will stand strain or bending.

True Appreciation of Telegraph and Telephone Age.—Mr. C. H. Jett, chief operator of the Postal Telegraph-Cable Company, Denver, Col., who is accomplishing much good among the members of his force who are inclined to join him in his electrical class, writes that as soon as one of his students reaches the interesting stage in his studies, he sees where he cannot hope to keep up to date without the assistance of Telegraph and Telephone Age.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

E. B. SHERBURNE, Advertising Manager.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, MARCH 1, 1913.

Systematic Reading.

Some idea of the value of TELEGRAPH AND TELEPHONE AGE to telegraph, telephone, cable, railway and many related interests may be obtained from the systematic method with which it is read by the officials and employes. In many foreign countries, and in this country as well, on the arrival of the bundle of papers, the copies are distributed among the heads of the various departments, who paste upon the cover a list of the names of those identified with the department who are required to read the main articles of each issue. The head of the department goes through the paper and marks articles of special interest which he wishes the employes to read and study, and then sends the copy on its mission of instruction. As each person finishes the reading he signs his name on the list, and then turns the paper over to another person, and he to the next, and so on. In this way the copy goes the rounds of the office, and when it returns to the head it bears the signatures of those who have gone through its pages, and absorbed the information contained therein. In this way all concerned are kept posted on the latest news and developments in their line of work.

This is an excellent schooling, and at the same time it is a duty that does not become arduous, because it is performed regularly and systematically.

We recommend this practice wherever it is possible to carry it out. It is beneficial both to the individual and the service. The fact that it is practiced so widely is conclusive evidence that TELEGRAPH AND TELEPHONE AGE is recognized as authority in its own realm of activity.

English Post-Office Engineers' Dinner.

At the annual dinner of the Post-office Engineering Department, London, England, Mr. Herbert Samuel, Postmaster-General, in proposing the toast of "The Engineering Department," said there never has been an occasion when the department was more deserving of toasting; the year 1912 had been a most arduous one for the engineering branch, which had been concerned with the transfer of the telephone undertaking to the state; the amalgamation of the two systems and of the two staffs; the arbitration—the greatest arbitration of its kind that had ever taken place in this country; and the readjustment of their engineering districts. In the present financial year they would spend on construction, renewals and maintenance, a sum of about five and one-half million pounds ($27,500,000). The future development of the telephone service was greatly bound up with the introduction, to a continuously increasing degree, of automatic systems. The experiments that had been made had been very successful, and the department was taking steps to extend the use of automatic appliances. They proposed to make an experiment of a very interesting kind; in some small towns, with less than fifty subscribers, an automatic installation was to be provided which would look after itself entirely. It would merely enable the subscribers to get into touch with the exchange in the nearest large town, and also enable the operators in that exchange to ring up the subscribers in the small place.

Mr. W. Slingo, engineer-in-chief, referred to the wonderful strides which the engineering department had made. The staff increased during the year by the acquisition of the National Telephone Company's staff from 9,000 to 16,000 men.

TRANSMISSION OF PICTURES BY TELEGRAPH.—A new process for the transmission of pictures by telegraph is said to have been invented by M. Carbonelle, of Belgium, in which the finished product at the receiving end is an engraved plate, from which printed copies may be immediately taken. A picture to be transmitted is printed with thick, non-conducting ink and transferred to a revolving cylinder. A stylus electrically connected with the telegraph line passes over the surface of the picture, and the variations of intensity of the current produced by the stylus cause the graver at the receiving end to cut to greater or less depth, thus producing a copy of the original, which may be placed immediately in the printer's form.

ANOTHER WAY TO SPEND MONEY.—One of the newspapers, in commenting on the cheap rates for transferring money by telegraph, states that after March 1 it will be cheaper to send money by telegraph than to keep it in your pocket.

LEASED WIRES TO NEWSPAPERS.—A bill has been introduced in the Arkansas Legislature to prohibit any telegraph company furnishing leased wires to newspapers which hold exclusive franchises from any press association.

Telephone Pioneers of America.

A. P. CRENSHAW.

Mr. Augustus Pemberton Crenshaw, assistant secretary and treasurer of the Chesapeake and Potomac Telephone Company, Baltimore, Md., entered the telephone service September 22, 1878, as inspector for the Bell interests in Washington, D. C., which occupied the field prior to the incorporation of the Chesapeake and Potomac Telephone Company in 1883, and since then has been associated with the latter interest. In the Chesapeake and Potomac service he has held the positions of general superintendent of construction, assistant general manager

A. P. CRENSHAW, (1878) BALTIMORE, MD.

and general superintendent of construction, assistant general manager and division manager and general superintendent of construction (combined), superintendent of construction, acting auditor, secretary and auditor, secretary and treasurer, finally becoming assistant secretary and treasurer of the Chesapeake and Potomac Telephone Company of Virginia, the combined companies covering all of the State of Maryland, the District of Columbia and the State of Virginia, also the larger portion of the State of West Virginia.

Mr. Crenshaw was born in Charles City County, Va., October 22, 1861, and is one of the best-known men in the Chesapeake and Potomac service.

President Lincoln and His War Operators.—Colonel A. B. Chandler, Mr. Charles A. Tinker and Mr. David Homer Bates, secretary of the Society of the United States Military Telegraph Corps, New York, made addresses on President Lincoln at a Lincoln birthday meeting of the New York Genealogical and Biographical Society on February 12. They related their experiences as operators in the War Department during the civil war and with President Lincoln.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What is the best-known conductor?

What is the relative conductivity of iron and copper?

Upon what three properties does the resistance of any body depend?

What is the effect of temperature on the resistance of metals?

What effect has an increase in the length on the resistance of a body?

What is the relation between the cross-section and the resistance of a body?

What is the reduced length of a telegraph line?

With what common mechanical device may a voltaic cell or an electric generator be compared?

Give an idea of the meaning of the word "potential," as applied to an electric current.

What is the meaning of the term "electro-motive force"?

What is an absolute unit of measurement?

To what is the force which is given current traversing a circular arc exercises upon a magnetic pole of given strength situated at its center equal?

From what sources are the names for the practical electrical units derived?

Define the ampere?

If we have given the number of turns and the mean radius of the coil of the tangent galvanometer, the observed deflection, and the horizontal force of the earth's magnetism at the place of observation, how shall we proceed to find the current expressed in amperes?

Give the list of prefixes used to designate the decimal multiples and submultiples of each unit in the metric system.

What is an ampere meter or ammeter?

What is the coulomb?

The volt?

The ohm?

What is the relative conductivity of a liquid as compared with that of metallic substances?

What is the effect of an increase of temperature upon the resistance of a liquid?

What is Ohm's law?

What is Joule's law?

Give one method of demonstrating Ohm's law, experimentally? *(To be Continued.)*

Course of Instruction in the Elements of Technical Telegraphy—XXXIV.

(Copyrighted.)

(Continued from page 112, February 16.)

[We began in our issue for October 16, 1911, the publication of a course of instruction in technical telegraphy. The course, which was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, is published for the benefit of those of our readers who desire to fit themselves for better positions in their vocation. It is elementary throughout and is divided into chapters, following one another in logical order.

The course has received the hearty commendation of telegraph officials and experts for its scope and accuracy and its sound practicability. In each chapter examples are presented in order to illustrate the application of the rules to practical cases, and each chapter is followed by a series of questions pertaining to the subject of the chapter, to be worked out by the student in order to review his progress. Back numbers containing these valuable articles can be obtained on application, at 10 cents per copy.]

WEATHER CONTACT.

It is somewhat difficult under certain conditions to tell whether the interference caused by a cross is due to a "metallic" connection with another wire or arises from "cross-fire," or, as it is often called, "weather-cross," which is the result of leakage from one wire to another.

The fact, however, that weather-crosses only make their appearance under certain unfavorable conditions, affords some indication as to the probable nature of the interferences at such particular times.

A cross in fine weather is almost invariably regarded as the result of a metallic junction between two wires; but in changeable or uncertain weather doubts are likely to arise as to the precise nature of the cross, which can then be definitely determined in the following manner:

If wires Nos. 1 and 2 in Fig. 37 represent telegraph conductors crossed at C. and open at D, the

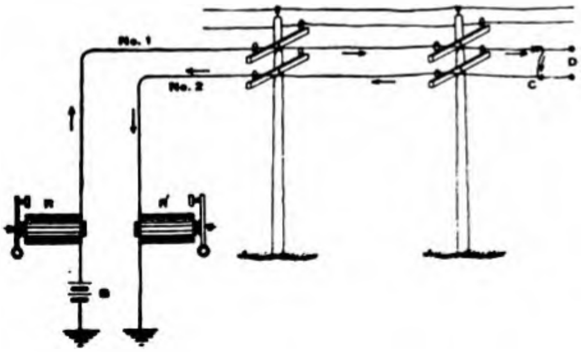


FIG. 37—METALLIC CROSS.

testing battery, B, will actuate relay, R^1, on the No. 2 wire, with the same force that it will exert upon R on the No. 1 wire, because the current in every part of the looped circuit formed by the metallic cross will be the same, assuming the existence of a perfect state of insulation upon the line. But in moist and foggy weather this is very far from being the case, and if we now consider the action of the testing battery upon R and R^1 from the effects of weather-cross alone (Fig. 38), it will be evident that the amount of current flowing through R will be considerably in excess of the quantity that reaches R^1 because of the defective insulation on the line which shortens up the circuit as far as R is concerned, while it deprives R^1 of the amount of current that is lost through escapes on the line. Therefore, unlike the previous case, R will now respond more vigorously to the outgoing signals than will R^1, thus indicating the nature of the fault.

Where the case becomes more complicated by the presence of a combination of both kinds of

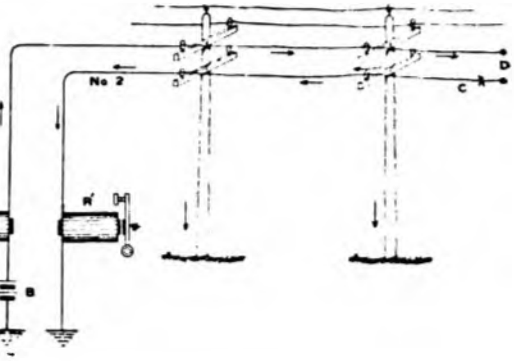


FIG. 38—WEATHER CROSS.

crosses in the circuit, the following considerations may serve as a guide in making the proper discriminations. A weather-cross, pure and simple, as shown in Fig. 38, necessitates a comparatively fine adjustment on each of the testing relays before its effects become palpable on either, because the circuit from the battery, B, on one wire to the ground on the other, is only partially completed through the insulators, cross-arms, poles, etc. The current is therefore very weak, and the magnetism developed correspondingly, feeble, especially in relay R^1. Where, however, the circuit of the two wires is more completely established, and its resistance thereby reduced by a metallic or other perfect connection, the current flow is considerably augmented, and the testing relays (especially R) may then be turned up very high indeed before counterbalancing the effects of the cross.

Weather-crosses are therefore associated with "low" and metallic crosses, with "high" adjustments of the relays, while a combination of both troubles is readily discernible by the difference shown in the force exerted upon the relay nearest the battery as compared with that farthest from it.

(To be Continued.)

CONDENSERS IN TELEGRAPHY.—Condensers are used in telegraphy for compensating the electrostatic capacity of the line, in the artificial circuit on differential duplex sets, for signalling and reading on bridge duplex sets, for counteracting the effects of self-induction in the coils of receivers and relays, for working polarized sounders on the central battery system, for shutting out the telegraph signals from the telephone on circuits where telegraphy and telephony are worked simultaneously, and for protecting circuits from earth currents during magnetic storms.

Reminiscences of the Confederate Military Telegraph Service.

BY R. O. CAMP, WILTON, ALA.

When Joe Wheeler made his famous raid back of the lines to McMinnville, Tenn., I was reporting to him, and when we entered the town I was ordered to rush the telegraph office and capture the operator before he could make any report of our approach, but when I arrived the office was vacant. I sat down at the key, and called Nashville in an effort to get some news, but the operator responded in very good Morse, "Better skedaddle, Reb, there are twenty thousand of us after you." We stayed several hours before leaving, and when we departed I carried with me a fine combination set of instruments which I found in the office. This outfit did good service for us until the end of the war.

After Lee's surrender, as I was on my way home, I called at the telegraph office in Atlanta, and operator John C. Gregg gave me the inside facts, which explained my failure to capture the Union operator. It appeared that several citizens who were on the outskirts of the town rushed in at our reproach and gave the alarm to the operator. The latter paused just long enough to acquaint Nashville with the facts, and then hastily departed for the tall timber.

When we went into winter quarters at Dalton, I was ordered to report to General Wheeler at Tunnel Hill, and when the Federal troops drove us out of that place I was the last to leave. I hit the high places across a corn field for about a quarter of a mile, with my instrument in my hand, and several members of the Federal cavalry took pot shots at my well-developed figure. I never stopped to apologize to the farmer for the damage to his corn, but if he followed my tracks he must have thought that a giant had passed that way. Finally I got under Wheeler's field pieces, and had a chance to sit down and consume a snack of hardtack and coffee. The next day I was ordered to Resaca, Ga., just below Dalton, where I established my office in the second story of the hotel, and remained until the battle of Resaca. When the heavy firing of that engagement began I had just received a message from Richmond for General Joseph E. Johnson, and had risen from my chair to give it to a courier when a round shot tore through the wall, cut off one leg of the table and one leg of the chair as cleanly as if a circular saw had passed that way, and passed on tearing a jagged hole in the other wall of the building. If my right leg had been where it was a moment before, I never would have made the record time ahead of Kilpatrick's cavalry which is down to my credit.

When we got to Atlanta I was ordered to go to Fairburn, on the Montgomery road, to establish a line of scouts and report results. We were run out of there twice in one week. The first time I hid in a cane field. The last raid caught me asleep in the hotel, and when I succeeded in getting downstairs, the Yankees were in the back yard. They proved to be a detachment of Kilpatrick's men, and when I discovered them I made such time that if a stop watch had been held on my time, I am inclined to think that some of the records of hundred yard dashes would have to be revised. When I collected myself, I found, much to my surprise, that the only material damage was a bullet hole in my hat. I had to fall back toward Atlanta to East Point, where I reported to General John T. Morgan. We stayed there only one day when the Yankees ran us out again. One of the couriers had my horse behind the office building, and when I got to it, the Federals were within one hundred and fifty yards of me. I lost my saddle, and rode bare back into Atlanta, but saved my hide.

[Mr. Camp contributed other reminiscences of his war experiences in our issues dated December 1 and December 16, 1912—Editor.]

Handling Messages Written in Spanish.

BY M. W. JONES, TRAINMASTER, THE GUAYAQUIL AND QUITO RAILWAY COMPANY, GUAYAQUIL, ECUADOR.

I was much interested in the article printed in your issue of December 16, 1912, by "A Western Manager" regarding the handling of messages written in Spanish. In view of the fact that the Spanish language is used entirely in Ecuador, a few words on the subject may be of interest to your readers.

All the telegraph operators employed by this company, with the exception of one, the chief train dispatcher, are natives of Ecuador. The alphabet used is a mixture of the American and Continental characters; there are no spaced letters, and there are some additional characters, such as the Spanish ñ, ch, etc. While all our business with the various agents, operators, etc., is done in the Spanish language, many hundreds of messages each day pass over our wires between the various officials of the company and conductors and engineers in English, and mistakes are very uncommon. Very few of our operators understand a word of English, and this makes me agree very heartily with your correspondent, that if operators receive by letter and not by word, there is no excuse for mistakes, no matter if the messages are written in Spanish, Italian, or any other language. Our men send the English messages letter for letter, making a period at the end of each word. What is still more remarkable, all our train orders are sent in English, as the conductors and engineers are Americans, and understand very little Spanish. We use the thirty-one standard order forms. It is very seldom that an error is made in an order, and we have no difficulty in handling our trains in the manner outlined. You can readily understand how serious it would be if any of our operators attempted to receive orders by words instead of letter for letter. I think it is a strong argument in favor of the case made by "Western Manager." My own experience as an operator for many years leads me to the same conclusion.

Annual Meeting and Report of The Mackay Companies.

The annual meeting of The Mackay Companies was held in Boston on February 15. The following were elected trustees for the ensuing year: Clarence H. Mackay, William W. Cook, George G. Ward, Edward C. Platt, Milton W. Blackmar and George Clapperton, all of New York; H. V. Meredith, vice-president of the Bank of Montreal, Montreal, and Sir Edmund B. Osler, of Toronto, Canada. The annual report of The Mackay Companies, which was presented at the meeting by Mr. Mackay, says:

"The past year has been one of constant progress with The Mackay Companies and with its land line and ocean systems—progress in gross receipts, net profits, extension of the properties, upkeep of the physical condition, and in the enthusiasm, loyalty and efficiency of the staff. The Commercial Cable Company has extended another of its cables from Newfoundland to New York, involving the laying of eight hundred and ninety-two miles of cable; the Far Rockaway-New York improvement has been completed; the French terminals have been relaid; the London office building has been finished and opened; and the improvements at Waterville have been completed. The Far Rockaway-New York improvements involved the construction of new underground lines for twenty-two miles, from the Wall street district of New York City to the Far Rockaway shore of the Atlantic Ocean. It was a necessary change on account of the United States Government having to dredge the entrance to Jamaica Bay for harbor purposes across which entrance the Atlantic cables lay in approaching land at Manhattan Beach. This work has been expensive, but now renders safe, it is hoped, for all time to come, the cable landings, inasmuch as the United States Government itself designated Far Rockaway as the point at which these cables should be landed. The London office building was another undertaking involving considerable difficulty and expenditure of money. It was necessary to provide for the expansion of the company's business and a greater concentration of facilities. This work also has now been completed. It meets all the expectations of the Commercial Cable Company.

"The Postal Telegraph-Cable Company has completed its lines throughout Texas, Arkansas, Oklahoma and Louisiana. Additional wires have been strung throughout the United States, including copper wires to the Pacific Coast. The rapid and accurate service of both the land and ocean systems has been maintained and improved.

"The most notable event of the year, however, in connection with your companies, is an invention of Mr. John Gott, who has been the chief engineer of The Commercial Cable Company since its organization in 1884. He has invented a device by which the Morse dot and dash signals can be used on long submarine cables, that is to say, messages can be sent by the ordinary land line Morse key and read on a Morse sounder. This invention surpasses in importance anything that has been added to the submarine cables since Sir William Thomson (Lord Kelvin) and Cromwell Varley first made the practical operation of long submarine cables possible fifty-five years ago.

"It is expected that Mr. Gott's invention will make the cable service as flexible as the land service. It links up cables or land lines or both or alternate cables and land lines, and is an achievement which inventors and the foremost scientists in the world in cable working have striven to attain ever since the first Atlantic cable was laid.

"The first trans-atlantic cable was destroyed by forcing a powerful electric current through it in the attempt to employ the Morse alphabet of dots and dashes. Ever since that time continuous but always unsuccessful attempts have been made to discover some method of using the Morse system of "dot" and "dash" signals.

"The far-reaching effect of this invention on all kinds of telegraph transmission, both by land and sea, cannot at this time be definitely stated, but The Commercial Cable Company believes that by this invention it will be possible to transmit, through automatic repeaters, telegraph signals around the world. The Commercial Cable Company has acquired the rights to this invention and has taken out patents all over the world.

"It should be mentioned that of the very limited number of improvements in submarine cable working Mr. Gott's invention is the third invention of prime importance produced by members of The Commercial Cable Company's staff, inventions which the rest of the cable world was quick to appreciate and adopt, namely, the vibrator, by the late Charles Cuttriss, for which he received first prize at the Paris Exposition of 1887, the automatic transmitters of T. J. Wilmont and Charles Cuttriss, and now the Morse cable system, by John Gott. This invention of Mr. Gott's transforms into a reality the dream of cable engineers ever since the first Atlantic cable was laid in 1858.

"Mr. Gott's invention is only the latest evidence that The Commercial Cable Company is still what it always has been, a progressive-aggressive-competing company determined to hold its pre-eminent position by meritorious improvements in international telegraph service."

Mr. Mackay then gives a comprehensive account of the proceedings and decisions regarding the use of the word "telegram" in calling for a telegraph office by telephone, which use the Mackay Companies claimed as discriminatory, because, in effect, it diverted to the Western Union Company business intended for the Postal Company.

Reference is also made to the decision of the Privy Council of the English House of Lords, in July last, in favor of The Commercial Cable Company in regard to the contract with the Newfoundland Government.

The practice of the Western Union Company of charging for extra words on messages taken in by the Postal Company for transmission to a point reached only by the Western Union lines, and the decision of the Public Service Commission in New

York to discontinue the practice, is also touched upon.

Regarding reductions in cable rates, the report points out that The Commercial Cable Company has consistently refused to reduce rates where it has been felt that reductions were unreasonable and uncalled for.

"Its policy in this respect," the report continues, "has been fully justified thus far, in that its business and profit show no diminution, but have actually increased during the past year."

The subject of wireless telegraph competition is next discussed. "Your trustees," the report states, "have had no cause to change their views concerning competition from wireless telegraphy. During the past year trials were made of wireless transmission, and the results prove that this mode of transmission is far inferior to that of cable transmission."

Government ownership of American telegraph lines is not regarded with favor by the trustees, and figures are cited to show the failure of such ownership of the English lines.

"The employes of The Commercial Cable and Postal Telegraph systems," the report says in conculsion, "continue to invest their savings very largely in the shares of The Mackay Companies, their holdings approaching two and one-half million dollars par value."

Following is the financial statement:

PROFIT AND LOSS ACCOUNT.

FOR THE YEAR FEBRUARY 1, 1912, TO FEBRUARY 1, 1913.

Receipts.

Income from investments in other companies	$4,136,009.11

Disbursements.

Dividends paid on	
The Mackay Companies	
Preferred shares	$2,000,000.00
Common shares	2,069,020.00
Operating expense, including Transfer Agents, Registrars, Auditors and Trustees' compensation, office rent, salaries, stationery, engraving of certificates, etc	31,323.72
Balance carried forward	35,665.39
	$4,136,009.11

BALANCE SHEET.

Assets.

Investments in other Companies	$92,013,748.93
Cash	353,154.97
	$92,366,903.90

Liabilities.

Preferred shares issued	$50,000,000.00
Common shares issued	41,380,400.00
Surplus	986,503.90
	$92,366,903.90

The report states that the income of the subordinate companies of The Mackay Companies is greater than is required to pay the dividends of The Mackay Companies, but its policy is to obtain from its subordinate companies, only enough money to meet those dividends.

Variations in Wireless Signals.

Mr. Walter N. Fanning, chief electrician, United States Navy, Vallejo, Cal., offers in the *Electrical World* four suggestions concerning the causes for the well-known daily variation in wireless telegraph signals:

First: That the current transmitted in wireless communication travels over the surface of the earth as a static charge, setting up an electromagnetic field in the air above, exactly the same as the field of force around an ordinary conductor carrying the same kind of charge.

Second: That the real regulating factors in wireless transmission are to be found by an investigation of solar, terrestrial and nocturnal radiation, and of convection currents.

Third: That a careful investigation of the "dew point" of the air at the transmitting station and at different points between the transmitting and receiving stations will show that the upward and downward radiation of vapor, as the temperature fluctuates around the dew point, will correspond with the greatly flunctuating strength of signals during darkness.

Fourth: That at or near sunset, at a given transmitting station, there is a short period of time when the atmosphere is in a stable condition—that is, without any circulation or radiation either upward or downward—and this condition may be the cause of the great increase in energy transmission noticed daily at this time.

Condenser Shunted Telephone in Wireless Telegraphy.—In practically all systems of wireless telegraphy the telephone receiver has superseded all other forms of reception, and the best results are obtained when the telephone is shunted with a capacity. An investigation into the function of this capacity has been made, and the chief results show that the value of the capacity which produces the maximum intensity in the telephone is not independent of the break in the primary current at the sending station; that in the general case where circuits in parallel with the telephone have a large resistance this maximum is due to resonance in the telephone circuit alone, and that the "harmonics" in the break, and not the frequency of the break itself, may be the most important factor in determining the value of the capacity to produce the best effect for any one telephone.

Distress Call by Searchlight.—The steamer "Beverly," which was disabled on Long Island Sound recently, used her searchlight to call for help. The steamer was not equipped with wireless, but her searchlight signals in Morse characters brought the needed aid.

Care and Selection of the Telephone Dry Cell.

A number of practical suggestions as to the purchase and care of dry cells in general are contained in an article by Mr. W. B. Pritz in a recent number of *Telephony*. Below are some of the suggestions, which are particularly applicable in the case of cells which are employed in telephone service:

There are numerous grades and brands of dry cells manufactured, varying greatly in quality, some being very efficient and some almost worthless for all but extremely light service.

From among these multitudinous brands the consumer must select that one brand which fulfills best his particular requirements. In this selection the purchaser must either accept the guarantee of the manufacturer or he must satisfy himself as to the superiority of the cell by such tests as he can afford to make. The latter alternative is open to all large users, and for their benefit reliable methods of testing have recently been outlined by the American Electrochemical Society [see our issues dated September 1 and September 16, 1912, for abstract of this report].

The cost of making such tests prohibits their use by the small consumer. In this case a brand of cell known to be reliable and one with a reliable guarantee should be selected. It is well to be cautious regarding new cells purported to be revolutionary in character, giving abnormally high voltage, current, etc. These properties are easily increased by certain means, in most cases at the expense of the service life of the cell.

In speaking of short-circuit current it is well to point out that low temperatures will decrease, and high temperatures increase, the amperage of any dry cell. Hence, the current should be taken only at ordinary room temperatures.

In purchasing dry cells, those with bulged or cracked seals should not be accepted, as such seals indicate rough handling or exposure to too high a temperature during transportation or storage. On light services, in which a cell may last six months or a year, a good seal is essential, since the value of a cell as a source of current depends primarily upon the action of the electrolyte, and the drying out of this constituent, due to faulty seals, will cause a shortened period of service.

The cell with corroded brass terminals or one from which the electrolyte is leaking, should be avoided. Electrolyte coming in contact with brass terminals or connecting wires rapidly corrodes them, and if the products of corrosion find their way into the cell, rapid deterioration will result.

In the case of many brands it is impossible for the purchaser to know how long the cell has been in stock. In general, new cells should be insisted upon, for even when not in use there is always more or less action taking place internally, which in time impairs the efficiency considerably. Some manufacturers recommend that cells be placed in service within sixty days after manufacture.

Most cells pass through a period of storage before being placed in service, either in the warehouse of the dealer or in the shop of the consumer. The deterioration during this period is influenced to a great extent by the nature of the place of storage. One of the greatest factors affecting this deterioration is the temperature.

It is evident from this data that dry cells should be kept in the coolest place available. Freezing temperatures cannot harm a cell, provided it is kept dry. Cells have been exposed to such low temperatures that they were frozen solid within, and gave practically no voltage or amperage. These same cells, when warmed again to room temperature, resumed their normal voltage and amperage.

Dampness, especially if the atmosphere is saline, as is the case near the seacoast, tends to corrode the terminals of the cell. In extreme cases the jackets may become wet.

It may be said, then, that cells should be kept dry, out of the sun and away from steam pipes, registers, stoves, or any other source of heat, in which case there should be no abnormal deterioration during storage.

In many cases cells are not properly inserted in the battery box, being crowded too tightly against one another, and not properly placed. Sometimes the binding post on the zinc of one cell comes in contact with the neighboring cell. If through jarring or jostling the paper jacket of the latter cell is worn through at the point of contact, this cell will be subjected to a short circuit and ruined. Short circuits are much less likely to occur if the cells are placed with the positive and negative terminals out of line.

Insulated connectors or wires should always be used for connecting cells to form a battery, as the wire may become depressed until it touches the rim of the zinc, in which case, if the wire is uncovered, the cell indicated is short circuited.

A most important factor affecting the efficiency of dry cells is the size of battery used. A cell will give greater efficiency when subjected to light drains than when the drain is heavy, *i. e.*, the increase in service is not universally proportional to the drain, but somewhat greater than this. Therefore, the drain to which a cell is subjected should be as low as is practical.

There are three possible ways of decreasing the drain on a battery of cells:

1. The voltage of the battery may be decreased by decreasing the number of cells in series.
2. The resistance of the circuit may be increased.
3. Additional sets of cells may be connected in multiple.

In practically all services the first two methods cannot be employed, for most apparatus has a definite fixed resistance and is made to operate within but a small range of voltage values. The third method may always be employed. Within certain limits great advantages are obtained by increasing the battery in the multiple direction.

No definite rule covering the number of sets of cells to be connected in multiple can be stated, for the advantage to be obtained is dependent entirely upon the severity of the service. Were it not for the deterioration always in progress in a cell, which has been called open-circuit deterioration, increased advantage might be indefinitely obtained by increasing the number of cells in multiple. However, the operation of this factor limits the advantage in any service, for it is obviously futile to employ so many sets of cells in multiple that the life of the battery is determined more by open-circuit deterioration than by the electrical properties of the cell.

On light service, such as the operation of telephones, etc., it would be useless to employ cells in multiple, for one set of cells often lasts from one to three years, a period during which open-circuit deterioration is much more influential than any other factor.

Telephone System on New York, Westchester and Boston Railway.

The *Signal Engineer* recently described at great length the signal, interlocking, power and telephone systems on the New York, Westchester and Boston Railway, which, it is stated, is the first strictly suburban railroad built from the ground up according to the most modern methods and with all the latest approved appliances for high speed and dense traffic. The author is Mr. Matthew H. Loughridge, assistant engineer of the road.

The dispatcher system consists of two train wires, one of which follows the main line to New Rochelle, connecting into the towers in this section. The other circuit follows the main line to the junction, and continues to White Plains, connecting the towers on the White Plains branch and the four-track section. These train wires are so arranged that they may be handled by one dispatcher, or each may have a separate dispatcher, as may be necessary.

There are three message wires. An additional line is provided throughout, known as the maintenance spare, that can be substituted for defective wires in the other lines, and also can be used for special conditions should traffic temporarily develop between two points.

Telephones are installed on each platform at express stations, and on alternate platforms at local stations, also at the entrance to the interlockings remote from the towers, and where the distance between stations exceeds one mile, outlying telephones are provided.

Communication between parties on lines that are not directly connected can only be secured through the switchboard operator in the executive offices at the One Hundred and Eightieth Street station, New York, who can connect the desired parties, or may be secured by the party making the call after the lines are connected at the switchboard. The chief object of the switchboard is for the use of the executive offices, it being handled by the operator who attends the public telephone switchboard. In view of the non-attendance of the switchboard operator at certain intervals, some of the executive offices are connected into the message lines on selectors. If desired, the system can be made entirely intercalling on all lines at any time, thus dispensing with the use of the switchboard.

The talking circuit is somewhat modified from the standard telephone circuit by the use of repeating coils interposed between the line and the telephones. They are connected through condensers so as not to interfere with the calling circuit.

In order to obtain a greater efficiency when a number of persons are listening on the line, the circuit is arranged so that when listening the receiver alone is bridged across the secondary of the repeating coil, and at the same time a retardation coil is connected in series with the receiver to prevent excessive side tones.

TEST PANEL AND SELECTOR CASE, COLUMBUS AVE. TOWER, NEW YORK.

A six-volt portable storage battery is used for the talking circuit, a thirty-six-volt battery for the operation of the private branch exchange switchboard, and a 135-volt battery for the intercalling system. These batteries are of twenty ampere-hour capacity, and are charged by the generators used for the interlockings.

The entire telephone system was manufactured and installed by the Western Electric Company.

The Western Electric Company's Contribution to Early Telephone Development.*

BY CHARLES E. SCRIBNER, CHIEF ENGINEER.

The incidents which led to the Western Electric Company entering the telephone business are interesting and worth telling. Elisha Gray, as an inventor, had been associated with the company, but in 1875 and 1876 was working as an independent inventor, developing a multiple telegraph system based on the discovery that several electrical waves of different frequency could be simultaneously transmitted over a wire.

I knew Mr. Gray quite well, also his assistant, W. M. Goodridge, who told me the following story:

In 1876, in Milwaukee, where experiments were being made in tone telegraphy, and while on the way from the telegraph office to the Newhall House for luncheon one day, Mr. Goodridge called Mr. Gray's attention to a street fakir selling what was known as the "lovers' telegraph," a string telephone. The thing was a simple contrivance in which two tin boxes were connected by a string two or three hundred feet long, and by speaking into one the voice would be carried over the string to the other, where it would be heard quite distinctly.

Mr. Gray talked through one of these telephones to a man some distance away and was much interested in it. At the luncheon table he made on the back of the bill of fare, a sketch of an electrical telephone, which he assured Mr. Goodridge could be made to operate over long telegraph lines. It was this simple incident which ultimately led to the entrance of our company into the telephone field.

Dr. Alexander Graham Bell had, long before the occurrence above recited, conceived of an electrical telephone and had even prepared his patent specification; but this he had not filed in the Patent Office at the time it was prepared because, as I have been told, he wished to file his foreign and American applications at the same time. This delay resulted in the remarkable coincidence of Bell's application and a caveat filed by Gray for his invention being received by the Patent Office on the same day. Which one was received first in point of time no one could tell, as there were no time stamps in those days. As a result of this coincidence there were established two rival claimants to the patent on the telephone.

The invention of Bell was financed by a group of New England men, and that of Gray by Dr. Samuel S. White, of Philadelphia, the head of the well-known dental supply house of that name.

Dr. White soon began to feel the burden of the increasing expense, and succeeded in interesting William Orton, then president of the Western Union Telegraph Company, in the value of Gray's claim as first inventor of the telephone, and in inducing him to take over the business for his company. The Western Union Company then, through a subsidiary company, the Gold & Stock Telegraph Company, which it controlled, organized The American Speaking Telephone Company, which entered the field in active competition with the Bell organization in the leasing of telephones to operating companies throughout the country.

At the moment that this competition was started, the Bell Company had been in operation for about a year and had licensed a few electrical manufacturing companies to manufacture under its patents, but did not permit them to sell telephones to anyone, it being its plan to own all telephones and to obtain its revenue from rentals of these instruments to be received from the operating companies. The manufacturing companies were, however, permitted to sell outright to these operating companies all other apparatus needed in the operation of the telephone business, such as subscriber sets and switchboards.

The Western Union Telegraph Company at the date of entering this competition owned and operated a telegraph instrument factory in New York City, and it also owned one-third of the capital stock

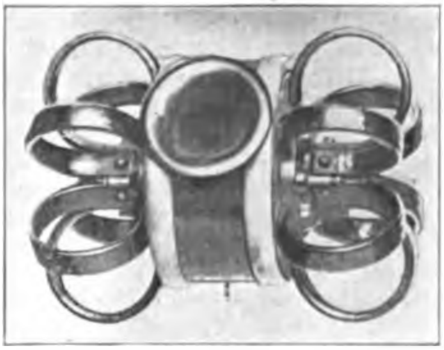


FIG. 1—PHELPS DOUBLE CROWN TELEPHONE.

of the Western Electric Manufacturing Company, which was the name of our company in those early days. These two shops—the one in New York and the other in Chicago—were called upon to design and make telephones and call boxes, switchboards, etc., for the Western Union exchanges. In a short time our company took over the New York shop, which it has ever since operated.

We found ourselves pitted against a group of manufacturing companies of great strength, and these companies had a tremendous advantage because of the year's start ahead of us. Mr. Bell, his assistant, Thomas A. Watson, Hilbourne Roosevelt, and others interested in the Bell Association had made designs of telephones, subscriber sets (including a ringer of remarkable efficiency), the gravity switch (operated by hanging the telephone on the hook), and the circuits controlled by this switch, so that hanging up the telephone automatically switched off the telephone and connected the line through the ringer; and they also had designed switchboards and switchboard circuits for the operation of a telephone exchange. These inventions were all patented. The patents were very broad and at first seemed to give the Bell Company a complete monoply of the only satisfactory forms of commercial telephone appliances to supplement the telephone itself.

*From *Western Electric News*.

It was to the task of meeting these conditions, then, that we applied ourselves, beginning in the winter of 1877-1878. In the first years of the telephone there were no transmitters as we know them; the same instrument was used both as a transmitter and receiver, and the strength of the voice currents was supposed to depend on the strength of the permanent magnet used in the telephone. I remember that some of the first lines were provided with only one instrument at each end, and it was very amusing to see that telephone go dodging from mouth to ear; often both parties would find themselves either listening or talking at the same time.

Our company at once set about designing the most powerful instrument of this type (known as the "magneto" type), and two forms were developed immediately, one at our New York shop, the other at Chicago. The New York instrument was equipped with a set of multiple permanent magnets and was called the crown telephone because of its resemblance to a crown. Two of these instruments joined together made a double crown. The Chicago design was wholly different, no permanent magnet being used. An electro-magnet energized by a local battery was substituted, and the instrument was very powerful for the magneto type and very light in weight and convenient to handle. These different instruments gave the most powerful transmission of any that I had ever heard up to that time; but with the best of this type the voice came over the line very faintly and if no better could have been developed there would never have been any substantial commercial telephone service to this day.

The double-crown telephone is shown in Fig. 1. This instrument weighs three pounds six ounces. The light type developed at Chicago, known as the Gray battery telephone, is shown in Fig. 2.

Our first effort was to produce a subscriber's set, or call box, as it was called, and one which would insure the operation of the switch when the telephone was taken from the hook or replaced. Fig. 3 shows the first type produced, and also the so-called Pony Crown receiver, which was used with it.

This set was provided with an ordinary electrical bell operated by a battery for signalling; a push button to call the central office; a lever to be moved by hand to switch the line from the bell to telephone; a hook on which to hang the telephone, and a guard on the switch lever to enforce the moving of the switch when taking off the telephone or replacing it. A battery was placed at each station strong enough to operate the central office annunciator. It was with this crude, inefficient instrument we were obliged to enter the fight, but, bad as it was, it was better than the one our opponents had first given to their customers.

FIG. 2—GRAY BATTERY TELEPHONE.

Because of the recognized inadequacy of the magneto telephone as a transmitter, the greatest pressure was brought to bear upon the inventors (Bell, Berliner and Blake for the Bell Company, and Edison for the Western Union Telegraph Company), to produce a loud transmitter that would permit people to talk by telephone without destroying their vocal cords!

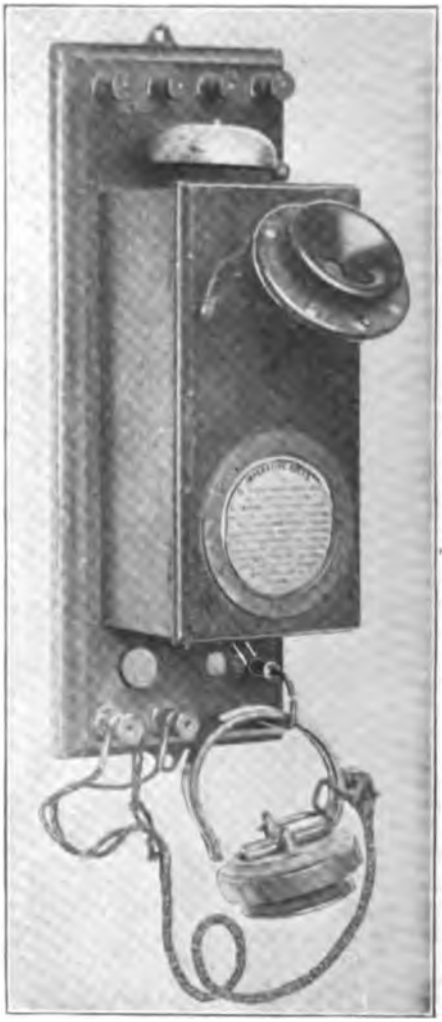


FIG. 3—FIRST TYPE OF BATTERY SUBSCRIBER'S SET, WITH PONY CROWN RECEIVER.

Edison was a young man then and was an independent inventor with a fine laboratory and model shop at Menlo Park, N. J., where he worked night and day. He once told me that he had no use for a watch, because when he was hungry he ate, and when he could work no longer he fell asleep. I once went to his laboratory and found him asleep with his head resting on the table where he had been at work all night.

Edison's interests were with the Western Union Telegraph Company because of large sums of money they had paid him for his telegraph inventions. One of the first he sold them was a quadruplex system by which four messages could be sent over a wire at the same time. Others had tried to do the same thing before and partially succeeded. Mr. Orton, while negotiating the purchase from him, asked: "Edison, what, after all, is the difference between your 'quad' and those of the other fellows'?" "Mine works, Mr. Orton, mine works," Mr. Edison replied. And that answer fits most of the Edison productions.

In advance of anyone else, he made (1878) a model of a loud-speaking battery transmitter to be used with a reinforcing induction coil. His patents

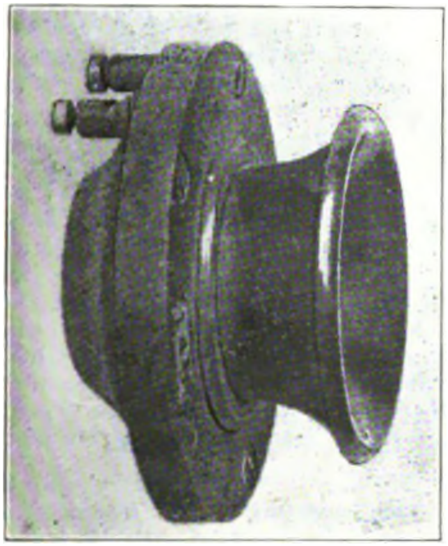


FIG. 4—ORIGINAL EDISON TRANSMITTER.

were sold to the Western Union Telegraph Company and he furnished our shops with models from which to begin manufacture. The two models for the Chicago shop were handed to Mr. E. M. Barton by Mr. Edison personally, and Mr. Barton brought them in his pocket to Chicago, to make sure they were not injured. They were redesigned to facilitate manufacture and were put on the market the same year. Every one marvelled that, where with the earlier telephone it was necessary to shout, a whisper could now be distinctly heard. Mr. Barton handed these models to me, and one of them, after the first tests, I opened up and it was used in making the modified designs which were later put on the market. The other transmitter I had marked not to be taken apart, and kept it in my own possession until the Sales Museum was established. It is now in the museum in the exact condition in which it was handed to Mr. Barton. A picture of it is shown in Fig. 4, and the resemblance to the present solid back transmitters is quite remarkable; nor does this resemblance rest only in the outward appearance. It is a solid back instrument and its construction contains the substantial principles of the present solid back transmitter.

These transmitters were manufactured in both the New York and Chicago shops and were placed on the market in 1878. Shortly following their introduction, Francis Blake produced his well-known microphone transmitter, which at once became the standard instrument for the Bell Company, and so continued for a great many years. These instruments at once put the telephone business on a substantial commercial basis and the business of both companies grew beyond all expectations.

With the advent of an adequate transmitter the receiver problem was greatly simplified, and the design first adopted was the Pony Crown receiver (as shown in Fig. 3) invented by George M. Phelps for the Western Union Telegraph Company.

Fig. 5 shows the rubber handled, single-pole receiver, designed for the Bell Company, which was its standard for many years. The standard magneto subscriber set with which it was used is also shown in the same illustration.

In the first years of the telephone industry, outside of the switchboard and the Edison transmitter, our company produced very little which has survived. Our subscriber apparatus was made up of forced expedients to evade the fundamental patents of the Bell Company. It included my own contributions of a wedge-hook switch to avoid the gravity switch patent of Roosevelt, a ringer of good efficiency to avoid the patent of Thos. A. Watson on the well-known centrally pivoted armature ringer, and a shunting telephone circuit to avoid another patent of Mr. Watson's. While our designs fully avoided these patents, still, being at best only expedients, they have not endured, but our high standard of workmanship, our careful manufacture and the generally high quality, mechanically, of our products gave us an immediate advantage which we have never lost.

In the operation of the telephone industry the three prime instrumentalities required are the trans-

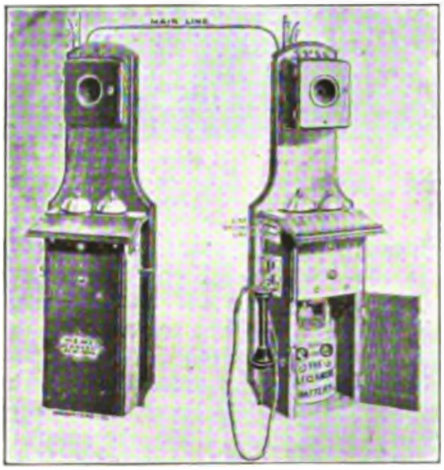


FIG. 5—EARLY MAGNETO SUBSCRIBER'S SET, WITH BELL SINGLE POLE RECEIVER.

mitter, the receiver and the switchboard system. Of these, the original Bell Company gave Bell's broad discovery of the telephone and the Berliner fundamental transmitter invention. The Western Electric Company gave the Edison transmitter which, in a modified form, is the standard to-day, and also the switchboard which in its broad principles and in most of its details is the standard for the entire world. This is our greatest contribution to the telephone art, a contribution which will probably stand in history as second only to the telephone itself.

From the very outset our switchboards, designed on wholly different principles from those of the Bell people, were superior in every way. Their boards were cordless and ours used cords; ours required fewer operators, were more durable, were cheaper to maintain and gave a much superior service. Only a short time elapsed before the number of subscribers in the larger exchanges grew so great and switching their lines became so difficult that it was realized that a radically new system of switchboards alone would solve the problem. The first commercial form of our non-multiple switchboard, as put on the market in 1878, is shown in Fig. 6.

The solution was found in the multiple switchboard, to the invention and development of which

FIG. 6—FIRST COMMERCIAL FORM OF WESTERN ELECTRIC NON-MULTIPLE SWITCHBOARD.

L. B. Firman, C. H. Wilson and myself contributed, but all in the interest of the Western Union Telegraph Company system and the Western Electric Company. From its first appearance in 1879 it proved to be the best system for the existing conditions, and as the industry grew it became absolutely essential to the carrying on of the business. For more than twenty years it was the subject of study and improvement and at the present day, every large exchange in the world, including the new automatic systems, contains switchboards embodying the fundamental principles of the very first multiple switchboard put into service, namely, the multiplying of each subscriber line to a large number of connecting points and providing, in connection with each line, a test or guard to prevent its double employment.

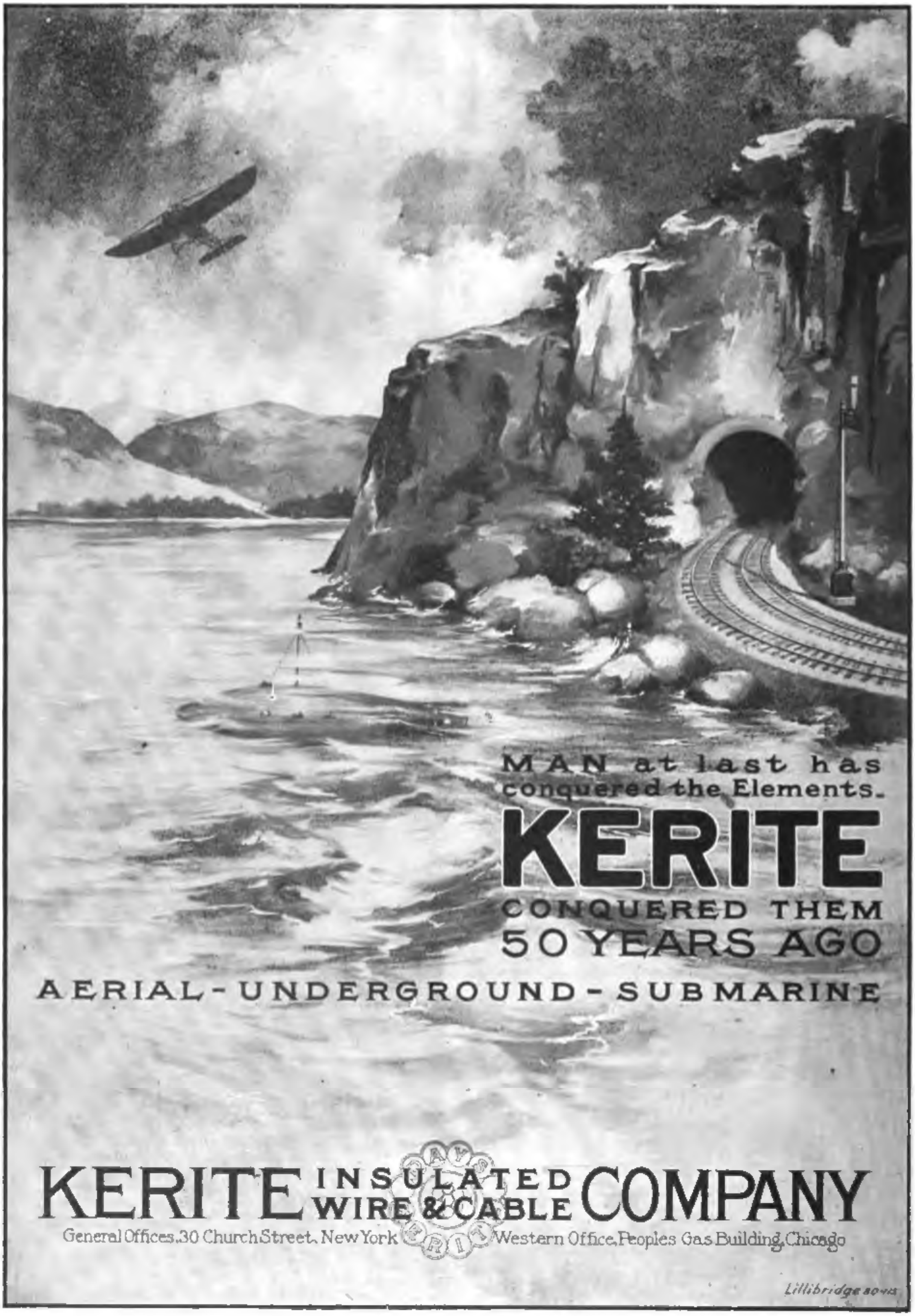
Late in 1879 the Western Union Telegraph Company was told by its lawyers that Gray's claim as first inventor of the telephone was not valid, and that in the litigation then pending Bell would probably win. By this time large sums of money had been invested by the Western Union interests; it concluded that discretion was the better part of valor, settled the suits and retired from the telephone field. This left our company with no telephones to manufacture and with nothing but the business we could do with the existing companies in switchboards, call bells, etc.

The superiority of our apparatus, however, kept the wolf from the door, and in a few years we were made the sole licensed manufacturer for the American Bell Company. The other manufacturing companies were merged into ours.

At the time this was done Mr. Theodore N. Vail was the general manager of the American Bell Telephone Company. Mr. Vail possesses, with his other innumerable wonderful qualities, a fine engineering mind. He made inventions in telephony in the first days of its existence and received many patents on these inventions. I believe that his rare judgment and unfailing foresight satisfied him in those days of thirty years ago that our company, with its designs, equipment and personnel, possessed the ability to keep pace in facilities with the rapidly increasing requirements of the business, and led him to take the steps which brought about our present close relations with the Bell interests. Indeed, I do not believe that he "builded better than he knew," nor have I ever heard that he regretted his action.

THE TELEPHONE IN THE WILDERNESS.—An interesting story is printed in the *Western Electric News* showing in a striking manner one of the many phases of unsefulness of the government's forest telephone service in the Rocky Mountains. Mr. W. P. Sidley, vice-president and general counsel of the Western Electric Company, was spending a vacation trip in the heart of the Rockies recently. While at Paint Rock Lakes, a ranger brought him a message sent the same morning from Chicago announcing the sudden death of A. D. Wheeler, Mr. Sidley's law partner. Mr. Sidley's party had left Horton's Ranch, the last point of communication with the outer world, ten days before. Under ordinary circumstances it would have taken from three days to a week to have located the party and delivered the message from the ranch. In the effort to find Mr. Sidley, the ranger had been called up by telephone at his cabin and asked if he knew of the whereabouts of the party. Having by chance seen their horses grazing, he received the message over the government's forest service line, and within two hours it was in Mr. Sidley's hands.

TELEGRAPH AND TELEPHONE IN KONGO.—There are about 2,000 miles of wire in Kongo used for both telegraph and telephone. There are also wireless stations at Banana, Boma, Leopoldville, and towns in Angola and French Kongo, and an attempt is being made to connect Boma with Elizabethville by wireless via the Kasai district. All these are government owned.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THE RAILROAD.

Association of Railway Telegraph Superintendents.

A joint meeting of the Eastern and Western Divisions of the Association of Railway Telegraph Superintendents will be held in the assembly room of the Chicago and Northwestern Railway, Chicago, Wednesday, March 19, at 10 a. m.

Discussion on subjects of mutual interest will be had, and matters in connection with the annual convention to be held at St. Louis, May 20, brought up.

The annual exhibit of the Maintenance of Way Association, which will be held at the Coliseum in Chicago at the same time, will be an attraction to draw the members to that city on the date named.

This will be an important meeting, and there is reason to believe that the attendance will be large. The affairs of the association are rapidly growing in importance, and these division meetings are great strongholds of the parent association.

Mr. Charles Selden, superintendent of telegraph, Baltimore and Ohio Railroad, Baltimore, Md., and Mr. E. A. Chenery, superintendent of telegraph of the Missouri Pacific Railway, St. Louis, Mo., are chairmen of the Eastern and Western Divisions, respectively. Mr. P. W. Drew, superintendent of telegraph of the Minneapolis, St. Paul and Salt Ste. Marie Railway, Chicago, is secretary of the association.

Death of U. J. Fry.

Urias J. Fry, aged 65 years, superintendent of telegraph, Chicago, Milwaukee and St. Paul Railway, Milwaukee, Wis., died February 23. He was a native of Urichsville, Ohio, and learned telegraphy in 1873-1874. In 1884 he became connected with the Chicago, Milwaukee and St. Paul Railway, and has been associated with that interest ever since, receiving the appointment of superintendent of telegraph, October 1, 1888.

Deceased was one of the best known railway telegraph superintendents in the United States, and was president of the Association of Railway Telegraph Superintendents during the year 1893-94. He was one of the association's most progressive members, and read several papers before the annual conventions. He was president of the Old Time Telegraphers' and Historical Association during the year 1902-03, and conducted the affairs of that body in an able manner.

Personally, Mr. Fry was a man of gentle nature, and highly esteemed by his associates and friends. He was deliberate in thought and action, and always impressed his friends as being careful and conscientious in his relations with his fellow men, and in everything he undertook to do.

In the death of Mr. Fry the railroad company, with which he was so long connected, and the Association of Railway Telegraph Superintendents, lose a wise and able counsellor, and his family will receive the heartfelt sympathy of a host of friends in their bereavement. The funeral services were held February 25, and were attended by many prominent railway officials and friends.

Mr. Vail on Railroad Transportation Problems.—Mr. Theodore N. Vail, president of the American Telephone and Telegraph and of the Western Union Telegraph Companies, delivered, on the night of February 18, in Boston, before the Merchants' Club, an address in which he discussed the New England transportation problem. He outlined at length the situation in New England to-day as he saw it, and then considered the railroad problem, arguing in favor of one comprehensive system.

Convention of Railway Telegraph Superintendents.—The next annual convention of the Association of Railway Telegraph Superintendents will be held in St. Louis, Mo., May 20, and active preparations are now being made for the gathering, which it is expected will be a large one. Many matters of importance to the railway telegraph and telephone service will come up at this meeting for attention and discussion, and there is every indication that the meeting will be a most profitable one from a technical standpoint. Mr. P. W. Drew, superintendent of telegraph of the Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill., is secretary of the association and will be glad to give any further information regarding the meeting.

Telephone Train Control in Wales.—A telephone train-control system has recently been installed by the Rhymney Railroad Company on its system between Cardiff and Glamorganshire, Wales. By means of telephones installed in signal towers, junctions and stations on the line, all of the train dispatching can be controlled from the head office in Cardiff.

Train Telephone System in Australia.—A novel system of train telephone service is in use on the Mendel Railway of Australia. It permits the locomotive engineer to send bell signals to the different stations along the road. A telephone is installed in every car, which is connected to the line by the opening of the telephone case, and connections are made along the telephone wires at the side of the track by a specially constructed trolley which projects from the locomotive cab.

Annual Meeting of the T. M. B. A.—The annual meeting of the Telegraphers' Mutual Benefit Association will be held at 195 Broadway, New York, March 12. The proposition to change the name of the association to Telegraph and Telephone Life Insurance Association in order to bring the operation of providing life insurance for the employes of the telegraph and telephone services into still closer and more direct relation to the two services in the future will be submitted at this meeting for action.

Mr. George T. Williams, of East Cleveland, Ohio, formerly and for many years superintendent of the Western Union Telegraph Company at Cincinnati, Ohio, writes: "The arrival of your paper is a 'Red-Letter' day for me in my isolated retirement, as it is my chief connection with my old employment."

The Next Convention of Old Time Telegraphers.

President H. J. Kinnucan, of the Old Time Telegraphers' and Historical Association, Detroit, Mich., is already at work in preparing the plans for the next reunion of that association, which is to be held in Detroit, August 25, 26 and 27. The members of the association may feel assured that their next reunion will be a delightful and profitable one, and no one is better fitted to conduct its affairs during the current year than is Mr. Kinnucan. He will do all within his power to give a good time to those who attend. Detroit and the adjacent country are among the most interesting sections in the United States, historically and commercially, and there is much of interest to be seen.

Mr. F. J. Scherrer, 30 Church street, New York, is secretary of the association.

PROCEEDINGS OF THE JACKSONVILLE CONVENTION OF OLD TIMERS.—The proceedings of last year's reunion of the Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps, held at Jacksonville, Fla., October 22-24, have been issued in pamphlet form. The book is very attractively gotten up, and gives a complete story of the reunion. It contains a full report of the proceedings, and an interesting account of the entertainment, besides many attractive and timely illustrations. This book will be cherished by the members as a record of one of the most interesting reunions ever held by the two associations. Secretary F. J. Scherrer, of the Old Timers' Association, is entitled to much credit for the excellent results of his editorial work.

ELECTRICAL INSTRUMENTS AND METERS IN EUROPE.—The Department of Commerce and Labor, Washington, D. C., has issued a pamphlet dealing with electrical instruments and meters in Europe, as reported by Mr. H. B. Brooks, commercial agent of that department. The works of thirty-one leading firms are described, attention being paid to equipment, number of employes and hours of labor, and especially to the nature of the products manufactured.

Meetings of Associations, Societies, etc., During 1913.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, at St. Louis, Mo., May 20. Secretary, P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION, at New York, March 12. Secretary, M. J. O'Leary, 195 Broadway, New York.

MAGNETIC CLUB, New York, April 10. Secretary, W. B. Dunn, 253 Broadway, New York.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS, at Watertown, N. Y. Secretary, Clarence R. George, city electrician, Houston, Tex.

OLD-TIME TELEGRAPHERS AND HISTORICAL ASSOCIATION AND SOCIETY OF THE UNITED STATES MILITARY TELEGRAPH CORPS, at Detroit, Mich., August 25, 26 and 27. Secretary of the Old-Timers, F. J. Scherrer, 30 Church street, New York; secretary of the Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

TELEPHONE PIONEERS OF AMERICA, at Chicago, Ill., October 16 and 17. Secretary, Henry W. Pope, 30 Church street, New York.

INDUSTRIAL.

America Leads in Electrical Manufacturing.

Of the five largest electrical companies in the world, three are situated in the United States and two in Germany. The last year for which comparisons can be made makes their order of precedent in point of gross business, as follows: Allgemeine Electricitats Gesellschaft, General Electric, Western Electric, Siemens & Halske and the Westinghouse Company. In the last twelve months the German company has overtopped the General Electric, which used to be the largest electrical corporation in the world, but the United States continues to claim two of the first three leaders of the world's electrical business.

The three American companies have a total investment of approximately $240,000,000, on which about seven and one-half per cent was earned, while the two German companies have a total investment of approximately $102,000,000, on which more than nine and one-half per cent was earned. If the Westinghouse company, which is still in the reorganization period as the result of its 1907 disaster, be omitted, it will be seen that the General Electric and the Western Electric companies, on an investment of upwards of $162,000,000, made a return of nine and three-tenths per cent. In short, the two largest and most successful American companies made a smaller return on their investment than the two largest and most successful companies in Germany and the world outside of the United States.

New Dry Battery.

The Western Electric Company has recently placed upon the market a new dry battery to be known as the "Red Label Blue Bell Battery." It is designed for intermittent service requiring high efficiency and rapid recuperation.

The Red Label Blue Bell Battery is of the high initial amperage and low internal resistance type, having an initial amperage of twenty-five amperes on short circuit. These characteristics, together with its powers of rapid recovery after use, ensure its long life and usefulness wherever this general type of battery is required.

Following are a few of the most important uses to which the battery is adapted: The operation of call-bells, annunciators and electrical toys; operating telephone pole-changers; railway telephones in furnishing transmitter current on train-dispatching circuits, as selective signalling battery or in operating interrupters. It is also specially fitted for ignition service in general, in conjunction with all types of industrial gas engines, as starting battery for all kinds of automobiles, and with slow-speed gas engines, such as are used generally in motor boats and automobile trucks.

MUNICIPAL ELECTRICIANS.

The Watertown Convention.

An important matter that will come up before the next convention of the International Association of Municipal Electricians, which is to be held at Watertown, N. Y., this summer, will be the report of the committee appointed at last year's convention, at Peoria, Ill., to investigate the subject of permissible voltage within the limits of municipalities. The recommendations of this committee and of the association will have a powerful influence in shaping municipal regulations on this important subject. In the large cities these matters are well understood, and to a large degree successfully met, but in the smaller cities where lines of all kinds, high and low tension, are carried overhead more or less danger exists, and if the committee succeeds in formulating a plan that will be universally applicable they will have accomplished an important work.

Mr. J. W. Kelly, jr., president of the association, is keenly alive to the necessities of the work for which the association exists, and through his activity he will no doubt bring to the surface many ideas of value at the Watertown convention. He has made a high record as a progressive in municipal engineering, and he has laid out work for the association that will bring it to the front among technical bodies.

Mr. C. R. George, secretary of the association, Houston, Tex., will be glad to give further information regarding the convention and arrangements for exhibits of apparatus.

Meeting of Electrical Committee National Fire Protection Association.—The Electrical Committee of the National Fire Protection Association will hold meetings in New York on March 26 and 27 to consider committee reports and suggestions for changes in the "National Electrical Code." Among the subjects to be considered will be the report of the committee on rubber-covered wires and cables. The meetings will be held in the rooms of the New York Board of Fire Underwriters, 123 William street. Mr. Ralph Sweetland, 141 Milk street, Boston, Mass., is secretary of the electrical committee.

A. P. Good Fellowship Club.

The operators, telegraph editors and wire men of the Illinois-Iowa circuit of the Associated Press, have perfected an organization under the title of "A. P. Good Fellowship Club."

The object of the club is to bring the men who handle the telegraph news service of the Associated Press into closer touch with one another, and to promote the efficiency of the service.

The following are among the charter members: Milton Garges, traffic chief, Chicago; William Snyder, and J. E. Cox, wire chiefs, Western Union, Chicago; W. L. Taylor, wire chief, American Telephone and Telegraph Company, Jacksonville, Ill., J. L. Pine, manager, Western Union, Jacksonville, Ill.; Harry Fessenden, chief operator, Western Union, Springfield, Ill.; Joseph Bucher and F. F. McCraynor, wire chiefs, Western Union, Springfield, Ill.; F. N. Rogers, wire chief, Central Union Telephone Company, Springfield, Ill.; P. A. Henathan, wire chief, Western Union, Peoria, Ill.; B. H. Anderson, wire chief, Western Union, Chicago.

Philadelphia Electrical Aid Society.

The twenty-fifth anniversary of the Electrical Aid Society of the city of Philadelphia, will be celebrated with a banquet, dance and high-class vaudeville entertainment on Tuesday evening, April 15. A souvenir book will be presented to each person attending the anniversary. It will contain a full and complete history of the society from its birth to the present day, including biographical sketches of its leading executive officers. The proceeds will be donated to the relief fund.

The Entertainment Committee consists of Charles A. Huver, chairman; Richard H. Conway, secretary; Francis W. Brooks, William M. Sailer, John C. Smith, Richard A. Luther, John V. Berger, Laura M. Scott, Merritt N. Redding, Eleanor C. Grady, Matilda R. Myers, Charles A. West, Edwin L. Moses, Thomas C. Fee, jr., John A. Chapman, Hannah M. Morrow, Walter B. Martin, John A. Maguire, Harry L. Myers, Helen G. Finan, Hannah M. Conway.

The officers of the society are: W. R. Harmstad, president; A. G. Strickland, vice-president; W. E. Vanarsdall, recording secretary; R. C. Murray, financial secretary; J. H. Wilson, treasurer.

Recent Developments in the Missouri Pacific's Telegraph Department.

The Missouri Pacific Railway Company, under the management of president B. F. Bush and first vice-president E. J. Pearson, has made enormous strides towards establishing itself as the most efficient and popular road in the Southwest. The operating organization has been inspired with the overcoming of obstacles to such an extent that the maintaining of schedule time of trains, regardless of severe weather conditions, has come to be accepted as a foregone conclusion in the States served by this road. The management has also been prominent among American railroads in the policy of taking the public into its confidence by giving through its department of publicity the facts which the people have a right to know, and this whether the truth favors or hurts the railroad company. This high position and record could not have been reached save by the adoption of an enlightened policy and liberal expenditures, and it is therefore in accord with such policy that special attention has been given to improving the road's system of communication and the safeguarding of its trains.

FIG. 1—BLOCKING SET.

Within a period of approximately one year 6,185 miles of No. 9 B. & S. copper wire have been strung and put into various telephone and telegraph service. Long distance telephone connection is now maintained between the St. Louis general office private branch telephone exchange and the private branch exchange at Kansas City, Mo., and at Little Rock, Ark., distances of 283 and 349 miles, respectively. In addition to the facilities for telephoning thus provided, each side of the physical pair is duplexed for telegraph service.

Within this period five districts, comprising 658 miles of additional telephone train-dispatching circuits, with 137 stations, have been put into operation, each circuit being simplexed to secure the maximum efficiency, and to provide additional means to move telegraph traffic. The station outfits are the Gill local battery bell selector sets and the telephone apparatus is Western Electric and Kellogg. Two circuits of over 1,000 miles each, formed in part by these lines, are worked by the Gill low-resistance simplex, and are, it is stated, giving most satisfactory results. With the increased telegraph facilities obtained by compositing and simplexing the telephone circuits, the general office at St. Louis now reaches direct by telegraph its offices in Colorado on the west and Texas and Louisiana points on the south, as well as its intermediate stations and division points.

Rapid strides towards the provision of adequate safeguards for train movement have been made in the installation of the manual telephone block.

Within the year under consideration, 2171 miles of this block, with 544 stations and 104 extensions sets, have been installed. To obtain the best possible conditions for a talking circuit for such purpose a metallic telephone circuit simplexed for local telegraph message service is provided. For block operation when the telephone is also used for train-dispatching, each station is furnished with apparatus, by means of which the operator is enabled, with the use of but one telephone and suitable jack equipment, to communicate with the operator at either the station in advance or in the rear. This is accomplished by means of the No. 4-E Blocking Set of the United States Electric Company, which, as well as the other special equipment used on this installation, was designed by this manufacturing company to meet the requirements of Mr. E. A. Chenery, superintendent of telegraph of the Missouri Pacific Railway Company.

This set, a view of which is given in Fig. 1, is installed in a compact oak box. On the front panel are the jacks and signals, and the perforated covering of the opening over the bell. The transmitter arm on the top swings a little less than a full circle, making the set accessible from either side. The generator handle is shown on the right, and the receiver head-band on a special hook switch on the left. The set is especially designed with regard to accessibility of the wiring and apparatus. The top, fastened by screws, lifts off, and the front panel, hinged at the bottom, drops to allow of getting at all the wiring.

FIG. 2—TELEGRAPH CONCENTRATION CABINET.

The induction, retard and simplex coils, condenser and bell are conveniently installed. Main cords are entirely eliminated, and the receiver cord connections are so arranged as to be replaced readily by an operator, thus obviating the necessity of sending a repairman when a cord defect is located. By the use of the indicating drops an employe whose duties require his presence outside the office is enabled, upon his return, to learn whether or not a call has been made on either block or dispatching circuit during his absence. One of Mr. Chenery's objects in the design of this equipment was a reduction in the amount of apparatus, including the number of bells in the offices where more than one telephone line enters. The feature of maintenance has been carefully studied, and every effort has been made to design apparatus which will withstand the hard usage of railroad service.

FIG. 3—TELEGRAPH CONCENTRATION TABLE, LITTLE ROCK OFFICE.

With the inauguration of the additional telephone and telegraph service, the relay office at Little Rock, which had formerly relayed an enormous amount of through telegraph business, became a relay office for local telegraph business only. Owing to the number of local wires to be covered, it was found that satisfactory service could not be had without increasing the force to a point where the cost per message would be higher than appeared justified. This is a condition which will appeal to all telegraph superintendents, and one which is quite likely to arise in railroad service. Superintendent Chenery, with the assistance of the engineers of the United States Electric Company, designed a "concentration cabinet," which solved the problem. A view of this equipment is shown in Fig. 2, it being understood that the other side of the cabinet has a similar arrangement of jacks and signals. The cabinet is equipped with four cords and plugs, connected to a corresponding number of resonator sets.

All the local telegraph wires, twenty-four in number, are concentrated on one quartette table, where is mounted the cabinet, with jacks multiplied, so that any wire is accessible to any one of the four operators. Twelve of the jacks are provided with lamp signals, and each of the lines connected to these jacks is equipped with a Gill selector, which, when operated, lights the lamp above the jack connected with that particular line, and a pilot relay rings a bell, which sounds until the call is answered. Plugging in to answer automatically extinguishes the lamp. All the selectors have the same combination, and all the operators in way stations were instructed how to operate them by making the proper combination upon their telegraph key, thus eliminating the usual office call for the relay station. The twelve jacks without lamps are to care for local commercial wires and dispatchers' wires, which are connected into the cabinet for emergency use.

Under the old scheme, with one wire to a position on sextette and quartette tables scattered over a large room, there were frequent complaints from way offices that they were unable to forward messages or reports on account of inability to raise the relay office. The Missouri Pacific has a "red ball" report system, by means of which the superintendent of car service is able to keep track of the movement of loaded cars over the system, and thus be in a position to furnish instantly to patrons information as to the movement of any car about which inquiry is made. This necessitates an elaborate set of reports, but the whole scheme is ineffective, unless these reports are handled promptly. A large number of these reports are relayed at Little Rock, and under the old system it required constant effort to get them in on time. The invariable excuse was that the relay office could not be raised, and the office making this excuse was always able to show a list of calls to prove that a conscientious effort had been made to move the reports. The installation of the selective equipment remedied all this delay, and did away with the occasion for excuses

FIG. 4—FOOT SWITCH

and explanations. With the means at hand of making a positive signal, it is the duty of the sending office to get reports in on time. Experience has shown that the relay office can take care of most of the calls the first time they are received, and of all calls that are made a second time.

An extra telegraph set is provided on the concentration table with which a designated operator gives a "busy" signal to such calls as cannot be accepted instantly. This is handled in the following manner: When a call comes in, any operator not actually engaged in sending or receiving a message plugs in and answers. If all the operators are busy, but one of them expects to be through in a few seconds, he announces, "I'll get it." If no one can either answer immediately, or expects to be able to answer in a few seconds, the operator handling the extra set plugs in and gives "25," the telegraph "busy" signal. The instructions to way station operators are that calls not accepted must be repeated at intervals of five minutes until an answer is had.

It has developed that where way offices formerly held their business until they had an accumulation of messages for the relay office, they now dispose of it much more frequently, resulting in a general quickening of the service. In the relay office the lost motion formerly occasioned by operators moving about the office, carrying their typewriters, was eliminated, and the tying up of wires by offices calling the relay office was reduced to a minimum. As a result, the business moves with greatly increased facility with the same office force. Superintendent Chenery says that since the concentration cabinet was installed he has not received a complaint of delayed messages wherein it was offered as an excuse that any office had been unable to raise Little Rock. All calls and wires are now treated alike by the operators working on the concentration table, and supervision by the chief operator is made easy and effective. With all the wires in the office in front of him, and all the business hanging on hooks within his reach, it is found that an operator endeavoring to move business covers with the concentration cabinet about ten times as much ground as was possible without it. He is constantly plugging in on the different wires, trying to find an opening to move a message, resulting in better service. The cost of the concentration equipment is not excessive when the economy of office space, facility of operation and expedition of business it effects are considered. This class of equipment has, it is said, aroused considerable interest on the part of the commercial telegraph companies, and it is believed that its use will be extended in both commercial and railroad service as its merits are appreciated.

Prominent among Mr. Chenery's assistants in this work have been Mr. J. C. Browne, general supervisor, and Mr. W. Rogers, telegraph inspector, to both of whom a large amount of credit is due. Mr. Browne has been with the Missouri Pacific Company for a number of years, having served as manager and wire chief, and then as general foreman. For the past two years he has been general supervisor of telegraph, having immediate jurisdiction of the construction and maintenance of the railroad company's telegraph and telephone lines. Mr. Rogers has had varied experiences in the telegraph field, having been in charge of switchboard and printer apparatus for the Western Union Telegraph Company before beginning service with the railroad company. Since that time he has served as manager and wire chief at the Wichita, Kan., office, until he was brought into St. Louis, and put on Superintendent Chenery's staff as telegraph inspector, having charge of engineering matters for the department. Both of these gentlemen have proved themselves industrious and enthusiastic aids, and have rendered valuable assistance in the working out of the developments described.

Mr. V. C. Balding, late night chief at Little Rock, who was in direct charge of the office for the last trick is an amateur photographer, and the view of the Little Rock office presented herewith is from one of Mr. Balding's negatives. It shows three lines connected, and illustrates the compactness and accessibility of the concentration equipment.

The telephone plant is maintained by a force of thoroughly experienced linemen, recruited principally from the Bell and independent telephone companies, as well as from the telegraph department of the railway company.

BUSINESS NOTE.

T. M. B. A. ASSESSMENT.—Assessment No. 548 has been levied by the Telegraphers' Mutual Benefit Association to meet the claims arising from the deaths of T. Hatch at Dryden, Ont., R. S. Parker at Wilmington, N. C., C. I. Depew at New Orleans, La., R. Wilkinson at Poughkeepsie, N. Y., W. J. Denver at Florence, Mass., and G. Owens at Memphis, Tenn.

REPORTING TYPEWRITER.—The services of a stenographer will be unnecessary if the invention credited to John B. Flowers, a young electrical engineer of Brooklyn, is successful. The machine is said to automatically translate the words of a speaker into typewriter characters. The spelling of the new machine is entirely phonetic.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

MR. F. J. SHERIDAN, of this office, has been appointed agent for TELEGRAPH AND TELEPHONE AGE, and he will be very glad to receive subscriptions, orders for books and any other business intended for this journal.

SAN FRANCISCO WESTERN UNION.

MR. GEO. E. PALMER has been appointed chief operator of the company at this point, vice H. S. Converse, retired on account of failing health. Mr. Palmer is well known in California. He was for some time supervisor of the Southern District, with headquarters at Los Angeles. He has been chief of the printing department in this office, and has occupied many other important positions. He is therefore eminently qualified to fulfill the duties of the position he is now called upon to assume. Mr. Converse retires with the best wishes of a host of friends.

MR. A. P. HARRISON, for the past two years foreman of construction, has resigned to accept the position of chief of the telephone department of the Great Western Power Company, with headquarters in this city.

PHILADELPHIA POSTAL.

Among the recent visitors at this office were F. F. Norton, superintendent of traffic, New York; and C. F. Troeller, manager, Atlantic City, N. J. Manager J. A. McNichol went to Baltimore recently, and chief operator E. W. Miller to Washington, both in connection with business of the company. Cashier J. H. Wilson made a trip to Atlantic City, on company business.

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Life Insurance is based upon the certainty of death at some time and its possibility at any time. The splendid financial position of the Telegraphers' Mutual Benefit Association, 195 Broadway, New York, is shown in the Reserve Fund of $328,000, which, apart from current assets, amounts to nearly 6½% of the total contingent mortuary liabilities, and yields an annual revenue of more than $15,000. Operating on sound and correct principles, with ample security, it offers to the telegraph and telephone employe the best and most economical form of protection for the family and dependents yet devised. Write for particulars.

Telegraph and Telephone Age

No. 6 NEW YORK, MARCH 16, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Engineering the Only Straight Road to Success.

If operators could be induced to study the true meaning of words and get the real significance thereof, instead of being frightened by the big ones, many of them would soon occupy positions of much greater importance than those they now hold.

For example, the word "engineer" usually signifies one who possesses an extensive knowledge in some particular direction, such as an electrical engineer, mechanical engineer or a constructive engineer. This impression is correct, but it does not follow that one must actually be at the head of a department, possess great knowledge, or even be connected with a big concern, in order to become an engineer. The fact is, anyone with average intelligence can become an engineer in five or ten minutes if he wishes to do so, and not even be compelled to turn aside from his business.

Now the duties of an engineer are to direct action and operation towards betterment. This he does by simply putting on his thinking cap and devising something new or better than what is already in use. He does not become the head of a department until after he has shown his superiors that he possesses ideas of value, and is likely to evolve others. Then the position comes to him; he does not even have to seek it. Hence the first step in the way to rise is to get into the "lime light," and not wait for some one to turn the rays in your direction.

If an operator wishes to become an engineer all he need do is to constantly strive to think of some way for bettering the service, say, in the operating department. He can do this without interfering in the least with his regular duties, and the moment he decides to keep on thinking and planning he becomes a full-fledged engineer in the true meaning of that term, and, furthermore, he should realize the fact that no one has so far ever succeeded in life who did not first become an engineer.

The next step to take is to disabuse your mind of the idea that the hard work necessary to succeed is disagreeable. If it was, this world's progress would soon cease. Every man who has succeeded will tell you that after he overcame the first difficulties the rest of the road was a real pleasure to travel over.

It is the same way concerning the manner in which operators, before they become "engineers," belittle their own abilities. The majority have little or no confidence in their ability to do anything greater than to send and receive messages. They even forget that it was a long time after they passed before they could sit down at a strange circuit with any degree of assurance, yet they finally overcame their timidity through nothing else than determination. Hence, to succeed, simply "keep at it"; that is the whole secret.

No doubt nearly every operator who reads this article will agree that all this is true; but mere philosophy does not seem to stir the average operator to action; he must be encouraged. For the benefit of such we will endeavor to help them by suggesting a few things they might think over. We suggest that they direct their minds towards devising something that the company needs, and then offer it instead of asking what is wanted, as is usually done.

As an illustration, let us mention a few of the things that have been accepted, and which any operator could just as readily have offered had he been alive to the company's interests, or even to his own convenience, instead of showing an indifferent attitude towards existing conditions. Take, for instance, the convenience, economy and other advantages obtained by the use of the recently installed spindle file with gravity clip-jaws for holding the received messages, and then think how many years operators were inconvenienced by having to bend forward to reach either a hook which punctured a hole in the message blank, or a glass tray where the wind often blew the messages away, all because they did not even try to improve the service. The adoption of the neat metal blank holders the operator now sees before him is evidence of the time he formerly wasted in hustling around the room to find and keep his table supplied with blanks. Does anyone assert that it required any great degree of intelligence or hard work to think of, and suggest the use of, these devices? Certainly not! Yet the interest displayed in the company's welfare, as indicated by offering these suggestions, immediately brought those persons who made them into favor with subsequent satisfactory results to themselves.

There are too many recent innovations all around the operator to-day to mention specifically. Every thought strengthens one's ability to think deeper next time. Just imagine what the world would probably have lost if Edison had not begun thinking. Had he not constituted himself an "engineer" while yet working a wire he would probably have always remained at the key. No doubt there are thousands of operators throughout the country who have valuable ideas in mind for the betterment of the service or for the improvement of apparatus, who may be timid about offering them, unable to work them out, or do not know just how to proceed to develop them.

Among so many, surely some may possess ideas more valuable than they think they are. We may be able to show some that their ideas are old; others, new, and possibly suggest a way for furthering some useful but as yet undeveloped device. An idea that seems reasonable should be put to a practical test.

Superintendents are soliciting ideas, and the engineers of the equipment departments are always eager to consider them; so do not be backward. Become an "engineer" at once.

Telegraph and Telephone Patents.

ISSUED FEBRUARY 18.

1,053,430. Detector for Party-Line Telephones. To J. W. Nilson, Balfour, N. D.

1,053,584. Transmitter for Selective Signaling Systems. To V. Durbin, Brookline, Mass.

1,053,864. Automatic Telephone Exchange System. To J. Peticky, Prague, Austria-Hungary.

13,533. (Reissue.) Telephone Transmitter. To F. Gottschalk, Stirling, N. J.

ISSUED FEBRUARY 25.

1,053,997. Telephony. To M. L. Johnson, Chicago, Ill.

1,053,998. Telephone Exchange System. To M. L. Johnson, Chicago, Ill.

1,054,176. Telephony. To E. R. Corwin, Chicago, Ill.

1,054,275. Telephone Switchboard. To P. C. Burns, Chicago, Ill.

1,054,581. Telephonic Transmitter. To W. J. Marchant, London, England.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, March 11.

American Telephone and Telegraph Co.	132⅝
Mackay Companies	81
Mackay Companies, preferred	67½
Western Union Telegraph Co.	67½

PERSONAL.

MR. KAMILO A. GONZALEZ has been appointed director-general of telegraphs of Mexico, with headquarters at the City of Mexico.

MRS. J. J. DICKEY, wife of the late J. J. Dickey, superintendent of the Western Union Telegraph Company at Omaha, Neb., has sailed for Honolulu, H. I., on a trip.

MR. JOHN E. MENDELSON, operator for the Western Union Telegraph Company, at Newark, N. J., has been selected by President Wilson as his private telegrapher at the White House, Washington.

MCMEEN AND MILLER.—The well-known electrical engineering firm of McMeen and Miller, Chicago, has been incorporated under the same name. The firm is composed of Messrs. S. G. McMeen and Kempster B. Miller, both of whom are widely known in the telephone field as authors and engineers. Mr. Miller is president of the new firm.

MR. C. A. JOHNSON, formerly and for many years manager of the Postal Telegraph-Cable Company, Meadville, Pa., who a year ago went to Italy in the interests of the Universal Telegraphic Company, formerly known as the Rowland Printing Telegraph System, expects to return to the United States the latter part of March. This printing telegraph system is in use in Italy.

Elliott Cresson Medals Awarded.

At the recent meeting of the Franklin Institute, Philadelphia, Elliott Cresson gold medals were awarded to Dr. Charles Proteus Steinmetz, of Schenectady, N. Y., for successful application of an analytical method to the solution of numerous problems of first practical importance in the field of electrical engineering, and to Emile Berliner, of Washington, D. C., for important contributions to telephony and to the science and art of sound reproduction.

The First Morse Recorder.

Prof. G. S. Macomber, of Cornell University, Ithaca, N. Y., at the recent meeting of the Ithaca section of the American Institute of Electrical Engineers, read a paper entitled "History of the Morse Telegraph Instrument." An interesting feature of the meeting was the exhibition of the old Morse telegraph recorder, which was used on the historic Baltimore-Washington line in 1844, and on which was recorded the first message—"What hath God wrought." The old instrument was not only on exhibition, but was put into actual service, and on it a message was received from Mr. Gano Dunn, past-president of the Institute and a former telegrapher.

This historic instrument was presented to Cornell University by Ezra Cornell, who founded the university, and who was the operator at Washington when the first line was opened in 1844.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

California Society Dinner.—At the dinner of the Society of California held at the St. Regis Hotel, New York, March 8, Mr. C. H. Mackay, president, had as guests Messrs. G. G. Ward, vice-president and general manager of the Commercial Cable Company; E. J. Nally, first vice-president and general manager; C. C. Adams and C. P. Bruch, second and third vice-presidents, respectively, and E. C. Platt, treasurer, Postal Telegraph-Cable Company; C. E. Merritt, assistant treasurer, Commercial Cable Company; John Goldhammer and F. B. Gerard, of the same company; and Roy Martin, assistant general manager of the Associated Press, New York.

Mr. E. J. Nally, vice-president and general manager, has been invited to become a member of a special committee appointed to celebrate the one-hundredth anniversary of the founding of Ossining, N. Y.

Mr. W. I. Capen, vice-president, New York, is in Chicago on business connected with the service.

Mr. E. B. Pillsbury, general superintendent, New York, has returned from a trip to Boston and other New England points in the interest of the service.

Mr. M. M. Davis, electrical engineer and chief engineer of telephones, has returned from his trip through the West.

Among Recent Executive Office Visitors were: Superintendents, H. D. Reynolds, of Buffalo, C. E. Bagley, of Philadelphia, and H. Scrivens, of Pittsburgh, Pa., and P. J. Farrell, quadruplex chief, Boston.

Mr. F. H. Dernell, manager, Burlington, Vt., has returned to duty after a long absence on account of illness.

W. W. Wagoner, former manager of the Postal Telegraph-Cable Company at Fort Wayne, Ind., died February 24.

Mr. W. B. Vincent has been appointed chief operator of the Pittsburgh, Pa., office, vice H. J. Colebrook, assigned to the position of night chief operator.

The Omaha, Neb., Office is being refitted.

Elaborate Changes are being made in the office and plant at Cleveland, Ohio.

The Operating Rooms at Worcester and Springfield, Mass., have been rearranged.

A Motor-Generator Equipment has been installed in the Oshkosh, Wis., office.

The Dynamo Plants at Springfield, Ill., and Cedar Rapids, Iowa, have been rearranged.

Storage Battery and rectifier equipment has been installed in the Niagara Falls, N. Y., office to replace gravity battery.

New Offices have been opened at Lancaster, Pa., Lebanon, Pa., Charleston, W. Va. (the latter with a new dynamo plant), Kingston, N. Y., and Lowell, Mass.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

Mr. Newcomb Carlton, vice-president, made an address at the recent annual dinner of the alumni of Stevens Institute of Technology, at the Hotel Astor, New York.

Mr. Belvidere Brooks, vice-president, accompanied by Mrs. Brooks, sailed for Bermuda, March 14, to be gone three weeks.

Mr. Levi S. Wild, manager of the Butte, Mont., office of this company, has been promoted to the position of district commercial manager, with headquarters at the same place. Mr. P. P. Hughes, manager at Grand Island, Neb., has been appointed to succeed Mr. Wild as manager at Butte.

Mr. G. C. Limle has been appointed manager of the Findlay, Ohio, office, vice C. T. Hendrickson, resigned.

Mr. E. C. Bowen has been appointed manager of the Barnesville, Ohio, office, vice E. S. Floyd, resigned.

Mr. R. E. Eckler has been appointed acting manager at Vincennes, Ind., vice J. R. Clark, manager, who has been granted an indefinite leave of absence.

Mr. W. A. Sterner, manager of the Butler, Pa., office, has been advanced to the management of the Erie, Pa., office, taking effect March 17, to succeed J. F. Firey.

Meetings.—A meeting of district commercial and office managers was held by superintendent J. W. Reed at Harrisburg, Pa., February 19. A meeting of local managers and receiving clerks was held at Philadelphia on the evening of February 28. Addresses were made by Messrs. A. C. Kaufman, division cable manager, New York, and superintendent J. W. Reed, Philadelphia. The meeting was held to discuss cable rates, new cable features, etc. Luncheon was served in the office after the meeting.

The Following Changes in the Western Division are announced: Miss Georgia Troutt has been appointed manager at Sullivan, Ind., vice Miss Jessie Opdyke, transferred to the traffic department at Tell City, Ind. Miss A. D. Davis, formerly manager at Linton, Ind., has been transferred to the traffic department at Rockport, Ind. She is succeeded at Linton by Mr. B. F. Stevens, of Charleston, Ill. Mr. R. J. Hammond has been appointed manager at Mattoon, Ill., vice I. L. DeBolt, resigned to enter other business.

L. C. Wooten, formerly manager of the Western Union Telegraph office at Fayetteville, N. C., died in that place February 27.

Electric Clocks in West Palm Beach.—There are about thirty electric clocks in service at West Palm Beach, Fla., which is said to be more than twice the number installed in any other town twice the size in the United States. The clocks are giving excellent satisfaction to the users.

General Eckert's Will Broken.

On February 17 Mr. James Clendenin Eckert, elder son of the late General Thomas T. Eckert, former president of the Western Union Telegraph Company, brought suit in the Supreme Court, New York, to break his father's will. The case was on trial for over two weeks, and on March 5 the jury returned a verdict in favor of the contestant, thus breaking the will.

The will was, after a long contest, admitted to probate by the surrogate, whose decision was printed in full in our issue dated January 1, 1912. The case will probably be appealed to a higher court.

Meeting of Western Union, Boston Chapter.

The regular monthly meeting of the Western Union Chapter of the Telephone and Telegraph Society of New England, was held in Edison Hall, Boston, Mass., March 6, district commercial superintendent C. F. Ames acting as toastmaster. Mr. A. G. Saylor, general manager, New York, was the guest of the evening and delivered a very able address. It was general in character and related to the development of the telegraph. Other addresses were made by Messrs. A. C. Kaufman, division cable manager, and J. A. Hill and A. Woodle, of Mr. Saylor's staff; Henry G. Bates, general transfer agent, New York; W. S. Barker, district plant superintendent; L. D. Wilbourn, district traffic superintendent of the Western Union Telegraph Company, and W. H. O'Brien, of the New England Telephone and Telegraph Company, Boston.

After the addresses the party was entertained by members of the commercial department. The entertainment included character songs by several young ladies from the bookkeeping department, solos by gentlemen and monologues and sketches by two messenger boys. There were 300 persons present.

Mr. L. S. Wild, of Butte, Mont., Promoted.

Mr. Levi S. Wild, manager at Butte, Mont., whose promotion to the position of district commercial manager is noted in another column of this issue, is one of the best-known telegraphers in the West, and is one of the leading citizens of Butte, where he has been manager of the office for the past twenty years. He began his telegraphic career in Chicago, fifty years ago, for the Western Union. There were only ten Western Union operators there then, and he has been in the employ of that company practically ever since. During the early part of his career he worked in most of the large cities between Chicago and San Francisco, also in many of the Southern States. In 1867 he crossed the plains on horseback from St. Joseph, Mo., to San Francisco, and was the first manager of the Virginia City, Mont., office. On the completion of the Union Pacific Railroad he returned to Salt Lake City, and in 1872 went to Portland, Ore., where he was engaged in other business. Leaving Portland in 1873, he returned to the telegraph, and filled positions in various places until 1886, when he became manager at Butte. Mr. Wild has been faithful to the Western Union interests during his long service, and in his recent appointment is recognized well-merited reward for his fidelity.

Magnetic Club Anniversary.

The twenty-fifth anniversary of the organization of the Magnetic Club will be celebrated at a dinner in the Broadway Central Hotel, New York, at half-past six o'clock, on the evening of Saturday, April 19. On this occasion the privileges of the club will be extended to all past-members, who are cordially invited to be present. A special programme of entertainment is being arranged, and it is expected that a highly enjoyable evening will be spent. Mr. W. B. Dunn, 253 Broadway, New York, is secretary of the club.

RADIO-TELEGRAPHY.

Mr. R. H. Armstrong, manager of the Telefunken wireless system, San Francisco, Cal., was a business visitor in New York, last week.

Long Distance Wireless.—Wireless messages were, on March 3, exchanged for the first time between the Eiffel Tower, Paris, and Lake Chad in Central Africa, a distance of 2,810 miles.

Wireless Heard Over 7,000 Miles.—It is stated that the naval radio station at Newport, R. I., on the morning of March 4, heard two wireless stations in the Argentine Republic exchanging messages. The distance from Newport is between 7,000 and 8,000 miles.

New Portable Wireless Station.—A new portable wireless telegraph station was recently exhibited to government officials in Washington. It is carried on a large automobile truck, and besides the wireless equipment it provides living quarters for twelve men. Two telescopic towers can be raised to an altitude of 200 feet by the same power that drives the truck.

The Phillips' Memorial.—The committee of the J. G. Phillips' memorial fund has accepted a design for a drinking fountain to be placed in Battery Park, New York, to commemorate the heroism of John G. Phillips, wireless operator on the "Titanic," and George C. Eccles, Lawrence A. Pruthout and Stephen Sczpanck, also wireless operators, all of whom went down with their ships while in the performance of their duties.

Wireless Icebergs Scout.—Negotiations are in progress between the English Government and the principal transatlantic steamship lines whereby both parties will bear the cost of sending into the North Atlantic ice regions a perfectly equipped vessel which shall have a powerful installation of wireless telegraphy. The plan contemplates wireless reports by this ship to stations on the American coast and to Atlantic steamers of the latitude and longitude of icebergs and other similar dangers.

Mr. B. J. Graybill, manager of the Western Union Telegraph Company at South Bend, Ind., in renewing his subscription, writes: "I cannot very well do without Telegraph and Telephone Age."

THE CABLE.

Mr. A. E. Powell, engineer of station equipments, Western Union cable system, London, England, returned to London March 4, after spending a week in New York on business in connection with the company's service.

The New Cable Station of the Commercial Cable Company at Far Rockaway, Long Island, is now in full operation. At the present time there is only a technical staff at the station, but provision has been made to install an operating staff in case it should be found that the high-tension currents should seriously affect the operation of the underground cables leading to 20 Broad street, New York, a distance of twenty-two miles.

The World's Cables.—Some interesting statistics regarding ocean cables are supplied by the *Elektrotechnische Nachrichten*. Germany possesses at present four cable companies. The Deutsch-Atlantische Telegraphen-gesellschaft owns two cable lines to America and one to Vigo, in Spain; the network has a length of 11,091 miles. The Deutsch-Americanische Company has 6,645 miles of cables. The Deutsch-Nederländische Company's cable in the South Sea (Menado-Jap-Guam-Shanghai) has a length of 3,928 miles, and, finally, the Osteuropäische Company's cable between Constantza (in Roumania) and Constantinople has a length of 213 miles. In the aggregate these four companies, whose headquarters are in Cologne, control a network of 21,776 miles. The two French companies have a total cable length of 32,215 miles; the six American, 38,991 miles. In London are the seats of eighteen English cable companies, which control a network of 149,623 miles. The largest English company, the Eastern Telegraph, alone possesses 47,078 miles of cable. Two other companies, the Eastern Extension, Australasia and China Telegraph Company, and the Western Telegraph Company, have each networks 27,280 miles in extent. English pre-eminence is, therefore, overwhelming. The United States and France are pushing ahead.

A. E. Powell, Engineer of Station Equipments, Western Union Cable System, London, England.

Mr. Alfred Everett Powell, who was appointed on December 1, 1912, to the position of engineer of station equipments of the Western Union Cable System, with headquarters in London, England, was born in London, April 27, 1874. He studied for three years under the tutelage of Compton & Company, electrical engineers, at their works in Chelmsford, England. He subsequently completed the electrical and mechanical courses at the University College, London. After graduation he entered the employ of the Headland Storage Battery Company, manufacturers of storage batteries and designers of electrical motor cars. He then became associated with Mr. S. G. Brown, and remained with him for ten years, being employed in the installation of the Brown drum cable relay and other devices for increasing the working speed of submarine cables.

The French Cable Station at Orleans, Mass.

In November, 1879, the first cable laid by the French Cable Company between Brest, France, to St. Pierre, Miquelon, thence to Cape Cod, Mass., was landed at Nausett Lights from the cable steamer "Faraday." At first the company occupied a part of the lighthouse keeper's dwelling, and in the next year a commodious station was erected to accommodate the staff. It contained well-appointed sleeping apartments, billard hall and gymnasim. At that time the mirror galvanometer was in use, and two operators were required to receive the messages over the cable, one to read the characters and the other to write the messages from dictation. Later the syphon recorder was installed.

The original cable is still in use, small parts having, however, being spliced in to take the place of worn out sections. Owing to the severity of the winter at Nausett Lights, and the isolation of the staff, the cable was extended from North Eastham in 1891 to Orleans, Mass., a distance of seven miles nearer Boston.

The Orleans station is in the center of the town, and in the summer time is a show place with its well-laid-out gardens and beautiful floral display. The station consists of the superintendent's office, testing room, work shop, laboratories and operating room. It is lighted by gasoline, and the force includes eighteen members, thirteen of them working twenty-four hours a day on evenly divided shifts.

In 1898 a second cable was laid by the company direct to Orleans from France, from which point all messages are sent direct to New York to be forwarded to their destination. Last fall the cable between Orleans and North Eastham was relaid because of the damage inflicted thereon by the Orleans fishermen spearing for eels. The new cable, however, is so large and heavy that it resists damage of this nature.

The present staff at the Orleans station consists of superintendent Hugh Osborne; assistants, A. F. Toovey, G. S. Hall, E. H. Upham; operators, T. Downs, F. B. Townsend, F. Lugg, L. H. Delano, J. Dickey, R. Deschamps, L. I. Williams, L. Brest, Henry Osborne, William Wilson, I. Bourroult, H. Gardner, L. Deschamps, and lineman D. I. Fulcher.

The cable employes are members of fraternal societies, churches, etc., and contribute in no small measure to the town's social and business activities.

CANADIAN NOTES.

James J. Ingram, aged 64 years, formerly manager for the Great North Western Telegraph Company at Ogdensburg, N. Y., died in that city February 26. He retired three years ago.

Must Handle Wireless Business in Canada.—An order was granted by the Canadian Board of Railway Commissioners on February 27 in the case of the application of the Marconi Wireless Telegraph Company requiring the Canadian Pacific Railway Company's Telegraphs to accept and transmit Marconi transatlantic wireless messages over its land lines.

THE TELEPHONE.

Mr. Theo. N. Vail, of the American Telephone and Telegraph Company, said recently, in speaking of the proposed gift by his company of $5,000 a year for five years to the Massachusetts Institute of Technology, to be used in electrical research work: "I believe that the time has come when important firms and corporations realize the need of carrying on broad research, in which the outcome is not to be limited to matters immediately connected with the daily routine of business. When such work is to be done there are evident advantages in committing it to an educational institution where experimental facilities are provided, and where the results may be set forth free from bias of the commercial kind." Reference to this gift was made in our issue dated March 1.

Mr. G. E. McFarland, vice-president and general manager of the Nebraska Telephone Company, Omaha, Neb., has been appointed vice-president and general manager of the Pacific Telephone and Telegraph Company, with headquarters at San Francisco, Cal., to succeed Mr. E. C. Bradley, resigned.

Municipal Telephone Defeated in Seattle.—The proposition to issue $2,000,000 in bonds for a municipal telephone plant in Seattle, Wash., has been defeated.

Cumberland Earnings.—The gross earnings of the Cumberland Telephone and Telegraph Company during 1912 were $7,888,443, an increase of $515,782; net earnings $2,025,014, a decrease of $449,563.

Marriage or Money?—Telephone and other public service corporations which suffer from the activity of Cupid among the ranks of women employes have increased, or are threatening to increase, their salaries as an inducement for these employes to not give up a certainty for an uncertainty. This seems like strong medicine.

Copenhagen Operators.—Telephone operators in Copenhagen, Denmark, work on an average six hours per day, rates of wages being regulated accordingly. This regulation is based on the usual European custom of providing a certain time which the girl operator can spend at home in the discharge of the domestic duties which devolve upon her. The operators all wear uniforms of a specially chosen, non-dust-collecting cloth, and the gradations of rank are indicated by variations in the braid trimmings of the uniforms.

Rates in Copenhagen.—Local telephone rates in Copenhagen, Denmark, vary from $8.00 to $50 per year, with many intermediate grades, to suit different conditions of service. Charges are not assessed on a unit basis, but by groups of 1,000 or 2,000 calls per year, except for the cheapest service, where unit charges amounting to about 1 1/3 cents per call are made. As a result of the cheap rate, the percentage of telephones per thousand population is greater in Denmark than in any other country of Europe.

The Telephone in Japan.—The Japanese Government is still hard pressed to furnish telephone service to waiting applicants. According to latest reports, there are over 45,000 persons on the waiting list, and that number increases by about 3,000 per month. So far the administration has been able to connect only 25,000 subscribers per year. The administration had worked out a second program of telephone expansion and appropriated $12,000,000 for the five years ending March 31, 1913. This plan has been found to be totally inadequate to the needs, and thus a third program, providing $25,000,000 for the five years after 1913, is under consideration.

Standard Telephone Transmission.—Telephone transmission is ordinarily stated as being equivalent to the transmission obtained over a given number of miles of No. 19 B. & S. gauge cable having defined constants and with given terminal conditions. The type of No. 19 gauge cable, which is used as the standard, is of somewhat lower capacity than the cables now employed. The transmission efficiency of the present No. 19 gauge cables is about 90 per cent of the standard No. 19 gauge cable used for measuring purposes, that is, nine miles of the present cable are equivalent to ten miles of the standard. The standards of transmission very generally used are, for local service, eighteen miles; for suburban toll service, twenty-five miles; for long haul toll service, thirty miles.

Annual Report of the New York Telephone Company.

The report of President Union N. Bethell, of the New York Telephone Company, for the year 1912, shows gross telephone revenue of $43,223,622.62, telephone expenses, $31,276,207.52, leaving net telephone earnings, $11,947,415.10, to which are added dividends, interest and miscellaneous earnings, which bring the total net earnings up to $17,313,170.41. After deducting dividends, reserves for contingents and for employes' benefit fund, there is a surplus of $14,666,002.84.

The report includes statements showing combined operating results of the New York Telephone Company and its associated companies. The total of the telephone earnings were $65,632,688.52. Telephone expenses $48,461,690.75, net telephone earnings $17,170,999.77, add other income $1,510,072.57, making total net earnings $18,681,170.34. After deducting interest charges and dividends declared a balance of $5,492,161.77 is carried as surplus and reserves. On December 31 there were 985,780 stations in the system directly operated by the New York company and its local connecting companies, an increase during the year of 97,445. Including the associated connecting companies, there were in service in the whole system at the end of the year 1,756,343 stations, an increase of 232,319 stations. Two million dollars were set aside by the company for the inauguration of the employes' pensions, disability benefits and insurance fund.

Annual Meeting of the Telegraphers' Mutual Benefit Association.

The forty-sixth annual meeting of the Telegraphers' Mutual Benefit Association was held at 195 Broadway, New York, in the afternoon of March 12, president Belvidere Brooks in the chair.

After the reading of the report of the committee on credentials, which consisted of Messrs. W. H. McKeldin, F. D. Bermke and C. A. Dortmund, and showed 2,244 present or represented by proxy, the report of President Brooks was read.

It showed that during the year the association experienced a very favorable mortality rate, in consequence of which, by levying only the minimum number of assessments, the executive committee was enabled, after payment of all death claims when due, to return the temporary loan shown in last report, as well as to place $15,000 additional in the reserve fund, bringing the par value to $348,000, which is equivalent to nearly seven per cent of the total contingent mortuary liability.

The membership shows a net increase of 102 in full grade and 43 in half grade, and special thanks are extended to Mr. H. J. Pettengill, president of the Southwestern Telegraph and Telephone Company, St. Louis, Mo., for his efforts to extend the membership among the employes of the Southwestern company's system.

Referring to the pension, sick benefit and insurance plan instituted by the American Telephone and Telegraph Company and the Western Union Telegraph Company, Mr. Brooks said: "This plan, as well as other plans already in force, will no doubt have a direct bearing upon the work of the association. It is, however, confidently expected that, as a large part of the present membership are thus having their insurance substantially increased without additional cost, the attention of all Western Union and telephone employes will be more generally directed to the subject of family protection, and that those within the age limits and not otherwise provided will continue to join this association in larger numbers during the coming years, thereby enabling their dependents to be protected in practically double the amount that could otherwise be obtained even under the established low assessment rates."

The reports of the secretary, the treasurer and the auditing committee were then read. They showed that the association had, on December 31 last, 4,616 members in full grade, carrying $1,000 insurance, and 841 members in half grade, $500 insurance, and that assets were held amounting to $352,570 par value over all liabilities.

The election of officers resulted as follows: Belvidere Brooks, president; Chas. P. Bruch, first vice-president; S. S. Garwood, second vice-president; A. R. Brewer, treasurer; M. J. O'Leary, secretary; T. M. Brennan and G. H. Fearons, members of the executive committee to serve three years; auditing committee, H. D. Reynolds, Buffalo, N. Y.; W. J. Dealy and T. E. Fleming, New York.

An amendment to the constitution was offered, changing the name of the association to "Telegraph and Telephone Life Insurance Association," and on motion was duly carried.

Those in attendance were:

Boston, Mass.—P. J. Farrell.

Bradford, Pa.—J. E. Golden.

Buffalo, N. Y.—H. D. Reynolds.

Chicago, Ill.—F. D. Bermke, C. A. Dortmund.

Nashville, Tenn.—J. F. Fleming.

New York.—W. H. Baker, L. Dresdner, T. E. Fleming, Wm. L. Ives, T. M. Brennan, E. B. Pillsbury, Gardner Irving, F. E. Coyle, J. C. Nelson, M. M. Davis, C. P. Bruch, B. Brooks, M. J. O'Leary, E. J. Nally, R. J. Murphy, J. B. Taltavall, F. C. Halstead, T. F. Clark, C. A. Tinker, C. C. Adams, W. J. Austin, A. R. Brewer, J. R. Beard, J. A. Berry, Col. A. B. Chandler, P. J. Casey, H. G. Bates, J. W. Connolly, W. B. Dunn, J. A. Diercks, D. J. Gallagher, Wm. Holmes, E. F. Howell, A. C. Kaufman, C. F. Leonard, J. F. McGuire, C. H. Murphy, H. T. Marks, J. F. Nathan, W. J. Quinn, M. W. Ravens, C. D. Reed, W. A. Sawyer, N. E. Stimson, P. J. Tierney, J. B. Van Every, A. O. Wallis, W. P. Waters.

Philadelphia, Pa.—S. S. Garwood, E. W. Miller, C. E. Bagley, C. H. Beckworth.

Richmond, Va.—Ashby Watkins.

St. Louis, Mo.—J. A. McIntyre.

Washington, D. C.—W. H. McKeldin.

Wheeling, W. Va.—H. G. Bills.

In the evening the executive committee entertained the visiting delegates and about fifty invited guests, at an informal dinner at the Hotel McAlpin, corner of Broadway and Thirty-fourth street, President Belvidere Brooks presiding. Several short informal addresses were made, interspersed with singing and music, and all present enjoyed the evening's entertainment.

The speakers were: Messrs. C. P. Bruch, A. R. Brewer, T. M. Brennan, A. B. Chandler, S. S. Garwood, C. A. Tinker, W. H. Baker, M. M. Davis, H. D. Reynolds, M. J. O'Leary, and P. J. Casey. President Belvidere Brooks, acted as toastmaster, and kept the party in an excellent frame of mind by his pleasant and humorous references to the various speakers.

Those present were: C. C. Adams, W. J. Austin, H. G. Bates, B. Brooks, A. R. Brewer, W. H. Baker, C. P. Bruch, C. E. Bagley, T. M. Brennan, H. G. Bills, J. R. Beard, F. D. Bermke, J. A. Berry, A. Carlson, T. F. Clark, A. B. Chandler, P. J. Casey, F. E. Coyle, J. W. Connolly, M. M. Davis, W. B. Dunn, C. A. Dortmund, J. A. Diercks, L. Dresdner, J. F. Fleming, T. E. Fleming, J. H. Fleming, P. J. Farrell, F. E. Fitzgibbon, S. S. Garwood, D. J. Gallagher, F. C. Halstead, Wm. Holmes, E. P. Howell, Gardner Irving, A. C. Kaufman, C. F. Leonard, J. F. McGuire, E. W. Miller, W. H. McKeldin, C. H. Murphy, H. T. Marks, R. J. Murphy, C. H. Mills, J. A. McIntyre, E. J. Nally, J. F. Nathan, J. C. Nelson, M. J. O'Leary, E. B. Pillsbury, W. J. Quinn, H. D. Reynolds, M. W. Ravens, C. D. Reed, W. A. Sawyer, W. E. Stimson, C. A. Tinker, J. B. Taltavall, T. R. Taltavall, P. J. Tierney, J. B. Van Every, A. O. Wallis, A. Watkins, W. P. Waters.

Institute of Radio Engineers.

At the regular monthly meeting of the Institute of Radio Engineers, New York, March 5, Dr. L. W. Austin, of the National Bureau of Standards, Washington, D. C., in a paper described some experimental extensions of his recent work on the variation with frequency of condenser resistances. Although Dr. Austin was unable to deliver the paper in person, the subject-matter aroused much interest and brought about a lively discussion.

The Institute of Radio Engineers, which was formed by the consolidation of the Society of Wireless Telegraph Engineers and the Wireless Institute, is now well on in its second year. The membership is still growing rapidly, and meetings are held on the first Wednesday of each month at Fayerweather Hall, Columbia University.

Walter P. Phillips.

Walter P. Phillips, who was born in Grafton, Mass., in 1846, was for several years engaged in the telegraph business in Providence and New York and he has ranked from start to finish with the operators whose work has made them famous. Among his telegraphic contemporaries were Thomas A. Edison, Andrew Carnegie, Patrick B. Delany, George Kennan, David Homer Bates and hundreds of others who have since become famous.

In 1874 he entered the service of the Associated Press, and within a year rose to be assistant general manager. In 1877 he was sent to Washington as manager at that point, where he distinguished himself in many ways, particularly in his efforts to have the Red Cross treaty adopted. He became associated with Clara Barton, and for twenty years was the general secretary of the Red Cross, ably seconding and supplementing that noble woman's work.

He has had the confidence and friendship of Professor Samuel Finley Breese Morse, the inventor of the telegraph; Generals Hayes, Garfield, Arthur, Sherman and Sheridan; of James G. Blaine, Robert G. Ingersoll, Henry George; Presidents Cleveland and Harrison; George W. Childs, Charles A. Dana, Whitelaw Reid, General John B. Gordan, Jay Gould, John W. Mackay, William Winter, Richard Mansfield, Eugene Field, James Whitcomb Riley, Thomas Bailey Aldrich, Samuel L. Clemens, and many others of varied political and religious faiths.

In 1882 Mr. Phillips became general manager of The United Press, with headquarters in New York. This organization was merged with the Associated Press in 1897. Mr. Phillips's success as a press association manager was beyond all precedent. He is now prominently indentified with the Columbia Graphophone Company, in whose service he has continued for upward of fifteen years. He is the only surviving 1877 member of the Lotos Club of New York, of which he has been a director and its secretary. He is a member of the Sun Alumni Association, having "worked with Dana on the New York *Sun*" just forty years ago—1872-73—and he has been prominent for many years in Y. M. C. A., Sunshine Mission and Shut-in Society work. He is a member of the Marble Collegiate Church of New York, of which the eloquent Dr. David James Burrell is the minister, of the Corinthian Lodge of Free and Accepted Masons of Bridgeport, and of the Bridgeport Board of Trade.

Miscellaneous.

E. W. Moister, auditor of disbursements, American Telephone and Telegraph Company, New York, was killed in the Subway, March 12.

J. F. McIlvaine, Brooklyn, N. Y., and W. J. Lyons, Charlestown, Mass., both old-time and military telegraphers, died recently.

New Exchange in Houston, Tex.—The Southwestern Telegraph and Telephone Company opened a new exchange in Houston, Tex., March 5, and for two days the new quarters were inspected by the public.

Consolidation in Detroit.—The Detroit Home Telephone Company, Detroit, Mich., has been consolidated with the Michigan State Telephone Company, thus adding 8,000 subscribers to the latter system.

The Telephone in Medical Practice.—*The Medical Review of Reviews,* in an editoral on the uses of the telephone in medical practice, says: "The telephone has been a mighty factor in improving the health and welfare of the community. Health bureaus have been able to accomplish their work more rapidly and effectively by its use. Ambulance service has been developed to a high state of efficiency through the accessibility of telephones in all parts of the community. Rapidty of service, with promptness in telephoning, have served to save many lives that otherwise might have been lost. To-day the telephone saves many a long and needless journey. Frequently, because of the knowledge and appreciation that a physician may be quickly summoned by telephone in case of real necessity, the doctor is not called at all, as some transitory condition has disappeared before morning. In contrast to this small loss is the gain through telephone visits in lieu of office calls. Such visits may be regarded as office visits on the ground that, if telephones did not exist, it would be necessary for the patient to seek advice at the office."

Philadelphia Electrical Aid Society Anniversary.—The twenty-fifth anniversary of the Electrical Aid Society, of the city of Philadelphia, will be celebrated with a banquet and entertainment, on Tuesday evening, April 15, at Mercantile Hall, Broad and Master streets. There will be a high-class vaudeville entertainment, and each member attending will be presented with a souvenir book of the society. The proceeds from the event will be donated to the relief fund of the society. The committee on the anniversary is composed of members from the Bell Telephone Company, Keystone Telephone Company, Western Union Telegraph Company, Postal Telegraph-Cable Company, Electrical Bureau and Automatic Signal Department of the Pennsylvania Railroad and Philadelphia & Reading Railroad Company. Charles A. Huver, of the Electrical Bureau, is chairman and Richard H. Conway, of the Pennsylvania Railroad, is secretary.

Local Absorption in Radiotelegraphy.*

BY A. H. TAYLOR.

The general absorption of electromagnetic waves by the medium traversed has been studied for the conditions prevailing in practical radiotelegraphy at sea by Austin. Unless this absorption over land areas is much greater than over water, it is not of serious importance to the amateur operating over distances not exceeding fifty miles and with wave-lengths not less than 300 meters (985 feet). By local absorption certain phenomena caused by purely local conditions at sending or receiving stations are referred to.

H. True has studied that form of local absorption due to earth currents and shown that it may be partially avoided by the use of a false ground. There are other local effects, however, which are of more immediate importance to the amateur, who must often take conditions in a given building or neighborhood as they are and make the best of them. Among these effects are those caused by the proximity of energy-transmission, lighting and telephone circuits and of grounded conductors such as gas, steam and water pipes.

Some field tests in connection with the departmental radiotelegraphic apparatus at the University of North Dakota necessitated the use of a rather short wave-length, namely, 245 meters. This length was obtained by allowing the aerial to discharge directly through the spark-gap to earth, as in the original Marconi experiments. The spark-gap was about three centimeters long and the primary of the induction coil absorbed 300 watts. The ammeter in the aerial circuit indicated somewhat less than one ampere. The aerial at that time consisted of four wires, spaced two feet apart, run up from the second floor of Science Hall to a pole on the roof, with a total height of thirty meters. The aerial was slightly bent, but at no point except at the base did it approach the building nearer than ten feet. The alternating-current circuits used with the induction coil had no connection with the lighting system of the building, which is operated on 220 volts direct-current energy. Nevertheless, this particular wave-length set up current surges in the lighting circuits of the building, which resulted in the blowing of several fuses, the starting of two motors and the burning out of several tungsten lamps. Altering the wave-length eliminated these undesirable effects, but it is quite evident that a very considerable amount of the radiant energy of the aerial could have been absorbed without causing a catastrophe of such a nature as to call attention to the presence of these surges in neighboring circuits. The trouble was also avoided without changing the wave-length of the aerial by altering the free oscillations in the lighting circuit considered as a Lecher system. This was accomplished by putting two condensers of one mf. capacity each across the line at two experimentally determined points. It is quite likely that similar effects occur in the neighborhood of aerials used for receiving only, resulting in the elimination of large areas of energy from the wave front.

Since these experiments were performed, a new aerial with a free wave-length of 450 meters has been erected. This is operated by a loose Tesla coupling, the energy being furnished by a self-controlling transformer which is used in connection with a rheostat. Two alarm clocks operate switches controlling an automatic sending device which repeats a sample message of a few words, containing all the letters of the alphabet. This makes possible the study of receiving conditions at distant stations; for instance, at the author's home in the city of Grand Forks, three miles from the university, using small sending power and a very short single-wire receiving aerial. At first the receiving apparatus was installed in a tool-house well removed from all overhead conductors, and a receiving aerial ten feet high was found necessary in order to read clearly signals sent from the university with fifty watts indicated power on the primary of the transformer. The wave-length was about 460 meters. Later the apparatus was moved into the house, which is connected with the city alternating-current lighting system. The same signals were then received at the same intensity with a three-foot aerial, as indicated by shunting the telephone. The intensity of these signals, however, was greatly increased when this aerial was brought near an electric lamp. Evidently, the lighting system acted favorably as a collector and reacted on the aerial by induction. This point was tested by disconnecting the lighting system, and in consequence the signals were greatly reduced in intensity. It is evident that any speculation as to the radiant efficiency of the sending station based on indoor observations would have been far astray.

It was suspected that the proximity of grounded conductors would have an unfavorable effect. Such was found to be the case, for with the apparatus installed in two different houses having gas illumination, no audible signals were received until the aerial was raised to a height of fifteen feet, that is to say, several feet above the second-floor level, even though 150 watts was applied to the sending transformer. When the apparatus was moved to the second floor, the height of the receiving aerial above the ground remaining the same, the signals were very loud. The ground connection in this instance was on a second floor radiator. The indications were that the portion of the aerial between floors was inactive in the first experiment: indeed, it was detrimental, because its lateral capacity effect to surrounding grounded objects acted as a shunting capacity around the detector circuit. The detector used in these experiments was a corborundum crystal of unusual constancy and fair sensitiveness. The coupling was a loose auto-transformer device, adjusted for maximum strength of signal.

The inferences to be drawn from these three cases are as follows: First, conductors in the immediate vicinity of radio-electric stations should be

* From *Electrical World*.

examined for resonant surges which may be followed by dangerous arcing and which, in any event, absorb a considerable portion of energy. If the wave-length radiated is not changed, these surges may be prevented by capacity loads placed at suitable points on the circuits. The condensers should be fused to prevent short circuit in case of a puncture being formed. Second, the presence of insulated overhead circuits may be favorable for the reception of signals with short aerials when these aerials are close to such circuits. In general, however, these circuits would absorb considerable energy which would not be reradiated to an aerial. Third, in a building containing grounded circuits it is best to locate the receiver as high as possible. Some experiments made with 150 watts sending power with a receiving station thirty-five miles distant seem to confirm this point.

Insulation of a Telegraph Circuit.

Ideal conditions on a telegraph circuit prevail when the armature of the relay is promptly attracted by the maximum current, which passes through the helix of the receiving magnet, and when the breaking of the circuit results in absolute elimination of current. This ideal condition is never attained in practice, owing to atmospheric causes beyond the control of the operator. This condition could only be realized upon a line having perfect insulation.

The resistance of any line is reduced by imperfect insulation, and a proportionate increase in the quantity of current drawn from batteries results; therefore the batteries are more rapidly exhausted in wet weather than under dry conditions. It also follows that in working lines on the closed circuit plan, a stronger line current is maintained in wet weather except near the middle of the line, and there is a corresponding decrease in the margin or variation of current between the open and closed circuit.

Since no insulation is perfect, the longer the line the greater will be the escape of current, and if the insulators are poor the proportion of current reaching the far end of a line may be very small as compared with that at the end where the current is introduced. The law which governs these conditions has been stated by Moses G. Farmer as follows: "If the current upon the line near the battery be called the entering current, and that upon the distant end near where it enters the ground be called the arriving current, then the distance to which any stated fraction of the entering current will reach is directly proportional to the square root of the conductivity of the wire, to the square root of the insulating power of the insulator, and inversely to the square root of the number of poles per mile used."

There is a limit to the distance to which satisfactory signals can be transmitted over a telegraph line; which limit is dependent upon the ratio of its conductivity resistance to its insulation. This makes it necessary to retransmit all communications destined for transmission beyond a certain station. This transmission is now usually accomplished by what is known as a repeater. This is simply an arrangement of instruments in which the relay (or sounder, in some cases) which receives the signals on one circuit automatically opens and closes another circuit. This function is analogous to the work of a relay on a local circuit, in which a sounder is placed. The repeater is also frequently employed for receiving press news, etc., on one or more branches of the main line. By the use of repeaters, it is quite possible to transmit messages over ordinary telegraph lines for distances of several thousand miles.

Government Regulation of Monopolies.

Mr. Emerson McMillin, chairman of the department of the National Civic Federation on regulation of interstate and municipal utilities, made a report at the recent thirteenth annual convention of federation, in which he said:

"The principle of public regulation of quasi-public undertakings is firmly established in this country. The Massachusetts board of gas and electric light commissioners antedates the Interstate Commerce Commission and is now almost thirty years old. Congress established a commission to regulate interstate railroads in 1887. Forty-two of the forty-eight States of the Union to-day have commissions of one kind or another exercising central supervision over railroads or local public utilities or both.

"The old idea that the purveyor of transportation, gas, water, electricity and other public services under modern conditions was engaged in a private business, subject to the same rules of bargain and sales as the dry goods merchant, the butcher or the manufacturer, no longer prevails.

"Competition, relied upon in the earlier days to protect supposed public interests, has failed. Competition in a public service business is war.

"The furnishing of a transportation, gas, water, electric, telephone or other public service is and should be naturally a monopoly. Unregulated monopoly in any field of endeavor is abhorrent to Anglo-Saxon people. While regulation of public utilities must be based on full recognition of the monopolistic character of the business, it is also true that recognition of monopoly invites public regulation or public ownership and operation. The department believes that not only public regulation is preferable to public ownership and operation, but that public ownership and operation may be deferred only by reasonable public regulation.

"The state owes it to its quasi-public agencies performing the transportation, gas, water, electric, telephone and other public services no less than to the public itself to free public utilities from the baneful influence of local politics. The state must see to it that the common law rule of reasonableness and non-discrimination is applied fully and in all respects fairly to these industries."

UNDERGROUND TELEGRAPH CABLES IN ENGLAND.—There are 1,197 miles of underground telegraph cables in England and 133 in Scotland.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

E. B. SHERBURNE, Advertising Manager.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, MARCH 16, 1913.

How Promotions Are Made.

The question has been asked us "Upon what principle do telegraph companies select their men for promotion?" and it seemed to be tinged with the bitterness of disappointment, as though the writer considered that his knowledge and ability had not been properly recognized by those in authority. As to this we have nothing to say except that we do not share in the belief implied.

The answer to the question, however, can be stated in the simplest terms, viz.: knowledge and fitness; these two qualifications form the basis of promotions.

We often hear the complaint in the case of a promotion that undue favoritism was shown in the selection of the man to fill the position. In such cases, even admitting the charge of favoritism, it will generally be found that the favored one possessed the very necessary qualifications mentioned. The favoritism cry generally proceeds from the one who thought he was entitled to the appointment, but failed to receive it. Bear in mind that there are a great many things to consider in the selection of a candidate for a position of greater responsibility.

There are many men to-day working at the desk who are really competent to fill higher positions, but their ability is generally unknown. They have stored their minds with useful knowledge—we know many such—but are timid about laying their ideas open to criticism. How can they reasonably expect to be chosen for advancement while hiding their light under a bushel? Unused talents rust and decay, and it makes no difference how many books a man has read and studied his knowledge is of no value whatsoever if it is not put to some use. Suppose, for instance, such a man—a telegrapher—is employed in a small village remote from headquarters, where he escapes observation; what can he do to place himself in the ranks of candidates for higher places? is a question that might naturally and reasonably be asked. A very effective way to do this is to let his knowledge be known through the medium of his class paper, if no other means are available, and thus attract to himself the attention of his superior officials, all of whom no doubt read the journal. If a man has made what he thinks is a discovery or an improvement in the method of performing a particular function, or in an apparatus, he should make it known. Individually he will thus become known, and if there is any merit in his work the officials at headquarters will soon learn of it, and he will become a "marked man" for advancement. One danger to avoid is self-satisfaction in the knowledge one possesses. No man knows everything and the wise man fully recognizes his own limitations. He is not satisfied with his present knowledge, but works to increase it.

The columns of TELEGRAPH AND TELEPHONE AGE are always open to the man who has ideas. Criticism brings out the truth, and while it may be favorable or unfavorable it is more advantageous to know the truth than to harbor an error.

We hope we have succeeded in pointing out at least one way for ambitious men to let their light shine, even though they may be on the outskirts of civilization. Distance is no obstacle to a man's progress if he has a purpose to carry out and he goes at it in the right way. We believe that a man with real knowledge and ability, wherever he may be, can bring himself to the front by utilizing the columns of his professional journal in the description and discussion of new ideas of his own or those of others.

The Successful Manager.

The boys had arranged a match to see who could run to a certain point in the straightest line. There were numerous entries, and each contestant had his own scheme. Some were very elaborate. One boy drove stakes along the route and stretched a cord between them, to guide him in the straightest line. All talked of their arrangements but Sam, who said nothing, and seemed to be making no plans for the coming event. When the day came, and the signal was given, Sam ran to the goal at a moderate pace, and when the judges investigated, it was found that he had won. All plied him with questions, to which he responded:

"I kept my eyes constantly on the goal."

Try it yourself, and see if your foot prints do not make as straight a path as that laid out with a transit.

The man who succeeds generally differs from his fellows principally in this one particular, of keeping his mind constantly on one fixed object of attainment.

Life is interesting. The more intelligent and educated the man, the more he is capable of taking an interest in things about him, and there are men who actually fail because, like a hen in a barnyard, they are always dropping one choice morsel to inspect another. These men are the fellows whose keen sensibilities and natural intelligence would land them in high positions if they could only be induced to select one line of endeavor and stick to it. Many men succeed because they are actually too unresponsive to fail. They happen to get into a certain line and they simply keep at it, not having taken enough interest in things about them to become conscious of any diverting tendency.

If you are a telegrapher, and desire to become a manager of an office, paste this desire in the crown of your hat, and keep your mind trained on that point.

The manager's position naturally divides itself into three parts: his relations with the company; his relations with the public; his relations with his employes. In all these relations tact is the main thing and knowledge second. Tact simply resolves itself into common sense, with good nature backing it. The necessary knowledge of technical details involves the study of underlying principles and their application to practical problems. Now is your time to pick up these underlying principles from articles in technical publications and from good text-books, for when you get the managership you will have to do the work, not learn to do it.

Be courteous to the public and to everyone; study the job of the man ahead of you; and try to fill your position so well that you will outgrow it.

But, above all, keep your eyes on the goal and drive toward it.

Mental Anguish.

Curious actions are occasionally brought against telegraph companies in the mental anguish states. Perhaps the most interesting of these is the action of Anna Demoss against the Western Union Telegraph Company, at Charlotte, N. C. The complaint alleges that on December 20, 1912, she became engaged to Joe Flynn, and that four days later she went to Burlington, N. C., for a short stay, having first made all her arrangements for an early marriage, but leaving the date undetermined. She alleges that on December 28 she received a letter from Joe asking if she could leave for Charlotte the following day and enter into the holy state of matrimony with him on her arrival at about four in the afternoon. She says that it was not convenient for her to become Joe's wife on the following day, and she therefore wired him that she could not do as he suggested. However, on the following morning, December 29, probably repenting and feeling that she ought not longer to keep Joe in suspense, she started for Charlotte, and when passing through Greensboro she filed a message with the Western Union Company addressed to Mr. Joe Flynn, Southern Depot, Charlotte, N. C., reading "Will arrive on No. seven four o'clock, meet me," signed "Anna." As a matter of fact, the telegraph company could not locate Joe at the depot, although it made strenuous effort, and in consequence the message had not been delivered when Anna arrived at 4 p. m.

Now, the damage: Anna says that because of Joe's failure to receive the message he was induced to believe that she "had no desire to become married to him," and "quarreled violently with the plaintiff and broke off the engagement and withdrew from the contract to become married to the said plaintiff as above set out, and in a fit of despondency left the city of Charlotte for points unknown a week later, and has not been heard from since." There seemed to Anna but one balm for her great injury; but one reparation for her great loss, and therefore acting on the advice of an astute "mental anguish" lawyer, she brought her action against the telegraph company, closing her complaint with the allegation, "and the said plaintiff is deprived of the company and affection of said Joseph Flynn for life; that she is deprived of the support by said Joseph Flynn for life; that she has endured much mental and physical anguish, and is damaged in the sum of $2,000," which is the figure at which she valued her Joe.

It is hard to determine which is the more ridiculous, the mental anguish doctrine itself or this action predicated on it.

Controlling Stock Quotations.—Among the recommendations in the report of the Pujo Congressional Committee in regard to its investigation of the so-called money trust is a provision that Congress prohibit the transmission by the mails, or by telegraph or telephone from one state to another, of orders to buy or sell, or quotations or other information concerning transactions on any stock exchange, unless such exchange is incorporated in the state or territory in which it is located.

Crystal Telegraph Poles.—In Germany, near Frankfort, there is a factory for the manufacture of crystal telegraph poles. In order to give better strength to the crystal mass of the posts they carry a framework of thick wire. These posts are said to be better than wood, because they perfectly resist the attacks of insects and are impervious to atmospheric influences. The insulating qualities of glass are also an important gain in the case of these poles.

Valuation of Property of Common Carriers.—The Adamson bill requiring the Interstate Commerce Commission to ascertain the actual value of the property of all railroad, telegraph and telephone companies and other common carriers, has been passed by both houses of Congress. The bill is designed to furnish a basis recognized by the courts for the fixing of equitable rates and charges.

Annihilates Time.—"What!" said the telephone subscriber as his quarterly bill was presented, "three months gone again?" "Yes," said the collector, "that is one of the advantages of the telephone, it annihilates time."

Course of Instruction in the Elements of Technical Telegraphy—XXXV.

(Copyrighted.)

(Continued from page 143, March 1.)

[We began in our issue for October 16, 1911, the publication of a course of instruction in technical telegraphy. The course, which was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, is published for the benefit of those of our readers who desire to fit themselves for better positions in their vocation. It is elementary throughout and is divided into chapters, following one another in logical order.

The course has received the hearty commendation of telegraph officials and experts for its scope and accuracy and its sound practicability. In each chapter examples are presented in order to illustrate the application of the rules to practical cases, and each chapter is followed by a series of questions pertaining to the subject of the chapter, to be worked out by the student in order to review his progress. Back numbers containing these valuable articles can be obtained on application, at 10 cents per copy.]

QUESTION PAPER.

In the following tests the student is requested to use the diagram of the switchboard represented in

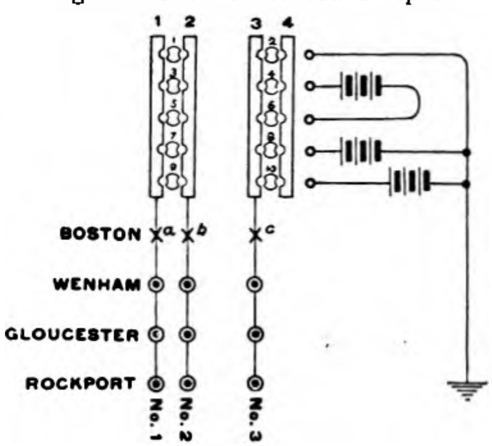

FIG. 39—PRACTICE TESTING DIAGRAM

Fig. 39, and show in each case, by means of the strap and disk numbers, a battery in connection with the faulty wire. The further insertion or removal of plugs must be specified as well as the inclusion of the test relay (not shown in the figure) at the spring-jacks *a*, *b* or *c*.

The three wires run from Boston to Rockport, through Wenham and Gloucester, Boston being the testing station; the student is now promoted to wire chief at that city.

(1) Lost Gloucester on No. 3. Relay on that wire shows the presence of a very strong current. How would you locate trouble?

(2) No. 2 is open. How would you localize fault?

(3) Getting kicks on No. 1, 2 and 3 seem clear. Localize trouble.

(4) Unable to raise Gloucester on No. 2. The pull between relay cores and armature is normal.

(5) No. 1 is swinging. Is the swing to a ground or a cross?

(6) What is a weather cross?

(7) How would you distinguish a weather cross from a metallic cross?

(8) A cross is suspected between the primary and secondary of an induction coil. Prove this to be the case.

(9) There is an intermittent fault on No. 2, occurring only at long intervals. How would you localize?

No. 4 is a clear wire and idle.

Wire Testing at Intermediate Offices.

In the testing operations previously considered the intermediate offices have taken no active part

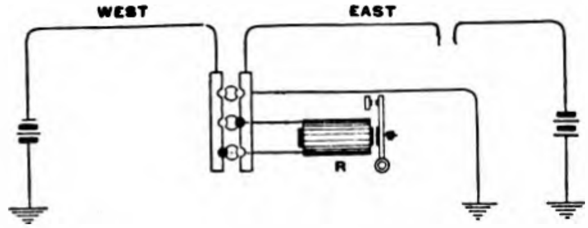

FIG. 40—TESTING AT INTERMEDIATE OFFICES

beyond obeying the instructions of the testing station by opening or grounding the wires, but a little intelligent assistance from the operator at the intermediate office might frequently save time in localizing the trouble, and be appreciated by the distant wire chief.

Suppose, for instance, that the intermediate local apparatus is included in the circuit of a through wire on which a failure occurs that manifests itself by

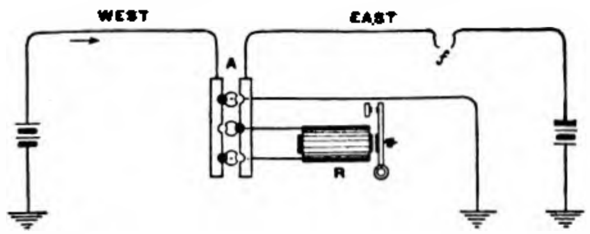

FIG. 41—TESTING AT INTERMEDIATE OFFICES

opening relay R, as in Fig. 40. The operator can at once proceed, without awaiting instructions from the terminal office, to ascertain for himself the character and location of the fault from the following considerations:

Let Fig. 41 represent that portion of his switch through which the wire is led, and let it be as-

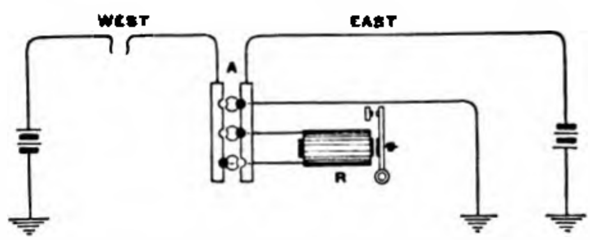

FIG. 42—TESTING AT INTERMEDIATE OFFICES

sumed that the fault is due to a "break" on the eastern division of the line. Then, on inserting an extra plug at A, the western line and battery become grounded at the switch before reaching the local relay R, which, it will be observed, is now inserted in the eastern line only, but still remains open on account of the disconnection at *f*. This inaction on the part of the relay will immediately indicate the nature of the trouble, in addition to placing the fault east of the testing station. Should the opening occur on the western section of the line, that fact can be established in a similar manner by shifting the extra plug at A to the position shown in Fig. 42, which will thereby transfer relay R to the western line with results similar to those just described. *(To be Continued.)*

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What is the average resistance of the standard cell of battery, and to what is it equivalent in length of copper wire, the thickness of that in the coil of the galvanometer previously described?

Assuming three standard cells in series, what is the combined voltage, resistance and the current generated?

State the law of joint resistances.

What is the reciprocal of a number?

What is the reciprocal of a fraction?

State a simpler method than the one previously given for ascertaining the joint resistance.

Give two methods by which the quantity of current traversing any given circuit may be varied?

What law may be stated with regard to the current traversing every portion of an undivided or non-branching circuit?

What is the law governing the flow of current on a divided circuit?

What is a branch circuit called?

When the flow of water has become steady in a closed pipe, what is true with regard to the quantity which passes any given cross-section?

Is this true in the case of an electric current?

When water is flowing through a horizontal pipe, what is true regarding the pressure at different distances from the source of supply?

Is the same thing true with regard to an electric current?

What term is applied to the decrease of pressure observable in an electric current flowing through a conductor?

Of what condition is the flow of an electric current an evidence?

What relation exists between the fall of potential and the resistance of the circuit?

What is meant by the capacity of the conductor?

What is the unit of capacity?

What is the electric unit of power?

What relation does it bear to the mechanical unit of horse-power?

State the relation existing between the quantity of power exerted by a given current, the current itself, and the resistance of the line.

What is current induction?

What is the name of the current induced by it?

What is a primary current?

What is a secondary current?

What is meant by the electrical dimensions of a cell?

In what units are they stated?

What relation exists between the number of cells in series in a circuit and the consumption of material?

Of what three elements does an electromagnet consist?

In what units may the magnetism of a magnet be expressed?

What is meant by the intensity of magnetism?

In what unit is it usually stated?

What is the unit of magnetism?

What is a uniform magnetic field?

(To be Continued.)

New Edition of Schneider's Electrical Testing.

The fourth edition of "Electrical Instruments and Testing," by Norman H. Schneider, is now on the press, and will be ready for delivery toward the end of the present month, March.

The book has been carefully revised and enlarged, and much important new text and many illustrations and tables have been added. It is brought up to date in its descriptions and illustrations of new apparatus, and in the testing work much new material has been added, including a number of pages on testing in the telephone exchange. Much new information is given on the use of the voltmeter in testing resistances, and the new tables will be found exceedingly useful.

The book will have about 300 pages and 149 illustrations. The contents by chapters are: Laws of Electricity; Galvanometers; Rheostats; Voltmeters; Wheatstone Bridge; Testing Sets; Current and E. M. F. in a circuit; Potentiometer; Charge and Discharge of Condenser; Telephone and Telegraph Cable Testing; Testing with Voltmeter; Testing Telephone Lines with the Voltmeter; Early Morning Tests; Location of Grounds and Crosses.

This is not a theoretical work, full of mathematics, but a clear, straightforward, positive help for the practical man, written by one who has had a wide and varied practical experience.

Mr. Jesse Hargrave, superintendent Mackay Telegraph and Cable Company, Dallas, Tex., and an electrical engineer of ability and high standing, is the author of the chapters on testing telegraph wires and cables and locating faults.

The price of the book will be $1.15, postpaid to any part of the world, and orders will be filled by Telegraph and Telephone Age, 253 Broadway, New York, on receipt of price.

The Care of Callaud Battery.

Following are the official instructions of the Western Union Telegraph Company regarding the care of Callaud batteries:

When new battery coppers are received, they should be placed where they will not be exposed to extreme heat, or to the sun, whether they are in a box or not. They should be kept in a temperature that will not dry out and crack the insulation on the stem. In extreme dry climates it may be necessary to immerse the coppers in water.

TO SET UP THE BATTERY.

Place the copper plate, unfolded, in the bottom of the jar, carrying the copper wire to which it is attached upward and out at the top. Fill the jar with water to a point about one and one quarter inches from the top. For a new cell put in the proper amount of sulphate of copper (blue vitriol) and place the zinc in position as directed. This should cause the water to be about one-half inch above the zinc. If no zinc solution is at hand to start the battery, connect on a short circuit until fit for use.

The zinc and copper solutions in this battery are separated by their own gravity, and this separation is easily maintained if not overcharged or interrupted. The blue solution should not be permitted to come in contact with the zinc, but should be separated by a clear white color line. When this rises to the zinc it indicates too great a quantity of sulphate of copper for the amount of work done by the battery.

As the water evaporates more or less rapidly it will be necessary to add a little more from time to time, to keep the zinc entirely covered with the solution.

When the zinc solution approaches full saturation the sulphate of zinc creeps over the zinc hanger and jar to the shelving; at the first outward indication of this the solution should be reduced by drawing off about one inch of the white portion of it. The degree of saturation may be indicated by the hydrometer, and should not be permitted to rise above twenty-five degrees. If the inside rim of the jar is occasionally coated with oil or paraffin, this spreading of the sulphate of zinc is in a measure prevented.

Ordinary batteries from which four or five lines are worked, should be thoroughly cleaned once in three months, the local battery cells once in three weeks.

The average life of a No. 1 Crowfoot zinc is about one year.

The average consumption of blue vitriol is about eight pounds per annum for each No. 1 cell.

Coppers are not consumed, and their life depends largely on the manner in which they are used.

TO CLEAN AND RENEW THE BATTERY.

Carefully remove the zinc, scrape off the adhering matter and wash well. Save the clean part of the solution, and pour it back into the jar after the latter has been thoroughly washed. In replenishing the cells with vitriol none of the crystals or crushed vitriol should be allowed to remain in contact with the zinc. Examine all connections, making each one bright and perfect. The shelves should be thoroughly cleaned before the cells are replaced, and care taken not to splash the water when refilling the jars.

The temperature of the battery room should never be permitted to fall to the freezing point, and, on the other hand, should not be kept so high as to produce rapid evaporation.

At stations where main batteries are maintained, but where the constant services of a battery man are not required, it will be the duty of the manager to frequently inspect and attend to his batteries, or promptly notify the person assigned to battery work at his office when the battery requires attention; and if not attended to at once, he must so notify his superintendent in writing.

Where linemen are assigned battery work in connection with other labor, they must know at all times the condition of batteries under their charge, either from personal inspection or through the manager, and keep them prefectly clean and in good working order. The coppers should be retained as long as possible, and none should be removed unless the connecting wire becomes defective, or the deposit on the copper becomes so great as to make a longer use of it likely to cause the jar to be broken when it is finally removed.

Electrical Resistance of Treated Timber.

Recent tests of the electrical resistance of timber treated with various preservatives showed that treatment by different creosote processes did not greatly change the natural resistance of the timber.

The resistance of wood was found to be least when measured parallel with the grain, and greatest when measured tangentially to the growth rings, an intermediate value being obtained when the measurement was taken radially with the growth rings. Resistance was found to decrease rapidly with an increase in contact pressure, and in a nearly direct proportion to the increase of temperature between the limits of zero and 50 degrees centigrade.

The tests seem to show that, due to an electrolytic effect, the resistance increases rapidly when the current is first applied and gradually becomes constant. On opening the circuit the reverse phenomenon is observed, as the resistance falls off rapidly at the instant the circuit is broken, and gradually approaches the value that existed before the current was applied. All the tests tended to show that the conductivity of wood is due primarily to the presence in the pores of an electrolyte formed by an aqueous solution of the salts found in the natural timber, or of these salts and others artifically introduced. The resistance of timber varies directly with the length and inversely with the cross-section, which is the law that applies to all conductors.

MR. C. E. BAGLEY, superintendent of the Postal Telegraph-Cable Company at Philadelphia, Pa., writes: "I have been receiving the AGE since its first issue, and could not get along without it."

Protection of Dispatching Equipment.

The type of lightning arrester and its location have given rise to much discussion. It is continually pointed out that commercial telephone authorities agree that the fuse must be next to the line, irrespective of the type of arrester. "While this is desirable in standard long distance and exchange service, both commercial and railway, I do not agree," says Mr. J. A. Kick in *Telephony,* "that it is practical in railway dispatching and message service. In fact, it has been proven impossible where continuous service is demanded.

"The light capacity fuse next to the line serves as a double protection in standard telephone work, in that it furnishes both lightning and sneak current protection and is of such capacity as to "blow" on very low currents. The blowing of a fuse on one of these circuits does not prove of such importance that a few minutes' delay will be felt. In fact, where it is important, as on long distance telephone lines, a man is usually at hand and makes replacement at once.

"On railway dispatching circuits, ten minutes or more delay, often much less, is a serious handicap in handling trains or important telegrams. Continuous service is demanded with the result that a light capacity fuse next to or in the line at way stations proves impracticable. With a selective bridge across the circuit at each station and the fuses next to the line, the selector is not really safe from damage until both fuses are blown. Until then, the selector circuit provides a high resistance path around an air gap. Should the arrester be slightly defective on one side, the selector runs a good chance of damage. With the very light equipment fuses back of the arrester, the first blown fuse protects the selector and telephone circuit from further possibilities of trouble. With the two following methods, first, a low capacity fuse installed ahead of the arrester and second, the same capacity fuse placed back of the arrester, there will be in the first case destroyed selectors, condensers, cords, receivers and other damage, while with the second arrangement very little or no damage and, strange to say, not many blown fuses.

"The blowing of fuses in way stations is most serious when the fuses are in the line, as it cuts off the entire circuit beyond the station. While it is desirable that the line be fused at way station test panels, it has been found that a comparatively high capacity fuse can be used with safety. It avoids both the unnecessary interruptions and at the same time furnishes protection against excessive currents. For the purpose of protection against sneak currents, it is possible to place fuses of say ten ampere capacity ahead of the arrester and equipment fuses of one ampere capacity back of the arrester. However, the demand for the first fuse, except where it is in the line wire for protection of test panels, is to some extent questionable, although there is no gainsaying that it is an added factor on the side of safety.

"There is a very acceptable explanation of the difference in protection required by commercial telephone circuits and those of dispatching service. A commercial circuit is fused and protected by arresters at two or three points in a distance of say 100 miles, while the usual dispatcher's circuit is furnished with twenty to thirty protectors in the same length of line. As there is practically no limitation in mounting space, an arrester with greater surface which furnishes more effective protection, is used.

"I have often watched the arresters in long distance telephone offices. It has been my experience that the fireworks display there was a class of its own when compared with that of the standard arrester used in railway dispatching service. The reason was that the discharge was forced to pass through the two arresters at the terminals, while on the dispatching line, it is dissipated through forty or fifty arresters distributed at various points along the circuit.

"Telephones placed in pole boxes and booths for the use of trainmen should be protected by lightning arresters and fuses to prevent loss of and damage to equipment and also to protect the user.

"This class of equipment does not receive the best of treatment nor does it always get the very best maintenance attention although it is in a class that should, as no one is accountable for damage and careless handling. It should therefore be provided with an automatic cut-out switch to keep the instrument from being permanently across the line.

"There are several types of carbon block arresters which provide a reasonable amount of protection, but the vacuum type of arrester is without question the proper form. The vacuum arrester gives protection with less maintenance attention than does any other effective arrester. While this form of arrester is yet too new in the service for the user to arrive at a definite figure of service life in full efficiency, yet some comparative service data has been secured to use for a basis in comparing maintenance costs.

"The vacuum arrester gives practically no trouble by reason of dislodged particles between carbons causing leaks to ground; is easily tested; and with the improved non-destructible enclosures, the maintenance should be a minimum with a maximum efficiency.

"Fuses should be of the enclosed type in such receptacles as to be replaced without danger. In fact, both arresters and fuses should be so assembled that they can be replaced during storms without fear of injury to the attendant.

"It appears rather out of proportion to pay twenty-five to fifty per cent for the protection of apparatus. It might be a good hazard to entirely neglect the protection if it were solely a question of the loss of equipment, but the most serious objection is possible fire losses and personal injury. When all is considered, the highest class of protection is an excellent insurance at a minimum rate, and there is not a single installation where such insurance is not justified.

Not enough attention is given to providing good grounds on arresters, and it is the writer's experience that seventy-five per cent of the telegraph office grounds are poor and have to be renewed for effective service in telephone work.

"The old practice of tying a wire to a piece of railroad iron and throwing it under the depot platform (an actual discovery) will no longer serve, neither will the tying onto a many-legged wire which is said to go to ground somewhere. There should be a good, substantial ground rod that reaches a permanent moisture level. It should be well soldered to a heavy copper wire which leads direct to the equipment with the fewest number of turns and no direct sharp bends.

"Where it is impossible to secure a suitable ground through the use of a rod, it is then necessary to use a copper plate and charcoal or a ground cone. The point I wish to make is not the means of securing a ground, but rather the necessity of a good ground, a point which is often overlooked. Protection, then, means high efficiency arresters, balanced capacity fuses, a proper circuit relation of the units and a perfect ground connection."

The Telegraph as an Auxiliary in Long Distance Telephone Work.

The beginning of the joint operation of the telegraph and telephone was suggested about in 1894, when a storm prostrated the wires. The following interesting account, which was printed in these columns after the event, shows how the situation was met:

"The use of Morse as an auxiliary to the long-distance system of the American Telephone and Telegraph Company is a rather new and radical departure. It is applied to the passing of telephone calls, which heretofore were passed over the telephone. With the aid of the Morse system the work of the telephone operators is very much simplified, greater speed and accuracy obtained and with increased efficiency of circuits a very considerable saving in wires.

"The possibilities of Morse in connection with the telephone service were first made apparent in November 1894. On election day a severe storm prostrated the lines of all companies. The American Telephone and Telegraph Company being the first to get a circuit working through were besieged with business, but how to reduce the accumulation with any degree of satisfaction under the ordinary method of doing the business was the problem that stared the officials in the face.

"It was suggested, however, that the details of all telephone calls be passed between New York and Boston by Morse, and to this end two skilled Morse operators were pressed into service. It was fortunate for the success of the experiment that the two operators were sufficiently expert, and the way the business was hustled through proved a revelation. The result proving so satisfactory, led to the introduction of Morse in a limited way by the New York and New Jersey Company and by the American Telephone and Telegraph Company, but the advantages were somewhat handicapped by inferior operators.

"The company, however, was satisfied that there was a future for the application of Morse and engaged Mr. Henry W. Pope, formerly general superintendent of the Metropolitan Telephone Company and an "old time" telegrapher, as special agent, to take up the subject with a view to its more general introduction."

Mr. Pope did some excellent work in this direction, his knowledge of telegraph requirements proving of inestimable value in the development of methods to bring this about. He is now the secretary of the Telephone Pioneers of America, and is one of the best posted men in the telephone service.

The First Telegraph Wires in Chicago.

The first telegraph lines were strung into Chicago in the year 1848. A telegraph office was established in what was known as the Saloon Building, at the corner of Lake and Clark streets. The first telegraph message came into Chicago, January 15, 1848. It was from Milwaukee. The first message from the East was received in Chicago April 6 of the same year. This last was a greeting from Detroit, which read as follows:

"To Milwaukee, Racine, South Port and Chicago: We hail you by lightning as fair sisters, as bright stars of the West. Time has been annihilated. Let no element of discord divide us. May your prosperity, as heretofore, be onward. What Morse has devised and speed joined let no man put asunder."

The answer which sped over the wire from the cities addressed was this:

"We return the greetings of our sister of the Straits, and trust that lightning may never prove an element of discord between us. As sisters, may we be joined by bonds as holy as those which unite maidens to the object of their love, but unlike that love, may our course always run smoothly."

In 1859 there were two telegraph companies—The Western Union and the Illinois and Mississippi—engaged in transmitting and receiving messages in Chicago. The offices were in the same building, at 11 La Salle street.

Induction in Australia.—A peculiar induction phenomenon has been noticed on some of the combination telegraph and telephone lines in Australia. Almost entire conversations can, at times, be distinctly heard by a person standing in front of the telegraph relay. This phenomenon is especially common at night, when operators can distinctly hear conversations produced at the magnets of their telegraph instruments when the line is not in use for telegraph work.

Texas Statistics.—Statistics of Texas industries show that there are 496 independent connecting telephone companies, thirty independent non-connecting telephone companies and four telegraph companies operating in the State, and that there are approximately 300,000 telephones in use. One of the telegraph companies is a wireless concern. The other three companies have 76,340 miles of wire, and a total of 1,251 offices within the State.

How the Bermuda Cable Was Repaired.

Karl K. Kitchen describes in the *World Magazine* the operation of repairing the Halifax and Bermuda cable which was broken last December near Hamilton, Bermuda. He was on board the cable steamer "Mackay-Bennett," of the Commercial Cable Company when the repairs were effected. This cable is 700 miles in length, and at the time communication was interrupted President Wilson was in Bermuda, and had been using the cable a great deal in keeping in touch with affairs in the United States.

"As the result of the accident," says Mr. Kitchen, "Hamilton was practically isolated from the rest of the world, for the only other cable went to Jamaica. By sending a message to Jamaica, and having it relayed to Havana, and thence by telegraph to New York, it was possible to get a few words through in fairly short time. But the tolls were enormously high.

"The moment the operator at Halifax found that the key on the Bermuda cable did not respond to his touch he reported the fact to his superior in the Halifax office. Orders flew back and forth telephone bells rang, messengers scurried in and out of the office, and in a few hours the 'Mackay-Bennett' cable repair steamer was on its way to Bermuda. The 'Mackay-Bennett' is the steamer which picked up 300 bodies of persons who died in the 'Titanic' disaster.

"The operators at Halifax and Hamilton had located the break. It was about six miles from the Hamilton end of the cable. Even when the captain of a cable repair ship knows that the break is about six miles from one end it's no easy affair to pick up the big wire ropes. The floor of the ocean is uneven and he must allow for slack. The crew was ready when the ship stopped. With a splash the big grapnel went overboard, and yard after yard of line was paid out until the hook touched bottom. The water was 120 fathoms (720 feet) deep at that spot.

"Luck was with the cable ship. So well had Capt. F. H. Larnder calculated that the very first cast of the hook brought up one end of the broken cable. It was hauled on board, the electricians attached their instruments and called Hamilton. The station answered immediately. A huge buoy was attached to the heavy wire rope and lowered into the water. Then we set out to find the other end.

"Cast after cast of the grappling hook and not even a nibble from the missing part of the cable. Farther and farther the cable ship worked away from the buoy. At last, after three hours' work, the grapnel resisted the pull. The fish had been caught. There was a cheer from the crew as it was pulled on board, about a quarter of a mile from the other end. This end was connected with a telegraph instrument and the operator at Halifax, about 700 miles away, answered. There was nothing more to do except to join the broken ends.

"A new section of cable was carefully spliced to the cable that had just been picked up. The cable was paid out over the stern as we steamed back to the buoy. This was hauled on board and the broken end spliced to the new piece of cable, an operation consuming less than half an hour. The repaired cable, as good as new, was dropped overboard to resume its place on the ocean's bed.

"Rarely does a cable repair ship have such good luck," says Mr. Kitchen, in conclusion. "Often storms arise which drive the ship from her course, tear the buoys from the ends they hold and compel the work to be done over again. In northern waters these conditions are felt at their worst. The ship becomes crusted with ice, it is difficult to maneuver, and doubly so to deal with a cable on bow or stern, when the roll of the seas threatens to fracture it again, and the launching of boats with men in them to buoy a loose end is hazardous.

"From these causes occasionally cable ships get short of coal and have to abandon work temporarily at critical periods, or they are enmeshed among the ice floes or bergs and have to let go all and retreat."

Magnetic Storms.—In the *Journal de Physique*, M. J. Bosler, in a paper on the relations between magnetic storms, earth currents, and solar eruptions, puts forward a theory of the production of magnetic storms which he believes to be new. He was, it appears, led to it by finding that the horizontal component of the disturbing force in a magnetic storm is on the average at right angles to the direction of the earth current observed at the same instant at the same station, and that these currents flow at each station in a direction which is nearly constant. At Parc Saint Maur, near Paris, for example, the direction is in general from northeast to southwest. Mr. Bosler considers these currents the cause of magnetic storms, and explains them as due to the expression for the magnetic induction through the earth having in it a variable term owing to electrified matter projected from the sun. This variable term would result in an electric current about the earth, which in turn would produce a magnetic disturbance.

Messenger Boy Makes His Mark.—A new messenger boy in Richmond, Va., has made a reputation in carrying out, in letter and spirit, his instructions to deliver telegrams as quickly as possible. He was given a message to deliver to a minister on a recent Sunday morning, and, faithful to his trust, he delivered it as the minister was preaching his sermon in the pulpit. The congregation was surprised when the boy walked briskly up the aisle and into the pulpit and handed the message to the minister. The latter was somewhat surprised too, but he took the telegram, signed for it, read it and then wrote the answer, which he gave to the messenger. The boy did not seem to realize that he was doing anything out of the ordinary. He was told to deliver the telegram, and he did so.

Mr. W. M. Godsoe, superintendent Canadian Pacific Railway Company's Telegraph, St. John, N. B., Canada, writes: "I consider your paper a welcome visitor. It is brim full of useful information."

Some Early Telegraph Lines.

In these days of scientific line building it is hard to realize the difficulties experienced by the original builders of telegraph lines, especially in the matter of insulation. Fifteen years ago Mr. Wm. Maver, jr., one of the foremost telegraph engineers in America, described in these columns the experiences in the early development of the telegraph, and from an historical standpoint the reprinting of some of the facts will be of special interest at this time.

One writer of forty years ago, Mr. Maver goes on to say, expressed himself as follows: "Of all the marvelous achievements of modern science, the electric telegraph is transcendentally the greatest and most serviceable to mankind. It is a perpetual miracle which no familiarity can render commonplace. . . . The same terrific agent which rushes with blinding and crushing force in the lightning has been brought under the perfect control of man and is employed at his will as an agent of his necessities; . . . it applies its marvelous energy to the transmission of thought from continent to continent with such rapidity as to forestall the flight of time and inaugurate new realizations of human powers and possibilities."

But while the later day and noisier and more prominent electric systems have in the busier centers of trade seemingly relegated the telegraph to a less conspicuous place than it previously occupied, it should not be lost sight of that even yet the electric telegraph is the only exponent of applied electricity in many parts of the world.

Nor should it be overlooked that in numerous instances the methods and apparatus employed in the operation of the later developments of the electric art are more or less modifications or amplifications of the methods and apparatus long employed in telegraphy. For instance, it will be found among other things that, as regards the most approved methods of insulation for overhead and underground conductors of the present day, we are but following out and improving upon the cruder methods employed for the insulation of the wires in the earliest days of the electric telegraph, a statement which will, I think, be verified by the following facts and incidents in connection with the early history of some of the telegraph lines of this country and of Europe.

Probably one of the first electric telegraph lines of any note was that constructed in 1833 for the German physicist, Weber, in Göttingen. The line was about one and three-fourths miles in length, and was originally constructed for the purpose of providing a means whereby the laws of the "galvanic" current could be studied. The line was also used for the experimental transmission of signals by a single needle system, and also for the regulation of the standard clocks at several of the observatories of the city named. The wires were run mainly over housetops, but were also suspended from steeples and on poles. The wires were insulated by pieces of felt from the various points of support.

This experimental line, according to Steinheil, whose writings on this and kindred subjects are very interesting and valuable, showed that no special insulation was required other than at the point of support. It seems to have been supposed, prior thereto, that there would be difficulty in keeping the electricity on the wire, even when suspended in the air, without some form of insulation around it. The wire used was copper, about No. 16 gauge. Another line, subsequently constructed by Steinheil in Munich, was about six miles in length. The copper used weighed about forty pounds to the mile. Steinheil states that "the longest span was 1,279 feet, and that the poles used, when steeples and housetops were not available, were forty or fifty feet long and were set in the ground five feet, and at the tops of which poles the wire was fastened to a cross-bar. At the point where the wire rested there was simply a piece of felt laid, and the wire was made fast by twisting it round the wooden bar. The distance from pole to pole was about 650 feet, but," adds Steinheil, giving expression to a difficulty which has often been met with by his successors in telegraph construction, "this distance was far too great, for experience has shown that the wires become considerably stretched by high winds and other causes, and have, in consequence, had to be taken up more than once."

It is almost needless to say that, despite the comparatively few points of support, the felt insulation was not by any means perfect, and Steinheil notes that the escape was five times worse in wet weather than in dry, and he sagaciously pointed out that on longer lines much greater precaution would require to be taken at the points of support of the wire.

Felt appears to have been considered the best available insulating material of that time; namely, 1833-1839; for in making some experiments, suggested by Weber, to test the feasibility of using the railway tracks for the transmission of telegraph signals, Dr. Schellin relates that Steinheil insulated the rails from the ties by interposing sheets of felt between them. This experiment was not successful, however, Steinheil finding that the current could not be passed through more than twenty or thirty rails, and, besides, "the wheels and axles of the cars made such an excellent metallic connection that the current lost its force, and the experiment was abandoned." Nevertheless, this experiment served the very useful purpose of suggesting to Steinheil that, since the earth was so good a conductor as to draw off the current from the rails, it might be used as the return wire of a telegraph circuit, thus enabling him and his successors to dispense with one of the two wires of the metallic circuit which had previously been considered necessary for the completion of a telegraph circuit.

While the credit of first employing the ground as a return wire of a telegraph circuit is thus generally given to Steinheil, it is on record, according to Highton, that a Dr. Watson had constructed an experimental circuit, consisting of two miles of wire, with the earth as a return wire, near London, in 1744-1747, and in which experiment the wires of the circuit were supported on posts. The experiments in this case were presumably designed to show that electricity from a Leyden jar ("frictional" electricity) could be conveyed to a distance.

The methods of insulating the earlier telegraph lines in England were repeatedly changed. First, as recorded by Highton, the wires were covered with cotton or silk, and "then with pitch, caoutchouc, resin or other non-conducting material, and when thus insulated they were inclosed in tubes of wood, iron or earthenware." This plan was soon abandoned for the introduction of wires on poles, insulated by dry wood, through which the wires loosely passed, but at every eighth or tenth pole were held fast and drawn taut by straining devices. This second plan in its turn was abandoned about 1849, and the wires and poles were torn up, and, "excepting in localities where the suspension of wire was difficult, as in streets and towns or on public roads, poles with earthenware insulators, which were generally covered with a wooden hood, were employed." The wire used was galvanized iron wire.

The first overhead wires in this country, erected about 1842, were, like the early German lines, insulated from the poles by pieces of felt and flat glass, but not satisfactorily, and glass knobs were subsequently employed with more success.

As the telegraph service was extended, it appears that in certain countries the short life of wooden posts, due to natural decay as well as to accidental destruction, led to the erection of more substantial supports for the wires. Thus in India and in Italy supports of stone, cenotaph in shape, were erected. In Italy, according to Sabine, a line of telegraph was constructed between Treviso and Tagliamento, a distance of perhaps twenty miles, the supports of which were stone pillars, about 14.7 feet high and about 1.8 feet at the base, tapering to the top, at which latter point the insulators were attached.

Turnbull and other writers describe a very interesting telegraph line, which was constructed by a Dr. O'Shaughnessy, in India, between Calcutta and Kedgeree, a distance of seventy-two miles—1850. The "wire" in this case was an iron rod from three to five-eighths of an inch in diameter. The rods were welded together by coolies, who carried their forge with them, and were able to weld one mile of rod per day. The rods were joined up in lengths of 300 feet, and thus welded, were in some places raised up on bamboo poles fifteen feet high, coated with coal tar and pitch, and strengthened at various distances by posts of sandwood, teak and ironwood from America. In other places the rod was laid underground "in a cement of melted resin and sand." The bamboo rods were found, Turnbull says, to resist storms which had uprooted trees the growth of centuries. Where this line crossed the Huldee River, about a mile in width, a gutta-percha covered wire secured in the angles of a chain was used, and this chain was found to afford perfect protection from the grapnels of the heavy native boats which navigate the river.

The advantages which the iron rod was supposed to give as compared with a wire were numerous. "Thus ordinary gusts of wind would not affect them, or ordinary mechanical violence. If accidentally thrown down they are not injured, though passengers, bullocks, buffaloes and elephants may trample upon them; they are not easily broken or bent; owing to the mass of metal, they give so free a passage to the electric currents that no insulation is necessary; they are attached from bamboo to bamboo without protection, and they work without interruption through deluges of rain; the thick rods also admit rusting to take place, without danger, to an extent which would be fatal to a wire. The rods, moreover, are not likely to be injured by crows or monkeys. Swarms of kites and crows perch on the lines through the swamps, but they cause no harm. The correspondence passes through their claws without interruption, though on one occasion a flash of lightning struck the wet rod and killed scores of them."

Condensers for Wireless Transmitting Circuits.

In the construction of a condenser for use in the wireless transmitting circuit, we have to consider what material used as a dielectric will absorb the least energy; also, we must so construct it as to withstand the high voltage to which it will be subjected. The losses in a condenser may be classed under two heads: 1, those due to the hysteresis of the dielectric, and, 2, those due to brushing that may take place from the edges and corners of the plates. The hysteresis losses vary considerably with the material of the dielectric and also with the frequency, being greater for high frequencies. In respect of internal losses an air condenser would be ideal, as the internal losses when air is the dielectric are nil. We are, as a general rule, however, faced with a practical difficulty—namely, the space required for the housing of such a condenser, since owing to the fact that the dielectric strength of air is small the places would have to be a considerable distance apart to withstand the pressure. In practice, therefore, the types of condenser most frequently met with are those consisting of metal plates arranged in a glass containing vessel and immersed in oil, and the well-known Leyden jar, the latter being most generally used.

The specific inductive capacity of glass is very high, being about nine times as great as air; this, together with the fact that it has great dielectric strength, enables the condenser to be kept within reasonable dimensions. The jars are built up in groups, a sufficient number being put in series to safely withstand the tension, and then in parallel till the required capacity is obtained.

If the jars show considerable brushing while in use, an improvement may be effected by putting more jars in series and so lessening the tension across each jar, but if this is done it will of course be necessary to add more in parallel to bring the condenser back to its original capacity.

System Applied to Train-Dispatching Circuits.*

BY JOHN A. KICK.

The installation of a train-dispatching circuit is a task that requires considerable skill. The more serious thought and advance planning, the better timed and more economical will be the accomplishment.

Would we purchase wire and distribute the coils at the required intervals and then look for pin room? Do we arrange this detail in advance? Also do we go further and study the wire lead, considering the future of the plant to such an extent that our plans include providing the best pin positions for the important dispatching circuit and adjacent pin positions for the next circuit which together with the first, will furnish a phantom circuit?

Has a plan been made that covers the full use of every wire on the lead and includes every phantom and simplex circuit? The making and remaking of such plans is productive of latent possibilities. It develops a system of procedure in final conversion to a telephone basis. It is a good system to give the construction foreman a diagram of the pole line, transposition prints, standard specifications, and a written description of the work to be done; and to see that he instructs his men before starting the work, rather than correcting their mistakes as he discovers them later. Many foremen are very dependable men, but they would be more efficient if the work were properly based upon a system which would include detail directions, placing the responsibility with the head of the department, and leaving only the execution to the foreman.

On a new circuit I have observed the results of improper pin assignment; frequent "bucks" with one or more turns; split sleeves and others with too few or too many turns; the line wires too tightly drawn for the prevailing temperature; irregular ties; and almost every other fault that could have been avoided if a standard or other effective system had been given the foreman. The same rule applies to the distribution and installation of equipment in that it should be accomplished in the most effective and economical way, leaving no chance for costly errors.

To each station should be assigned the full equipment and material. This may be readily accomplished by listing each item for the several classes of stations, such as test station, intermediate station, trainmen's station, etc. Then under each, list the names of stations to receive the equipment assigned to its class. It is a simple operation to so arrange the distribution, when the plan is prepared in advance and the assignments made, but when it is left to be accomplished on a rapidly moving special or in a regular baggage car, it goes wrong more often than otherwise.

With the actual installation work system cannot be overlooked. It applies to the proper assignment of the members of the gang, as well as to their individual efforts. Equipment should be placed in accordance with predetermined fixed positions. These positions should conform not to the personal wishes or whims of the inexperienced operator, but to the very best operating standards which can be made the subject of considerable interesting study. Furnish the installing foreman a set of blue prints that indicate the location of the parts of the equipment with respect to the center line of the operator's position. They should also show the assembly of the switching and protective equipment which is placed on a mounting panel or the office wall.

Coach the installers to perform as many operations as possible with a tool before laying it down. In other words, follow a system something like the following:

Place all of the equipment.
Bore all necessary holes in the table.
Screw the equipment into place.
Run all wires and skin and brighten their ends.
Loosen all binding posts.
Place all wires under the posts.
Reset all binding posts and test.

This is better than listening to the continual clatter caused by the picking up and laying down of pliers and screw-drivers.

In installing work one workman frequently runs a number of pairs to a given point from which they are to be included in the work of another. These pairs should be marked by using a code so that no questions need be asked. Each installer should have the necessary working tools to prevent confusion from borrowing.

There is an effective system that can be applied to almost every step in the construction and installation of a telephone train-dispatching circuit and it extends to the methods of final test. The final test can be made by checking the speed of operation; local and main line currents in the dispatcher's station (both full and average); the operation of selecting each station; and the tone of the answer back, which very readily indicates the adjustment of the bells. Where local battery circuits are employed at the way stations, the full and average current test is of great value. It indicates the condition of the battery and discloses any irregular adjustment in the controlling device.

System should follow the circuit indefinitely, as the wire chief must maintain it by some system of tests of transmission; routine of line tests for troubles; reading of current values; and last, but not least, a system of recording the maintenance attention.

* *Telephony.*

EFFECT OF HEAT AND COLD ON BATTERIES.—If a battery is allowed to become frozen the current is very much impaired or altogether suspended. Heat promotes chemical action, and a battery while warm works most vigorously. In a warm climate, however, the battery should be kept in a cool place to reduce evaporation and unnecessary waste of material. The best results from a battery are obtained when the temperature is about 70 degrees, and it is kept at that point summer and winter. The output of the battery is then uniform.

Telephone-Telegraph Fire Alarm Systems in German Cities.

Many of the German cities have found it conducive to the general safety against fires to install a combination of telegraph and telephone for fire alarms.

The essentials for fire safety and prevention of conflagrations, says the *Electrotechnische Zeitschrift*, of Berlin, are immediate notification of the fire department of the fire, accurate location of the same, and smallest possible waste of time between the alarm and the action of the department. The older telegraph system has been very efficient, but has one drawback in that the seat of the fire is only approximately known, and that much time could be saved if the fire department knew the exact location. The telephone would eliminate this difficulty, for the person giving the alarm could give the location, thus guiding the fire apparatus and avoiding dangerous delays.

Where there is a large, complex group of buildings, as in a factory, it is essential to reach the alarm from any part of the plant, or even to have the alarm sent in automatically. Automatic alarms are arranged along the ceilings, where the heat would be the greatest in a possible fire, so that the contact would melt and set off the alarm. In the halls and the different parts of the building push-buttons are installed which allow a similar alarm to be given by the person on duty. All push-buttons are connected to a drop disc indicator, which has as many discs as there are fire stations in the district. The indicator is provided with a red and a green lamp. The green lamp shows trouble, the red lamp fire. As an acoustic signal a loud siren can be used, or else a loud alarm bell or a megaphone. Near the switchboard of the factory is an indicator which shows the number of the fire house and district alarmed. The alarm bell is stopped by disconnecting the disc. The disc will be half visible, however, and the two lamps will show whether there is only some disturbance in the line or a fire.

In a fire alarm system that can be used for smaller towns, up to about 10,000 people, having a volunteer fire department, the public fire boxes are attached to lamp-posts or houses. The alarm bells are installed in the homes of the members of the volunteer fire department. In the homes of the officers, the mayor and other officials, telephone instruments are connected to the alarm bells. The telephones are connected to the headquarters or the police stations or else to the telephone exchange. The exchange has a numerical counter indicator, operated by line relays. To call up the exchange automatically in case of trouble, two relays are used, which are cut off automatically by other relays after an alarm has been given. The alarm is transferred by the counter system to a Morse instrument. At the same time a high-tension current siren can be operated by a high-tension relay. The alarms and telephone are distributed in the different districts but collected at one central point.

An efficient system for larger cities up to 50,000 inhabitants, having a city fire department, as also a volunteer department, comprises alarm boxes usually provided with telephones and directly connected to a recording instrument. Fire alarm bells are installed in the homes of the volunteer firemen. If cables are used for the telephone and telegraph wires, it is especially desirable to have the alarm bell wires separate, so that the disturbances unavoidable in the bells may not be distributed to the cable conductors. The central exchange, whether fire alarm station, police department. or telephone exchange, probably the former, is provided with an inductor, a telephone, a Morse instrument and a time-recording apparatus. A multiple relay passes the alarm to the central station, which in turn passes it on to indicators and the alarm bell. A numerical selector selects between one of the alarms running in at the same time, passing the one on for immediate action, recording the other, and only passing it on when the first one has been communicated to the proper district. The telephones can be connected with any desirable district.

For large cities with city fire department exclusively, the alarm boxes are connected in each district to a double recording instrument. The telephones are connected as in the other system. All of the fire stations have Morse telegraph instruments, and are directly connected to the fire headquarters. The wires of the fire stations end in a Morse apparatus used to send out orders to the different fire houses. Most of the fire stations have a large lamp operated by a contact indicator. A multiple relay takes care of the transmission of alarms to the several district fire stations. In cities with a combined fire alarm and police alarm system, the alarm boxes are provided with special telephone instruments for use of the police department. These telephones are connected to the exchange and from there to the fire alarm box and the fire or police headquarters. It is therefore a regular telephone system. In this case a special return fire alarm bell signal is arranged for, operated by a multiple relay through a contact indicator, relay and transformer. To call policemen on the various beats, megaphones or horns are installed in various parts of the city, which are operated by special wires, and are connected at the central exchange or headquarters by a switch.

In Touch With the World Though Deaf and Blind.—Mr. James Gallaher, a Western Union operator at St. Louis, Mo., received injuries from a fall on the ice recently that resulted in loss of hearing and impairment of eyesight. The news of the day is conveyed to him by his son and his office associates by tapping upon his temples in Morse characters.

Mr. Ashby Watkins, who has been agent for this publication for many years at Richmond, Va., covering the Western Union interests at that point, writes: "I hear nothing but praise for Telegraph and Telephone Age, and the improvement in the paper is very marked. It has a greater value than ever before to the telegraphers of to-day."

THE RAILROAD.

MR. E. A. PATTERSON, assistant superintendent of telegraph of the Chicago, Milwaukee and St. Paul Railway, has been appointed superintendent of telegraph, with headquarters at Milwaukee, Wis., vice U. J. Fry, deceased. Mr. A. C. Adams, has been appointed assistant superintendent of telegraph to succeed Mr. Patterson.

JOINT MEETING OF RAILWAY TELEGRAPH SUPERINTENDENTS.—A joint meeting of the Eastern and Western Divisions of the Association of Railway Telegraph Superintendents will be held in Chicago, March 19. Among the many things of importance to be considered will be the matter of exhibits at the annual convention to be held in St. Louis, Mo., May 20, 21 and 22. The general arrangements for the convention will be given due consideration, and definite action will probably be taken on many of the points involved in the plans for the meeting. Mr. Charles Selden, superintendent of telegraph, Baltimore and Ohio Railroad, Baltimore, Md., and Mr. E. A. Chenery, superintendent of telegraph, Missouri Pacific Railroad, St. Louis, are the chairmen of the Eastern and Western Divisions, respectively.

PENNSYLVANIA RAILROAD ELECTRICAL SCHOOL.—A free course of correspondence study in electrical engineering and associated subjects has been inaugurated by the Pennsylvania Railroad under the supervision of Mr. J. C. Johnson, superintendent of telegraphs, Philadelphia, Pa. Use will be made of a series of instruction papers in pamphlet form, each covering a different field, and the course will include elementary work on direct-current and alternating-current circuits and apparatus; mathematics, mechanical and geometrical drawing; magnetism and its application to electric generators, motors, measuring instruments, telegraph, telephone, signal, lighting, traction and general electrical equipment; every-day troubles developing in each type of apparatus, and methods of locating and overcoming them. It is understood that students are invited to ask questions, and a course of supplementary reading of text-books and periodicals is recommended. The first text-book in the educational course deals with elementary arithmetic. It will be followed by pamphlets on primary cells and direct-current. Fourteen of these pamphlets, concluding with electric traction and power-plant design and apparatus, will complete the series.

A. C. Adams, Assistant Superintendent of Telegraph, Chicago, Milwaukee and St. Paul Railway.

Mr. Albert C. Adams, whose appointment to the position of assistant superintendent of telegraph of the Chicago, Milwaukee and St. Paul Railway, has just been announced, was born in Whitewater, Wis., October 1, 1866, and entered the telegraph department of that road, at Milwaukee, Wis., on November 1, 1886. He was stenographer and clerk about five years, and then became chief clerk to the superintendent of telegraph, the late U. J. Fry, which position he held at the time of his recent appointment as assistant superintendent of telegraph.

Wireless on the Lackawanna.

The Lackawanna Railroad will soon install a wireless telegraph service to communicate with moving trains. Equipment has been ordered for the section of the road between Scranton, Pa., and Binghamton, N. Y. The system will be installed by the Marconi Wireless Telegraph Company

The Lackawanna Railroad experiences considerable difficulty in maintaining its wires on this section of the road in the stormy season, and decided to try the wireless system to insure communication at such times. The undertaking will be largely experimental, but the railroad officials feel sanguine as to the results. Wireless masts will be erected at the principal railroad stations, and it is expected to be able to communicate with distant cities, as well as carrying on the dispatching of trains and other local railroad business.

The apparatus will be installed on express trains, the instruments being located in the observation cars. The work is to be proceeded with at once. Mr. L. B. Foley, New York, is superintendent of telegraph of the Lackawanna Railroad.

St. Louis Convention of Railway Telegraph Superintendents.

The Planters' Hotel has been selected as the headquarters of the next convention of the Association of Railway Telegraph Superintendents, which is to be held in St. Louis, Mo., May 20, 21 and 22. Ample space will be provided for the exhibition of apparatus and appliances of special interest to the superintendents, and the indications are that this feature of the convention will receive particular attention. Every effort is being made to interest manufacturers in this convention, and its possibilities as a means of bringing their products to the attention of the men who are directly interested in them. Mr. E. A. Chenery, superintendent of telegraph, Missouri Pacific Railroad, St. Louis, has charge of the arrangements for the convention and exhibits.

As this will be the first meeting of the association held in St. Louis, extraordinary efforts will be made to produce a good impression upon the visitors. On account of the central geographical location of the city a large attendance is expected, and several valuable papers will be presented by well-known authorities. The programme of the convention is now being arranged, and we hope to be able to present it in an early issue.

Mr. P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railroad, Chicago, Ill., is secretary of the association.

MR. O. C. GREENE, for many years superintendent of telegraph of the Northern Pacific Railroad Company at St. Paul, Minn., who retired from active service two years ago, writes: "Though out of harness, I feel that I cannot afford to be without TELEGRAPH AND TELEPHONE AGE."

Care of Railroad Telephone Apparatus.

The telephones and apparatus should be frequently inspected with the view of preventing trouble that may arise later due to loose connections, etc. Receivers should be inspected for dents in the diaphragm, foreign matter lodged between the diaphragm and cap or magnet poles, and also for loss of magnetism. The permanent magnets should be strong enough to hold up the diaphragm on its edge. Receivers sometimes become demagnetized due to the signalling impulses, when the receiver is off the hook, passing through the receiver in the wrong direction. The direct-current impulses will charge the condenser when the receiver is off the hook, and this charge will momentarily pass through the receiver and demagnetize it if it is not connected up properly.

The transmitters frequently become filled with foreign matter between the diaphragm and face plate, especially if the mouthpiece is gone.

This should be cleaned out, as it will cause poor transmission. A frying noise in the telephone is caused by too much battery or by loose connections in the primary circuit.

All connections should be examined to see that there are no loose and dirty contacts, and connections should be cleaned. Lightning arresters should be examined for partial grounds, loose connections, and defective ground wires.

All connections, both inside and cable pole, should be soldered. This is a very important point.

The condenser in the telephone set sometimes becomes shorted, causing a failure of the selectors when the receiver is off the hook. This can be determined by having the dispatcher ring the station with the receiver off the hook. If the selector fails to operate try it again with the receiver hung up. If the selector now operates the condenser is shorted at this particular station and should be replaced. A partial short in the condenser may not cause a selector failure, but it will cause a loud interference in the receiver due to the current flowing through it, and a defective condenser may be located this way by listening while the dispatcher is calling some one.

A loud cracking in the receiver when the dispatcher is ringing on the line is caused by a partial short on the line.

The telephone line will become noisy if either wire becomes grounded, open, or crossed with another wire. The trouble may be located between sections by having the line test switches opened one at a time. If the noise stops when a switch is opened the trouble is beyond that office. If the noise still exists when the switch is opened the trouble is between you and the office. In this way the cause of the trouble may be located between two test offices. An open circuit may be caused by a broken wire in the line, a defective cable pair, or a defective switch in a test office. A ground may be on the line or in an arrester in an office. A cross would most likely occur on the line. After locating the section in which the trouble is it may be traced to the station or between stations as follows:

In case of a ground or cross call a station and have him short his line switch with a knife or car seal, and if this quiets the line the trouble is beyond him. If in trying the next station the noise still remains, the trouble is between these two stations. An open can be located in this same way. In case of a solid short on the line this same test can be reversed and used in the same manner by having the station put a ground on one side of the line. This can be done by placing a car seal or wire from one line wire to the ground post on the lightning arrester. Grounds may also be located by having the various offices open their office switch and see if this clears the line. If the arrester is grounded the operator can clear it by removing the carbon blocks from the arrester. It sometimes happens that during a storm several offices will become grounded and they will have to be located one at a time.

An open in the line will cause noise in proportion to the distance it is from the end of the line. Thus a line may be open near one end and appear very noisy to the man at that end and comparatively quiet to the man at the other end. An open will cause a failure of selectors beyond and sometimes cause a failure to a number of selectors between the dispatcher and the open due to the adjustment of the selectors and the abnormal current flowing through them. A short will also have the same effect on the selectors so that trouble cannot always be located by the stations the dispatcher is able to call.

These listening tests may be applied by the telephone maintainer or operator at any station on the line, and it is a good plan to have two persons listening in when these tests are being made, as the results can then be compared and the locations easily determined. Considerable practice is required to accurately locate the trouble between stations with listening tests on account of the slight change caused in the noise when the fault is close to a station under test.

American Standard Wire Gauge.

Great confusion formerly existed, both in this and other countries, in respect to wire gauges, designated as the custom is by progressive numbers, there having been almost as many so-called standards as there were different manufacturers. The Brown & Sharpe Manufacturing Company, of Providence, R. I., some years since established a gauge in which the actual thickness of wires designated by successive numbers is made to diminish in a true geometrical progression. Under the name of the American gauge, this has now become the generally accepted standard in this country among manufacturers of copper, brass and German silver wires.

Life of Telegraph Poles.—A method for prolonging life of telegraph poles has been recently adopted on the Western railroads. It consists of cutting off the pole near the ground and replacing the old base with the new one. It is expected that this will result in prolonging the life of the pole for five or six years.

MUNICIPAL ELECTRICIANS.

Mr. John Tyler Green, superintendent of fire and police alarm telegraph, and outside wire inspector, Toledo, Ohio, was born in Cleveland, Ohio, July 11, 1875. He entered the telegraph service in Toledo, Ohio, in 1889, and later became a lineman and cable man for the Central Union Telephone Company. Subsequently he advanced to the position of inspector, and later became superintendent of underground and aerial cable installation for the same company in Indianapolis, Ind. Returning to Toledo, he became engineer for the F. Bissell Company, and later was appointed to his present position.

Municipal Electricians' Convention.

The eighteenth annual convention of the International Association of Municipal Electricians will be held in Watertown, N. Y., this year, probably some time in August, the date yet to be selected by the executive committee.

One of the most important subjects for the municipal electricians to discuss will be that of inspection of electrical wiring in small cities. Mr. W. S. Boyd, who is connected with the underwriters' laboratory in Chicago, called attention to this matter in a paper read by him at last year's convention in Peoria, Ill. He advocated the creation of state departments for electrical inspection, and the increase of pay for inspectors. Inspection should cover both inside and outside wiring, he said, for the proper safeguarding of life and property.

The membership of the association is scattered from San Paulo, Brazil, to Saskatoon, Saskatchewan, and from Winnipeg, Man., and San Francisco, Cal., to Cape Cod, Mass., and is composed of active, bright men.

There is promise of a large attendance at the Watertown Convention and the exhibits of apparatus and appliances will likely be extensive. The exhibits form a very important feature of these conventions, as they enable the municipal electricians to become familiar with the latest devices in fire and police signalling.

Mr. Clarence R. George, Houston, Tex., is the secretary of the association, who will give further details regarding the convention to those interested.

Telegraph Tournament in Seattle.

A telegraph tournament, open to operators from the U. S., Mexico and Canada, is being arranged to take place in Seattle, Wash., some time in May, and will include a wireless contest. Prizes will be offered in the various classes, including railroad and commercial work, wireless, Phillips' Code and ordinary press work.

In the wireless contest messages will be exchanged with ships at sea, and will be open to wireless operators from all parts of the world. A special prize will be offered for the best pen receiving for ten minutes. An exhibition of old telegraph apparatus will form a feature of the tournament.

Mr. Thomas B. MacMahon, an old-time telegrapher, and now a prominent attorney of Seattle, is organizing the tournament.

Reunion of Old Timers.

The reunion of the Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps, which will be held in Detroit, Mich., August 25, 26 and 27, will, from present indications, be the most memorable in the history of the two organizations. Active preparations are now being made by the committees in charge to insure a successful meeting and a good time in the beautiful convention city. Mr. H. J. Kinnucan, president of the Old Timers' Association, being right on the ground, will do all in his power to make the reunion a success, and see that every one in attendance has an enjoyable time.

Mr. F. J. Scherrer, secretary of the Old Time Telegraphers' and Historical Association, 30 Church street, New York, is also busy with the plans and details of the gathering, and he will be glad to give any member further information. Mr. D. W. Bates, 658 Broadway, New York, is secretary of the United States Military Telegraph Corps.

Round-About Release.—An employe of a telegraph company was recently locked up in a hall in St. Louis, Mo., by accident. Fortunately there was in the hall a telegraph wire connected with Kansas City. He told Kansas City of his plight, and the latter sent a telegram to the janitor of the St. Louis hall to go to the rescue of the imprisoned man. The janitor had locked up the hall for the night not knowing there was anyone there.

G. Swope, Vice-President Western Electric Company, New York.

Mr. Gerard Swope, whose election as vice-president of the Western Electric Company, New York, was announced in our issue for February 16, and whose portrait is presented herewith, was born in St. Louis, Mo., December 1, 1872, was educated in the public schools of St. Louis, and graduated from the Massachusetts Institute of Technology in 1895 with the degree of Bachelor of Science in Electrical Engineering.

He entered the employ of the Western Electric Company at Chicago in the fall of 1895. He spent a year in the various departments of the Clinton street factory, and in the fall of 1896 entered the power apparatus engineering department as a designing engineer on power apparatus. The latter

GERARD SWOPE, OF NEW YORK.

part of 1898 he joined the sales department, and in the summer of 1899 was transferred to St. Louis in charge of the sales office there. He organized and was the first manager of the St. Louis distributing house, opened in January, 1901, and remained as manager at St. Louis until the beginning of 1906, when he was transferred to Chicago to take the dual position of assistant supervisor of branch houses and power apparatus sales manager. The work in the latter department proved of such magnitude that after a few months he gave up the work of assistant supervisor and went to Hawthorne as power apparatus manager in charge of the sales, manufacturing and engineering of the power apparatus business of the company. In the spring of 1908 the company reorganized its commercial departments, and Mr. Swope became general sales manager, with headquarters at New York. This position he has since occupied, in charge of all branches of the company's sales. He was elected vice-president in January, 1913.

Concrete Poles.

The increasing scarcity of timber and the accompanying increase in cost have for some time past compelled engineers to look about for suitable substitutes. For many purposes steel and concrete have long since replaced the weaker and less durable wood. For poles, however, both for transmission lines and for telegraph lines, wood is still extensively used and concrete is comparatively scarce. There is probably little doubt in the minds of engineers as to the desirability of using either steel or concrete poles in place of wood, as soon as it becomes economically possible to do so, says the *Electrical World*. The principal objection is the increased first cost of steel or concrete as compared with wood. Whether, in the future, this cost can be reduced to the present price of wood, the future alone can show. A second objection which has been found to concrete poles is their increased weight as compared with either wood or steel. A solid concrete pole weighs probably three times as much as one of wood of the same strength, and a hollow pole about twice as much. This, of course, increases the cost of transportation and handling.

When ultimate costs are considered, however, the concrete pole, with its greater strength and lower maintenance cost as compared with either wood or steel, appears to be the logical successor of the wooden pole. An essential feature intimately connected with the use of concrete poles is that they should be designed as carefully and even more conservatively than steel poles would be. Concrete poles have been built, which after a short time in service developed unsightly cracks, and which under tests proved to have considerably less strength than wooden poles of the same size. The knowledge which a series of tests would give us to show how closely the behavior of concrete poles agreed with their theoretical behavior would be of extreme value, for the strength depends not only upon the materials, but also upon the care with which they are placed in position. In this connection it is of interest to know that one of our Eastern railroad companies is now conducting a series of tests on concrete poles of various types and designs, with the idea of replacing some of the wooden telegraph poles along its right-of-way with concrete.

The relative merits of building poles at the site as compared with constructing them in a well-equipped central plant will depend, of course, upon conditions varying with each location and upon the number required. When the poles are built at the site there is a choice between constructing them flat on the ground or vertically in place. In a hollow pole, in which the reinforcing rods with their accompanying bands or rings take up a large proportion of the comparatively thin concrete shell, the difficulty in pouring concrete into the top of the vertical form, without causing objectionable voids and a possible separation of the stone from the cement, becomes considerable. It is a question whether even the use of very fine stone and a very wet mixture will reduce this difficulty sufficiently to warrant making hollow poles vertically.

OBITUARY.

HOWARD N. THOMPSON, for many years with the Associated Press at Paris and St. Petersburg, died in New York on March 3.

H. T. JOHNSON, aged 52, an old-time telegrapher, and president of the Manhattan Electrical Supply Company, New York, died at Daytona, Fla., whither he had gone for a few weeks' rest. Deceased was an operator in the oil regions about 1880, and in 1889 he and Mr. J. J. Gorman, also a former operator, started the Manhattan Electrical Supply Company. The remains were brought to New York for burial.

J. B. PRUDHOMME, aged 53 years, a pioneer telegrapher of Texas, died January 9, following a stroke of paralysis. He was born in Campti, La., and was a student at Notre Dame University, Ind., where he learned telegraphy. At the age of nineteen he was manager and lineman of a private wire from Campti to Shreveport, La. In 1880 he came to Texarkana as manager for the Western Union, and remained in the employ of that company until the Postal Telegraph-Cable Company of Texas entered the State, when he accepted the managership at Texarkana, remaining there until the time of his death.

Death of A. M. Van Duzer.

Ashley M. Van Duzer, age 84 years, an old time telegrapher and a forty-niner of the telegraph, and for many years manager of the Cleveland, Ohio, office of the Western Union Telegraph Company, in the late sixties, died in that city, February 28, after an illness of about one year. Deceased was a close personal friend of J. H. Wade. and General T. T. Eckert, former presidents of the Western Union Telegraph Company, General Anson Stager, general superintendent, and Mr. E. P. Wright, district superintendent at Cleveland, all of these men being now dead. Mr. Van Duzer was a recognized Shakespearian scholar, and was considered an authority on English and French literature, philosophy and history. He was born in Evans, N. Y., March 12, 1829, and went to Cleveland in 1850. In the last few years he had been attached to the county recorder's office in Cleveland.

Death of P. J. Hurlburt.

Preston J. Hurlburt, aged 67 years, the New York messenger for the American Graphophone Company. for many years past, died. suddenly, March 3, at his home. in Bridgeport, Conn. For an extended period Mr. Hurlburt was the manager for the Western Union Telegraph Company in Providence, R. I., but in recent years he had lived in Bridgeport, and had filled various positions in the service. He was especially valued for his faithfulness and judgment, and all sorts of missions were entrusted to him with absolute confidence that they would be carried out with care and intelligence. He went to New York every week-day and very seldom failed to make his appearance at a given time in the Tribune Building, where the executive offices of the Graphophone Company are located.

There was one occasion, however, when he did not come at his usual hour. It had been a sultry day, and he made the journey by the night boat, so as to reach New York in good season. The steamer was the "Nutmeg State," which caught fire and went ashore off Sands Point, October 13, 1899. Though many lives were lost, three or four brave men did all that they could for their dying fellows, and remained on board until the other passengers were safely on land, and the unfortunate craft keeled over. Among the last to make their escape was Mr. Hurlburt, and only one man came after him, and very close behind him at that. His satchel contained, as usual, documents and papers of the greatest importance, and he reached New York a few hours later. by train, bringing everything intact. He went down the rope with one hand, and held on to the satchel with the other.

President Easton, of the Graphophone Company, in speaking of Mr. Hurlburt's valor and loyalty voiced the sentiment of all who came in contact with him. He said it was a matter of genuine sorrow to him that so valuable a man in every-day emergencies, as well as in the great one when his life was endangered, should be lost to the company.

Mr. Hurlburt was born in Great Barrington, Mass., where he learned to telegraph. He was an operator in Bridgeport when a young man, also at New Haven, where his reputation became fixed and his services were sought to take the heavy press report. in Providence, in the closing years of the civil war. A few years later he was appointed manager.

Mr. Walter P. Phillips says of Mr. Hurlburt. in one of the historical articles he has written for TELEGRAPH AND TELEPHONE AGE:

"Early environment has much to do with our development. Mr. Hurlburt had in his home town the benefit of the society. in his youth. of Franklin Leonard Pope, the partner and associate of Edison, and one of the greatest men of his time, who was killed in making a dynamo connection while yet a young man. When Mr. Hurlburt arrived in Providence in 1865 to take the press report he was perfectly equipped for his work, and he grew as the years passed, and became the most finished operator Providence had ever had, taking into account, as a whole, his sending, receiving and penmanship."

Mr. Hurlburt left a wife and two sons, Arthur C. Hurlburt, advertising manager of the Colt's Patent Fire Arms Manufacturing Company, Hartford, and Jarvis S. Hurlburt, of the Providence Telephone Company at Providence.

PROTEST BY BROKER TELEGRAPHERS.—The Association of Broker Telegraphers of New York will make a vigorous protest to Governor Sulzer against the passage of the bill providing for the doubling of the tax on stock transfers, as well as the other bills affecting the Stock Exchange, on the ground that the proposed legislation will seriously endanger the livelihood of broker telegraphers and clerks.

Management of Automatic Repeaters.

In repeating signals from one circuit to another, the sounder-lever which carries the contact-points has to move a certain distance, after the circuit of the first line is closed, before it can close the circuit of the second line. This occupies a definite time, so that the duration of the current or length of each signal sent forward, is shorter than that received from the transmitting station. A second repeater shortens the signals still more, so that ultimately the signals may fail altogether. This may be partially remedied in practice by the skill of the sending operator, who, in working through a repeater, should transmit his signals more firmly, that is, increase the duration of the key contact. It is also important that the sounder-levers should be permitted the least possible movement compatible with the proper operation of the spring contact-points, and with convenience in reading. The armatures of the supplementary local magnets seldom need adjustment if the batteries are kept in good condition. The adjustment of the relays is precisely the same as in ordinary apparatus. The tension of the retracting springs of the sounders, on the other hand, should be very moderate, just enough to raise the armature when released. A repeater works most efficiently when the signals have what is termed a "dragging" sound. When interrupting the sender through a repeater, the receiving operator should first hold his key open for two or three seconds.

How Standard Time is Distributed.

Few people understand how time is accurately obtained and distributed throughout the country.

Every clear night, the astronomers at the United States Observatory, Washington, D. C., observe the transit of certain stars, which are due to cross the meridian at a known time. The exact instant of their transit is recorded electrically by means of a chronograph, which also records the seconds from a sidereal clock. The difference between the time of the sidereal clock and the time the stars cross, shows the error of the clock.

The time signals sent out each day are wholly automatic, and consist of a series of short marks produced on an open telegraphic circuit by the beats of a transmitting clock located in the observatory. The wires of the Western Union Telegraph Company are used for the dissemination of these signals at noon (75th meridian) each day, for an interval of three and five minutes, immediately preceding and ending exactly at noon.

For the country east of the Rocky Mountains, the signals are sent from the United States Observatory at Washington, and for the country west of the Rocky Mountains, the signals are sent from the United States Observatory at Mare Island Navy Yard, California. The entire series of signals as sent from both of the observatories, are graphically shown as they appear on a chronograph tape. The electric connections of the transmitting clock sending these signals are such as to omit certain seconds in each minute, as shown by the breaks in the record.

These breaks enable anyone who is listening to a telegraph instrument at any office that is cut into the circuit during the transmission of the signals to recognize the middle and beginning of each minute. At the 59th minute, there is an interval of ten seconds, which is followed by the final noon signal.

At each office throughout the United States where time service is established, there is a master clock installed for the purpose of transmitting hourly signals to the subsidiary clocks to keep them in perfect time.

At the present time, when scientific business methods make every fraction of a minute valuable, the value of the present system has become incalculable, so much so, that a "time" connection is indispensable in nearly every place of business, as the variation of one minute frequently costs hundreds, and sometimes thousands of dollars.

Historical Sketch of the New York Telegraphers' Aid Society.

The New York Telegraphers' Aid Society was organized in New York, March 7, 1880. The idea of the organization arose from the practice of soliciting by means of subscription papers assistance for distressed operators. These demands became so frequent and burdensome that it was suggested that a society be formed with the idea of enabling any member of the telegraph fraternity in New York to obtain assistance, in the hour of need, from a general fund, and it is said, to the honor of the society, that since its organization there is not a single instance on record where a distressed worthy operator has not received aid, and of those who have died not one has been buried in a pauper's grave.

The following-named gentlemen were present and took an active part in the organization proceedings and are therefore charter members of the society. C. Flood, Richmond Smith, P. J. Tierney, A. E. Sink, E. F. Howell, John A. Torrance, J. W. Moreland, J. B. Taltavall, G. A. Newton, Joseph Knittle, J. M. Foster, J. B. Hurd, D. B. Mitchell, H. C. Richardson, W. D. Chandler, C. J. Lawson, C. H. Miller, T. G. Kennedy, M. M. Davis, F. W. Cushing, F. W. Baldwin, John K. Calvert, S. A. Coleman, E. W. H. Cogley, J. B. Sabine, R. G. Stephenson, J. H. Dwight, G. Irving, T. J. Landy, J. T. Stephenson, E. S. Risdon, J. H. Largay, W. A. Steele, F. Jessen, J. P. Kohler, A. S. Downer, Thos. Allen, R. W. Martin.

The organization has enjoyed a healthy growth from the start, and at the first annual meeting the first ladies to join the society were Miss Kate E. Cummings and Misses Fannie and Sarah Martin. Miss Cummings devoted a large share of her time and thought to the welfare of the society, serving several terms on the executive committee.

One of the early forms of American telegraph insulators strongly resembled a plug hat in shape. The hat was filled with sulphur.

Latest Book on Wireless.

"Wireless Telegraphy and Telephony, Simply Explained," is the title of a recent book by Mr. Alfred P. Morgan. As is usual with most of the writers of books on radio subjects, the author makes his appeal entirely to the amateur and to the casual reader who desires to familiarize himself with the general principles of the science.

The book contains ten chapters as follows: I, Principles of transmission and reception; II, Means of radiating and intercepting electric waves; III, Transmitting apparatus; IV, Receiving apparatus; V, Tuning and coupling; VI, The dignity of wireless telegraphy; VII, The ear; VIII, The telephone; IX, The wireless telephone; X, General remarks.

The descriptive matter is sufficiently complete and comprehensive to give the student a good understanding of the wireless art in theory and practice, and is totally devoid of mathematics. Some good illustrations are used to show the analogy between familiar phenomena and wireless theory.

The book contains 154 pages and 156 illustrations, and besides the information on the two main subjects, there is a great deal of other matter of a kindred nature that will be found highly interesting and instructive. The reading and study of this volume will give one a good general knowledge of modern wireless telegraphy and telephony.

The price is $1.00 per copy, and copies may be obtained of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York. Books on any other electrical subject may also be obtained at the same address.

BOSTON PLANT CHAPTER.—The fifteenth regular meeting of the Boston Plant Chapter of the Telephone and Telegraph Society, of New England, was held Tuesday evening, March 11. Mr. James E. Cole, commissioner of wires, of Boston, delivered an illustrated address entitled "Electrical Conditions, Past and Present, and some of the Work and Experiences of the Wire Department." Mr. Gordon S. Wallace, 125 Milk street, Boston, Mass., is secretary of the chapter.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

Edward Adamec, of this office, was married on February 22 to Miss Harriett Johnson.

The annual election of the New York Telegraphers' Aid Society will be held on the ninth floor, 195 Broadway, on Tuesday, March 25. Polls will be open from 8 a. m. to 6.30 p. m. The annual meeting will take place Wednesday, March 26, at 6 p. m., at the same address.

Mr. E. Hess, of the all-night force, died suddenly on February 25. His death followed an operation for intestinal trouble, and proved a great shock to a host of friends. The interment was at his former home, in Pennsylvania.

An extension to the loop switch is being built at 195 Broadway. It is of the pin-jack style, and is in two sections, and its installation was rendered necessary on account of the conjestion of the present board and the large increase in business of that division.

Senator William L. Ives, one of the oldest employes of the operating department, after a service of fifty-four years, has been retired by the company on a pension taking effect January 1. The "Senator" will be missed by his numerous friends in the service at 195 Broadway. He has promised, however, to meet the Old Time and Military Telegphers' at the Detroit reunion in August. His address is 153A Hull street, Brooklyn, N. Y.

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

FOR SALE.—Bound volumes of TELEGRAPH AND TELEPHONE AGE for 1912. Price $3.50. Sent by express, charges collect. This price covers the bare cost of binding and handling in addition to the regular subscription price of the paper. The binding is of substantial black cloth, with neat gilt lettering. The index is even more complete than usual, comprising, in addition to the regular alphabetical classification: The Cable, Obituary, Postal, Radio-Telegraph, Railroad, Western Union, Authors, Biographical, Book Reviews, Canadian Notes, Editorial, Legal, Municipal Electricians, Some Points on Electricity, The Telephone, Telephone Pioneers. In addition to the index for 1912, a complete index for the year 1911 has been added, thus greatly increasing the reference value of the work. This complete record of events of the year and the latest developments in telegraph, telephone, cable and wireless science should be in the library of every progressive member of these professions.

Telegraph and Telephone Age

No. 7 NEW YORK, APRIL 1, 1913. Thirty-first Year.

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SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Working Overtime.

While this article does not directly concern electrical matters, as the above caption would indicate, it does concern the health and comfort of operators and employes in general, and for that reason it should not be considered inappropriate for this column.

The question as to how much overtime in the way of extra work an operator is able to endure without undermining his or her health has never been determined, for the reason that anyone can usually disprove another's claim by merely mentioning the name of one or more operators in the office who are now and have, for a short or long time, actually been exceeding a specified limit.

Now, the object in bringing up this question is not to encourage the habit of working overtime, but to show how, when compelled to work extra during the busy summer season, or at any other time, such work may be performed with the least amount of discomfort and harm. The fact is that of two operators possessing normal and equal physical constitutions at the beginning, one may work overtime almost constantly for months, or even years, without apparent harm, while the other may break down within a very few days or weeks, owing to differences in their habit of living and the manner of performing their work.

We could give the names of several operators who worked overtime almost constantly for several years with apparently no harmful results, and one, in particular, who averaged probably ten days per week for nearly twenty-five years, during which time he was never confined to his bed for twenty-four consecutive hours through sickness. Furthermore, in addition to this, he found time to study music and electricity, write a book on electricity and contribute articles to a magazine. If asked to explain how he was able to stand it he would reply somewhat as follows:

"Eat, drink, sleep and exercise properly." In order to know just what that means look about you and ascertain the cause of breakdown of those operators who have suffered, then avoid pursuing the same course.

The majority of those who break down early, and are nearly always complaining about the general state of their health, usually belong to that class of overtime workers known as "No Lunch Operators."

This type is divided into two classes: One, consisting of operators who postpone eating until they get home several hours after the regular meal hour, and the other, of those who bring a small lunch and eat it in the company's time. Sometimes each class varies the order slightly by rushing out for a few minutes and snatching a bite of unsubstantial food, which really does more harm than good.

Now, it should be obvious to all that under the first-mentioned conditions especially, one's stomach will not only be called upon, in its weakened condition, to perform more work than usual, but on account of the late start it gets it will be working instead of resting during the time required by the individual for sleep. The result is he passes a restless night and goes to work next morning unrefreshed. A few repetitions of this kind generally sends him home for a day or two in order to recover, and in the end he loses more time than he made by his erroneous methods.

Another cause of breakdown is due to the habit some operators have of taking alcoholic stimulant when nature is actually warning them that a rest is needed, in order to continue working overtime. Such persons obviously run a great risk, because they merely shut off the danger signal and tread directly towards the inevitable pit.

Among the minor causes of illness and discomfort is that of sitting in a cramped condition at one's desk, leaning forward so as to prevent full breathing, gripping the key too strongly, and otherwise overstraining certain parts of the body at the expense of others.

Now, the proper thing to do before beginning an extra day's work is to first take at least a half-hour off, and eat moderately of plain but substantial food. Then, before retiring for the night, no matter how late it may be, take another half hour for the purpose of deep breathing and a fast walk in the open air. The few hours of refreshing sleep resulting from this practice will be worth more to you next day than twice that number of hours spent tossing about in bed.

MENTAL CAPACITY.

Another great mistake the majority of operators make is in believing that, owing to the great strain to which one's brain is constantly subjected through long hours of sending and receiving, he is naturally barred from further mental exertions, and he usually offers that excuse for taking so little interest in acquiring the electrical and other knowledge necessary for his well-being. Is his brain not already overworked? His possible headache leads him to firmly believe that such is the case, and therein lies his first and greatest error of judgment. If he will temporarily divert his mind into another line of thought, no matter if it be the solving of a difficult problem, he will experience almost immediate relief. Not only that, instead of the extra exertion overworking the brain, as he imagines would be the case, he will actually be strengthening it, as a whole, by supplying nourishing blood to neglected parts of that organ. During the interval the overworked portion of the brain wlil get a rest and quickly recuperate. The fact is the brain possesses a greater capacity for hard work than any other organ in the body, if it is properly nourished and cared for.

By this method you will find the secret of successful study, and the only means of acquiring knowledge with ease and pleasure. There is really no excuse for the listless attitude the majority of operators assume towards study, and they have no one to blame but themselves for failing to advance in knowledge and usefulness.

Telegraph and Telephone Patents.

ISSUED MARCH 4.

1,054,887. Automatic Telephone Exchange System. To F. Wöhler, Hanover-Linden, Germany.

ISSUED MARCH 11.

1,055,555. Telephone Attachment. To C. R. Phillips, Richmond, Va.

1,055,863. Telephone Signalling Device. To W. G. Blauvelt, New York.

1,055,870. Telephony and Telegraphy. To S. G. Brown, London, Eng.

1,055,988 and 1,055,989. Telephony. To E. R. Corwin, Chicago, Ill.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, March 26.

American Telephone and Telegraph Co.	133
Mackay Companies	80½
Mackay Companies, preferred	65
Western Union Telegraph Co.	67

PERSONAL.

MR. THOMAS AHEARN, of Ottawa, Ont., sailed from New York on March 27 for Panama.

MR. F. G. BOYER, superintendent of telegraph, National Transit Company, Oil City, Pa., was a recent New York business visitor.

MR. C. W. MCKIBBON, superintendent of telegraph of the Gulf Pipe Line, with headquarters at Beaumont, Tex., was a New York business visitor recently.

MAJOR J. O. KERBEY, the well-known old-time and military telegrapher and author, has just returned to his home in Washington, D. C., from the Barbados, much improved in health.

JAPANESE TELEPHONE VISITORS.—Mr. Toshiyuki Hatekeyama and Mr. Takeo Hida, of the Department of Communications of the Japanese Government, Tokio, Japan, are in this country with the intention of spending several months in a study of American telephone methods.

MISS MARY J. MACAULAY, a press operator at Lockport, N. Y., who lives in Le Roy, N. Y., is a candidate for the postmastership at Le Roy, and is taking an active part in securing names to a petition for the position. Miss Macaulay has an excellent record as an operator.

MR. J. N. JOHNSON, of Albuquerque, N. M., an old time telegrapher and inventor, is a New York business visitor. Mr. Johnson, many years ago, was a prominent figure in telegraph circles in New York and Chicago. His business will keep him in New York until about May 1.

MISS LUCILE COLLETTE, of Seattle, Wash., daughter of Mr. N. T. Collette, a well-known old-time telegrapher on the Pacific coast, has won honors in Paris, France, as a violinist. Although only eighteen years of age, her playing is said to be as finished as that of an artist of riper years and experience. She has studied music in Paris and Prague, Austria-Hungary, and has won several prizes. Her musical career has been highly successful from an artistic standpoint. Miss Collette will return to America during the year and will probably give her first American violin recital in New York.

HON. PETER V. DE GRAW, of Philadelphia and Washington, a well-known old-time telegrapher, who for eight years has most creditably filled the positon of fourth assistant postmaster-general at Washington, has retired from that office. The officials and employes of the bureau presented him with a cut-glass and sterling silver decanter, goblets and elaborate tray, handsomely engraved and appropriately inscribed. Endorsements have been presented, urging President Wilson to appoint Mr. De Graw a member of the Board of Commissioners of the District of Columbia. General Nelson A. Miles, George B. Cortelyou, and other prominent persons in Washington are among the signers of the endorsements. Mr. DeGraw has an excellent record as a gentleman and public official, and has a host of friends in official circles in Washington, and among telegraphers throughout the country.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. F. T. BOTT, is manager of the Postal interests at Dayton, Ohio. Mr. J. G. Wolf, represents the same interests at Omaha. The manner in which these gentlemen have handled the company's affairs, during the distressing conditions, growing out of the unparalleled storms, has called forth the praise of every official of the company.

MR. E. REYNOLDS, assistant to the president, is making a trip of inspection through the Southern Division in the interests of the service.

MR. C. M. BAKER, division general superintendent of plant, Chicago, Ill., recently took his daughter to Phœnix, Ariz., on account of failing health.

W. H. SCHLAEFER, B. J. Conlin, E. T. Bridgeman, E. B. Hagerty, H. A. Burdick, J. J. McCauley, all of the operating department at 253 Broadway, New York, recently enlisted in the New York Militia, for service in the First Company, Signal Corps, National Guard, New York.

GEORGE W. JACKSON, aged thirty-nine years, formerly chief operator at Rochester, N. Y., died in that city, March 15.

Among recent executive office visitors were Mr. E. W. Miller, chief operator, Philadelphia, Pa.; W. A. Reicherter, jr., chief clerk to superintendent C. A. Richardson, Boston, Mass.; L. J. Mackey, chief clerk to superintendent H. Scrivens, Pittsburgh, Pa.

MAGNETIC CLUB.—Invitations have been issued to members and past-members of the Magnetic Club to attend the dinner to be held at the Broadway Central Hotel, New York, at 5.30 o'clock p. m. April 19, to celebrate the twenty-fifth anniversary of the organization of the club. A special programme will be arranged, and a large attendance is looked for. The proceedings of the twenty-fourth annual meeting, held January 9, have been issued in small pamphlet form. Mr. W. B. Dunn, 253 Broadway, New York, is the secretary.

LINES DAMAGED BY STORMS.—Severe damage was done to telegraph and telephone lines in the West, South and Southwest by a succession of cyclones and blizzards, March 15 and 23. Both of these storms were followed on March 24 and 25 by unparalleled floods and loss of life in the middle and southern parts of Ohio and in Indiana, the greatest damage being done in Dayton, Ohio. The city was almost entirely ruined. Telegraph, telephone and railroad property was swept away over a very large area, and no direct communication by these means with the unfortunate towns was possible for several days on account of the high water. In numerous instances entire plants of telegraph, telephone and railroad companies were completely destroyed. Columbus, Ohio, the capital of the State, also suffered very severely from the flood. The telegraph companies, it is stated, have never before experienced such widespread damage to their properties.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

MR. THEO. N. VAIL, president of the American Telephone and Telegraph Company, and of the Western Union Telegraph Company, was, on March 12, elected a life member of the corporation of the Massachusetts Institute of Technology, Boston, Mass.

MESSRS. NEWCOMB CARLTON and Belvidere Brooks, vice-presidents; G. M. Yorke, general superintendent of plant, and W. N. Fashbaugh, general superintendent of traffic, who left New York, February 24, on a trip of inspection through the South, have returned. Mr. Carlton expresses himself as pleased with the general condition of offices, plant and service in the South, and was particularly impressed with the high character and efficiency of the Western Union employes in the various cities visited.

MR. BELVIDERE BROOKS, vice-president, accompanied by Mrs. Brooks, returned to New York from Bermuda on March 31, after an absence of a couple of weeks.

MR. J. MCROBIE, general manager of the American District Telegraph Company, New York, has returned from a three weeks' business trip through the Southwest and to the Pacific Coast cities.

MR. W. W. BROWN, is manager of the Western Union interests at Dayton, Ohio. Mr. J. R. Hyland, is manager of the same interests at Omaha, Neb. These gentlemen are by long experience well fitted to take care of the responsibilities growing out of the disastrous effects of the recent storms.

MR. J. D. FELSENHELD, solicitor at 854 Broadway, New York, has resigned to accept the position of assistant manager at New Orleans, La., vice J. W. McMahon resigned.

COMMERCIAL MEETINGS.—The regular monthly meetings of groups 1, 2 and 3 of the New York district and local managers and counter clerks were held March 26, 27 and 28. They were presided over by Mr. J. F. Nathan, commercial superintendent of the New York District.

Conference of District Officials and Managers at Indianapolis.

A get-together meeting of the officials, managers and other representatives, of the sixth district, Western Division, Western Union Telegraph Company, was held in Indianapolis, Ind., March 20. The convention was presided over by district commercial superintendent A. C. Cronkhite.

On opening the meeting superintendent Cronkhite made an excellent address, which was greeted with hearty applause.

Other brief and timely expressions of cheer and good fellowship, which embraced various topics of general interest, were made by Messrs. A. A. Montgomery, district traffic superintendent, Cincinnati; C. F. Newsom, division cable agent, Chicago; R. E. Scorah, district plant superintendent, Indianapolis, and John F. Wallick, former district superintendent at Indianapolis, now retired.

An attractive programme covering the exploitation of the various services of the company was carried out in detail, and many ideas for the development of business were advanced.

When the convention adjourned, the heads of the various departments of the local forces joined the visitors, and all repaired to the dinning-room of the English hotel, where covers had been spread for the sixty-five. At each plate there was a place-card in the shape of a miniature telegraph blank bearing the text of the first telegram ever sent. The menu was unique.

After the banquet, the party was escorted to Keith's, where a programme of special features was enjoyed. Mrs. Lola Wright, of the local office, sang "Send me a Night Letter, Dearie," while the chorus, typewritten in telegram form, was flashed on the screen. Other typical slides were shown.

Among the invited guests were: M. T. Cook, assistant general manager, and C. F. Newsom, division cable agent, Chicago; A. A. Montgomery, district traffic superintendent; H. C. Comstock, district traffic supervisor, and R. C. Bliss, manager, Cincinnati, Ohio; R. E. Scorah, district plant chief; S. V. King, commercial agent; P. L. Mounce, manager; J. M. Taylor, chief operator; Wright Marble, Solicitor; John F. Wallick, former superintendent, and C. S. Rhoads, superintendent of telegraph, of the Big Four Railway, all of Indianapolis.

A letter from division traffic superintendent T. W. Carroll, Chicago, extending felicitations and expressing regrets of his inability to be present was read and greeted with applause.

The following managers were present and took active part in the proceedings: R. J. Hammond, Mattoon, Ill.; J. S. Meador, Mt. Vernon, Ill.; H. K. Armstrong, Anderson, Ind.; J. R. Sample, Bedford, Ind.; J. E. Riley, Bloomington, Ill.; J. J. Lash, Columbus, Ind.; H. A. Hutton, Crawfordsville, Ind.; A. A. Burr, Evansville, Ind.; Z. M. Apple, French Lick, Ind.; M. H. Hutton, Kokomo, Ind.; E. L. Dyer, Lafayette, Ind.; M. J. Doherty, Logansport, Ind.; F. J. Rhorer, Marion, Ind.; F. B. Bradley, Muncie, Ind.; W. A. Mossman, New Albany, Ind.; F. W. Booher, New Castle, Ind.; F. M. Andres, Peru, Ind.; M. A. Ryan, Richmond, Ind.; C. W. Mason, Terre Haute, Ind.; R. H. Underwood, West Baden, Ind.; J. H. Jarvis, Greenville, Ohio; J. K. Morgan, Kenton, Ohio; M. F. Miller, Marion, Ohio; C. E. Machir, Piqua, Ohio; G. W. Morton, Sidney, Ohio; Miss E. E. Martion, Tiffin, Ohio; F. Sausser, Urbana, Ohio.

P. P. Hughes, Manager, Butte, Mont.

Mr. Preston P. Hughes, whose appointment as manager at Butte, Mont., was announced in our issue for March 16, was born in Emporia, Kan., July 13, 1888, and entered the telegraph service in that place September 10, 1904, as messenger. From 1905 to 1908 he was manager of the Postal Telegraph-Cable office in Emporia. In the latter year he entered the Western Union service as manager at Superior, Neb., and in September, 1910, he became manager at Grand Island, Neb., which position he held at the time he was appointed manager at Butte.

Dinner of Dot-and-Dash Club.

A dinner of the Dot-and-Dash Club, of Philadelphia, Pa., was held March 29, and was largely attended, several officials of the Western Union and Postal Telegraph-Cable Companies being in attendance as invited guests. There was much enthusiasm, and the dinner was a highly enjoyable affair.

Addresses were made by Mr. Chas. P. Bruch, third vice-president of the Postal-Telegraph Company, New York, and others.

President S. S. Garwood presided over the meeting, and kept everyone in a happy frame of mind.

As the event took place just as this issue was going to press, details will be deferred until our next issue.

WESTERN UNION VS. AMERICAN TELEPHONE.—A decree in the litigation between the Western Union Telegraph Company and the American Telephone and Telegraph Company over rentals of telephones was affirmed by Judge Putnam in the United States Circuit Court of Appeals, Boston, March 18. By the decree the telephone company will pay the Western Union $3,141,529 and give it 18,000 shares of the stock of subsidiary companies. The suit was instituted in 1893 because of a disagreement regarding telephone rentals dating back to 1879. This decree may be appealed to the Supreme Court if a writ of certiorari is granted.

THE CABLE.

MR. JOHN F. FRASER, superintendent Western Union Cable system, Halifax, N. S., was a New York visitor March 18, on his return to Halifax from California.

THE CABLE STEAMER Robert C. Clowry is engaged on some work on Western Union cables between Key West, Fla., and Havana, Cuba.

CREED SYSTEM ON CABLES.—The Creed printing telegraph system is being tested experimentally on the Western Union lines between New York, North Sydney, N. S., and Heart's Content, N. F. By this system a gain in speed is effected, while re-punching tape is done away with.

WEEK-END SERVICE WITH ARGENTINA.—Week-end letter service was instituted March 8 between Argentina and the United States, Canada, United Kingdom, Holland and Belgium. The rate from New York is $4.85 for twenty-five words. To and from inland points the regular land line rates are added.

MEXICAN CABLE OPERATORS DURING THE REBELLION.—The diplomatic corps and government officials, as well as the members of the foreign colonies and the representatives of the press in the City of Mexico, are loud in praise of the employes and managers of the cable company for the work that they have performed during the recent rebellion in that country. The operators remained at their posts when the bullets were falling in the streets outside and the shells from the Ciudadela were breaking in the building over them.

THE TELEPHONE.

Mr. T. D. Lockwood, general patent attorney American Telephone and Telegraph Company, Boston, Mass., was a recent New York visitor.

Mr. F. Gill, chief engineer of the National Telephone Company of Great Britain, with headquarters at London, sailed for home March 29, after a three weeks' stay in New York.

Mr. John A. Bell, a telephone official at Dayton, Ohio, stands out prominently as a hero in the recent disaster, which overtook that city. He was imprisoned during the flood, but by means of the telephone he kept Governor Cox, at Columbus, informed as to the situation in the stricken city.

American Telephone and Telegraph Election.—At the annual meeting of the American Telephone and Telegraph Company, held in New York, March 25, the present officers were re-elected. Messrs. Harry H. Brigham and Thomas B. Bailey were elected members of the Board of Directors.

Luncheon to New Pacific Telephone Officials.—Mr. C. H. Gaunt, general manager of the Western Union Telegraph Company, San Francisco, Cal., on March 20 gave a luncheon in honor of Mr. G. E. McFarland and J. A. Nowell, president and vice-president, respectively, of the Pacific Telephone and Telegraph Company. Besides the hosts and guests of honor, there were over fifty persons present.

Superintendence by Telephone.—Construction work on the new battleship "New York," now building at the Brooklyn Navy Yard, was for several days, recently, directed by telephone by Lieutenant-commander Walter B. Tardy, of the Navy engineering department, who was quarantined at his home by diphtheria in his family.

Mexican Telephone Operators During the Recent Rebellion.—Answering subscribers' calls while solid shot plowed its way through the walls of the exchange building was the task cheerfully performed by the young women operators of the Mexican Telephone and Telegraph Company during the recent battle in Mexico City. Great damage was done to the wires of the company.

News by Telephone.—The idea of news service by telephone has been revived in Berlin, Germany, where two publishers have devised a plan for supplying subscribers with news and music at certain hours of the day at a price of $1.25 per month. This plan has been in operation in Newark, N. J., and in Philadelphia, Pa., and in other sections of the United States with more or less success.

Extending Italian Telephone Service.—The Italian Chamber has approved a proposal to spend $14,000,000 on reorganizing and amplifying the telephone service. New exchanges will be erected, and the underground cables increased in number. It is proposed to extend the improvements to all the towns on the government lines, and to remodel the interurban service as well.

Telephone Societies in California.—Two new telephone societies have recently been formed on the Pacific Coast. The Pacific Technical Society, of Los Angeles, Cal., meets weekly. At a recent meeting the following subjects were discussed: "The Induction Coil," by M. W. Jackson; "Ohm's Law," by E. F. Clark; "Composite Circuits," by F. G. Whitney; "The Wheatstone Bridge," by K. Friemark. The Telephone and Telegraph Society, of the Pacific Coast, San Francisco, Cal., meets monthly. The officers are: President, C. W. Burkett; vice-presidents, P. H. Coolidge and J. P. Downs; secretary and treasurer, A. C. Rogers.

Boston Plant Chapter Entertainment.—The Boston Plant Chapter of the Telephone and Telegraph Society, of New England, will present a musical review, entitled "The Minstrel Regatta," in Boston, on the evenings of April 2 and 3. According to the poster announcement "the cast of 100 includes fifty of the prettiest girls in the Bell system." Mr. Charles E. Ames is chairman of the show committee, and Mr. Gordon S. Wallace is secretary.

Farm Telephones in Michigan.—The development of farm telephone lines in Washtenaw County, Mich., has been very rapid under the management of Mrs. Edwin Ball. Her husband, now deceased, started the exchange in Webster township, Mich., and now there are 2,732 farm telephones in that county and neighborhood. The various rural lines are connected with the Michigan State Telephone Company exchanges at Ann Arbor, Dexter and Ypsilanti. Mr. F. J. Keech is manager of the Michigan Telephone Company at Ann Arbor, Mich.

Pacific Telephone and Telegraph Company.—A general reorganization among the officials of the Pacific Telephone and Telegraph Company in San Francisco, Cal., has been effected. Mr. Henry T. Scott resigned as president, and was elected chairman of the board. He is succeeded as president by Mr. G. E. McFarland, of Omaha, Neb., as announced in our March 16 issue. Mr. J. C. Nowell, general superintendent of plant, Bell Telephone Company of Pennsylvania, Philadelphia, Pa., has been elected general manager, in place of Mr. E. C. Bradley, resigned.

Officers of the National Independent Telephone Association.—The directors of the National Independent Telephone Association on March 3 elected the following officers: President, Manford Savage, Champaign, Ill.; first vice-president, E. B. Fisher, Grand Rapids, Mich.; second vice-president, N. G. Hunter, Wabash, Ind.; secretary and treasurer, Richard Valentine, Janesville, Wis.; assistant secretary and cashier, Miss N. Thompson, Chicago, Ill. The board also selected from its membership the following named as its executive committee: Manford Savage, H. D. Critchfield, E. B. Fisher, N. G. Hunter, R. Valentine, L. D. Kellogg and J. B. Earle.

CANADIAN NOTE.

Mr. C. E. Lillie, manager for the Great North Western Telegraph Company, at Quebec, Canada, has resigned to enter the wholesale coal and stevedoring business at that place. Mr. Lillie is a Canadian, and has been in the telegraph business since 1893. He has many friends in and out of the telegraph service, who will wish him much success in his new line of endeavor.

RADIO-TELEGRAPHY.

Mr. W. C. Pearse, a well-known old-time telegrapher, is chief of the wireless service on the new steamer "Pastores" of the United Fruit Company. Besides being the newest of the United Fruit Company's "great white fleet," the "Pastores" is the largest, and is stated to be one of the finest fitted out and equipped steamers afloat. She carries two wireless operators, and their quarters consist of a large operating room, a generator room and two handsome sleeping rooms. The United Fruit Company itself fits out its steamers with wireless equipment, and has complete and independent control. The power of the "Pastores'" outfit is 2½ kilowatts, the motor being of five horse-power. The transmission radius is 500 miles in the daytime and from 500 to 2,000 miles at night.

Wireless From Key West to Cairo, Egypt.—The Lloyd's wireless operators at Cairo, Egypt, have on several occasions recently copied messages from the Key West, Fla., station. The distance between the two points is over 7,000 miles.

The National Wireless and Telegraph Company, of Arizona, has been incorporated in California, with a capital stock of $2,000,000. The company will transact a general telegraphic business in Southern California, Arizona and New Mexico.

Long Distance Wireless.—It is stated that the Sayville, L. I., station of the Atlantic Communication Company, has recently been in wireless communication with the San Cristobal station at Lima, Peru, and that messages have been exchanged between the San Cristobal station and a steamer in the Straits of Magellan.

Wireless to Falkland Islands.—The radiotelegraphic station at Port Stanley, Falkland Islands, has been opened to public service. European business to and from Port Stanley will be handled through the station located on the Cerro at Montevideo, Uruguay, which is 1,243 miles distant. The Telefunken system is used at the Cerro station.

The Federal Telegraph Company owns and operates stations, utilizing the Poulsen system, at the following points: Seattle, Wash.; Portland and Central Point, Ore.; Sacramento, San Francisco, South San Francisco, Los Angeles and San Diego, Cal.; Phœnix, Ariz.; El Paso, Fort Worth and Dallas, Tex.; Kansas City, Mo.; Chicago, Ill.; and Honolulu, T. H.

Resistance of Antennas.—It has been known to many experimenters that the antenna resistance was much larger at longer wave-lengths than should have been the case, according to the Hertzian theory of radiation. Dr. C. Fischer has carried out some interesting experimental observations, showing that this increase in antenna resistance is, under certain circumstances, proportional to the wave-length, and he appears to believe that this increased resistance is due to radiation.

Determining Longitude by Wireless.—Experiments are being conducted between the Arlington, Va., wireless station and the Eiffel Tower station in Paris to determine by means of wireless the precise longitude of Washington and Paris. Signals were received at Paris from Arlington on the night of March 20, but the latter station was not able to hear signals from the Eiffel Tower on account of atmospheric conditions. On March 22 faint signals were received at the Arlington station from the Eiffel Tower.

Scout Cruiser "Salem" at Gibraltar.—The scout cruiser "Salem," of the United States Navy, while at Gibraltar last month, had wireless communication with the Arlington, Va., station. The tests on the way across to Gibraltar proved that in the day time dispatches could be received continuously by the "Salem's" apparatus from the station at Arlington up to a distance of 2,400 miles. Arlington was able to hear the "Salem" in the daytime up to a distance of 1,300 miles. At night, when the atmospheric conditions were especially favorable, communication was maintained easily at much greater distance.

Wave-Lengths of Ship Antennas.—The fundamental wave-lengths of ship antennas average about 400 meters, with extreme points about 150 meters above and below. Modern transmitters operate efficiently at wave-lengths from about one and one-fifth to say four times the natural wave-length of the antenna used and give best results at about two and a half times this. Therefore, the working ranges of wave-lengths for small, average and large ships are 300-1,000, 486-1,600 and 660-2,200 meters respectively. Since it is considered impossible to transmit with good efficiency at wave-lengths below the antenna fundamental, it is very evident that in prohibiting the range between 600 and 1,600 meters the government has effectually prevented ship-to-ship and ship-to-shore signalling under the best conditions. This is without regard to the effect of atmospheric absorption, which causes remarkably rapid attenuation when wave-lengths less than 800 meters are used and so increases the difficulties of transmission with short waves.

Radio Licenses.

Provisional licenses for radio stations have been issued by the government radio inspector at New York to the Telefunken Company, New York, Atlantic Communication Company, Sayville, L. I., and the *New York Herald*, New York. Licenses have also been issued to various coastwise steamers and to 269 amateur stations in the New York district.

The amateur stations are given calls, beginning with the figure 2, as, for instance, 2AB, 2AC, etc.

It is a violation of the law for the stations so licensed to use calls other than the ones assigned.

The radio law applying to ocean cargo steamers becomes effective on July 1 next, and on such steamers there may be substituted a member of the crew, who can act as the second operator, and who will be required to take an examination similar to the one now given for amateurs. To these men who pass this examination there will be issued a certificate in the form of an amateur first-grade license.

Mr. W. D. Terrell is the radio inspector at New York.

Annual Report of American Telephone and Telegraph Company.

The report of the directors of the American Telephone and Telegraph Company for the year 1912, signed by President Theo. N. Vail, was issued March 19.

At the end of the year the number of stations which constitued the Bell Telephone System in the United States was 7,456,074, an increase of 823,449, including 344,173 connecting stations. Of these 2,502,627 were operated by local, co-operative and rural independent companies or associations having sub-license or connection contracts, so-called connecting companies.

The Bell telephone toll lines of the United States now reach 70,000 places, from many of which a telegraph message can be sent. The extent of the system is best realized by comparison with less than 65,000 post-offices, 60,000 railroad stations and regular telegraph offices at about 25,000 places.

The total mileage of wire in use for exchange and toll service was 14,610,813 miles, of which 1,678,198 were added during the year. Of the total mileage over 12,400,000 miles were exchange wires, and nearly 2,200,000 toll wires. These figures do not include the mileage of wire operated by connecting companies. Of this total wire mileage 7,804,528 is underground, including 452,374 miles of toll wires in underground cables.

Including the traffic over the long-distance lines, but not including connecting companies, the daily average of toll connections was about 738,000, and of exchange connections about 25,572,000, as against corresponding figures in 1911 of 645,000 and 23,484,000; the total daily average for 1912 reaching 26,310,000, or at the rate of about 8,472,000,000 per year.

The amount added to plant and real estate by all the companies, excluding connecting companies, constituting the system in the United States during the year 1912, was $75,626,929.

Estimates of all the associated operating companies and of the American Telephone and Telegraph Company for all new construction requirements in 1913 have been prepared. It is estimated that about $62,000,000 will be required for current additions to plant in 1913, of which amount some $30,000,000 will be provided by the existing and current resources of the companies.

During the year $66,705,000 was applied out of revenue to maintenance and reconstruction purposes; of this, over $15,000,000 was unexpended for those purposes.

The total provision for maintenance and reconstruction charged against revenue for the last ten years was over $409,000,000.

Tables show the business for the year of the Bell Telephone System including the American Telephone and Telegraph Company and its associated holding and operating companies in the United States, but not including connecting independent or sub-licensee companies, nor the Western Electric Company and Western Union Telegraph Company except as investments in and dividends from those companies are included respectively in assets and revenue. All inter-company duplications are eliminated in making up the tables so that the figures represent the business of the system as a whole in its relations to the public.

The gross revenue in 1912 of the Bell System—not including the connected independent companies—was $199,200,000; an increase of nearly $20,000,000 over last year. Of this, operation consumed $65,200,000; taxes, $10,300,000, or one and one-half per cent on the outstanding capital; current maintenance, $31,800,000; and provision for depreciation, $34,900,000.

The surplus available for charges, etc., was $56,900,000, of which $14,200,000 was paid in interest and nearly $29,500,000 was paid in dividends.

The total capitalization, including inter-company items and duplications, of the companies of the Bell System is $1,294,835,468. Of this, $568,976,849 is owned and in the treasury of the companies of the Bell System. The capital stock, bonds and notes payable *outstanding in the hands of the public at the close of the year were* $725,900,000. If to this be added the current accounts payable, $25,300,000, the total outstanding obligations of every kind were $751,200,000, as against which there were liquid assets, cash and current accounts receivable, of $73,400,000, leaving $677,800,000 *as the net permanent capital obligations* of the whole system outstanding in the hands of the public.

During the year 1912 careful appraisals of the physical property of all the companies in the Bell Telephone System were made by the engineers, and it was found that whereas the book cost of the properties as at August 1, 1912, was about $736,000,000, the cost of reproduction at the same date exceeded $797,000,000. In other words, at the date named it would have cost about $61,000,000 more to replace the actual physical property than the amount at which it was then carried on the books of the companies.

This appraisal did not include any amount whatever for intangible assets, such as good-will, patents, franchises, cost of developing the business or going concern values, all of which would still further increase the cost of reproduction by a large percentage.

The contracts and licenses account, which had been reduced to a small amount during previous years, was entirely written off during 1912.

For the year there was an increase in assets of $92,300,000, of which $75,600,000 represented current additions to plant, including the necessary real estate. This increase of $92,300,000 is represented by $65,800,000 increase in outstanding obligations for the whole system, and an increase in surplus and reserves of $26,500,000. Of this, $26,500,000 increase in surplus and reserves about $700,000 represents premiums on capital stock received through conversion of bonds, and $8,845,000 was set aside on December 31 for Employees' Benefit Funds.

All of the present surplus and reserves, aggregating over $164,000,000, is invested in tangible and productive property, the revenue from which enables the companies to maintain their efficiency without paying capital charges on this amount.

Attention is called to a comparative statement of the Bell System for the years 1907 and 1912. During that period the gross earnings have increased $70,600,000, of which $54,900,000 has been absorbed by increase in expenses, leaving an increase of $15,700,000 in net earnings. Of this increase in net earnings, $3,700,000 was taken for increase in interest and $11,300,000 for increase in dividends. The surplus in 1912 was $13,200,000, an increase of $700,000 over that of 1907.

During this five-year period the assets of the companies have increased over $311,000,000, while the capital obligations and payables outstanding have increased only a little over $199,000,000. The surplus and reserves have increased from $61,300,000 to $164,200,000, nearly $103,000,000 after setting aside $8,845,000 for the Employes' Benefit Fund.

"Our associated operating companies," the report states, "have settled into a steady stride and in normal years the rate of growth requires only a normal amount of new construction and reconstruction. The sales of the Western Electric Company to the associated companies have therefore not recently been subject to violent fluctuations, and in the past year did not differ materially from those of 1911. Sales to other customers have been increased. While the rate of net profit on the investment in the business is not as large as is earned by other electric manufacturing companies, it is sufficient to pay interest on the bonds and the regular rate of dividends and provide the reserve which such a business requires."

The net earnings of the American Telephone and Telegraph Company were $37,907,644.26, an increase of $4,606,398.49 over 1911. The interest charges were $5,844,698.86, and the dividends at the regular rate of 8% per annum were $26,015,587.76. Of the balance, $6,047,357.64, there was carried to Reserves, $2,800,000.00 and to Surplus, $3,247,357.64.

During the year $13,652,000 of new stock was issued under the offer of June 20, 1911. In addition, $2,726,200 of stock was issued upon conversion of bonds, making the total increase of capital stock during 1912, $16,378,200.

At the close of business December 31, 1912, $132,998,000 of the $150,000,000 of convertible bonds of 1906 had been handed in for conversion, leaving outstanding at the end of the year $17,002,000, a reduction in 1912 of $3,457,000.

The number of shareholders, 50,297, on December 31, 1912, shows an increase of 2,956 during the year.

Referring to the plan for employes' pensions, disability benefits and insurance, which went into operation January 1, Mr. Vail says:

"The underlying motive in the plan was to secure the younger employes, who were intending to make their life work in the service of the Bell System, against the ordinary contingencies during the period when it is impossible to provide against them by the exercise of the usual thrift and economy; and to give such employes freedom from anxiety either for their own welfare or that of those dependent upon them."

The announcement of the plan, which was made January 1, was very favorably received, Mr. Vail states. [This announcement was published in our issue dated January 16, and the details of the plan were published in the issue of November 16, 1912.]

During the year 1912 a number of important engineering developments have been initiated, and many of great value have been well advanced towards completion, but have not yet reached the stage where they can be described.

Experience with the engineering devices and methods employed in the New York-Denver line, referred to in last year's report, having demonstrated their value under severe practical conditions, a systematic introduction of these improvements was undertaken and actively prosecuted throughout the United States, so that at the end of 1912 there was a total of 54,750 miles of the heaviest gauge wires equipped with the new arrangement, thus doubling their transmission efficiency, and in addition to this there were obtained, without any expenditure for new wires, phantom circuits equivalent to 12,600 miles of the heaviest gauge circuit. These improvements have brought into communication with each other places formerly too remote, and between a great number of places less remote, noteworthy improvements in the service have been reported.

Engineering plans have been completed for the extension of four heavy copper wires from Denver to San Francisco, and construction work is to commence as soon as the weather permits.

Underground cables with 600 pairs of wires have been the largest number which it has heretofore been practicable to employ. Experiments were completed during the year and specifications prepared for a new type of cable providing 900 pairs, of 1,800 wires, in the space which was formerly required for 600 pairs. This will result not only in great economies in the use of cables, but also in large economies in the construction and utilization of underground conduits.

The new telephone and telegraph building in New York City [on Lispenard street] is rapidly approaching completion. This is to be the largest building used for housing telephone and telegraph central office equipments and operating rooms. It will contain two telephone central offices of 10,000 lines each, the long-distance switchboard and operating headquarters, and a new operating room and equipment for the Western Union service. The engineering plans and specifications for this work have been completed, so that the installation of the apparatus and wires may commence as soon as the building is ready.

Mr. W. H. Mann, manager of the Western Union Telegraph Company, at Phœnix, Ariz., writes: "I could not afford to miss Telegraph and Telephone Age, as all hands look forward to its coming twice a month."

A Telephone Man.

"I said at the beginning that I was not a telephone man, and I have been trying to think just what really goes to make up the composite creature who might with truthfulness say that he is an all-around telephone man," said Mr. N. C. Kingsbury, vice-president of the American Telephone and Telegraph Company. "Mr. Vail does not claim to be a telephone man, although he started in at the very inception of the business. Mr. Bethell admits that the telephone chair is too big for him, Mr. Richardson says that he is a lawyer fallen from grace, Mr. Burt would deny that he is a telephone man, and so I have found that it goes generally throughout the list of men who have the most to do with the telephone business, and I have for some time past been searching for the ideal telephone man. I have tried to formulate in my mind just what qualities such a man would possess, and I have come to the conclusion that he would be a paragon. In the first place, he must know electricity as few engineers do know it. All of us know certain phenomena of electricity, but none of us as yet knows just what electricity is. We know, for instance, that a current so feeble as to be almost without sufficient characteristics to note its presence will take the human voice in New York and transmit it and reproduce it in Denver, but just how it is done or just what is the physical explanation of this wonderful fact we do not know.

"The ideal telephone man must be an expert mechanic. Almost every realm of manufacture and mechanics must be at his fingers' ends. He should be able to climb a pole or operate a switchboard, he should be able to splice a cable and install an instrument. The ideal telephone man must be a politician in the wisest and best sense of the term. He must be able to deal with legislatures, with city councils, with committees of all sorts and with the public at large. The ideal telephone man must be a great student of human nature. He must know how to organize and control a large, widely spread organization of men and women. He must be perfectly honest in all of his dealings with the public and with his organization. He must be a financier of no mean ability. He must be able to read with a clear view the present and the future. He cannot judge the future from the experiences of the past, because the past in the telephone business is too near at hand to be an infallible guide for the future. He must know the varied needs and industries of his particular section of the country, and, indeed, of all sections of the country. In disposition he must be lovable and patient. He must be able to withstand temptations in every direction and to receive without anger criticisms, just and unjust, and above all, he must recognize that he exists to assist in performing a very high type of public service, and to that end must he devote all his energies and all his time."

ASBESTOS PROTECTION FOR POLES.—Asbestos coverings as a protection for the bases of telegraph poles are being used in France. Sheets of asbestos are tacked over the surface of the wood to a point about eight inches above the ground level. The process is said to be expensive, and it remains to be demonstrated whether a greater saving will result than by the employment of the well-known creosote treatment.

Some "Don'ts" in Letter-Writing.

An exchange gives some good advice to letter-writers who use antiquated expressions in their letters that do not comport with the spirit of the times.

Carefully avoid such words and stock phrases as "beg to acknowledge," "beg to advise," "beg to inquire," etc. Don't "beg" at all.

Don't say "kindly" for "please." Avoid "the same" as you would a plague.

Don't write "Would say." Go ahead and say it.

Don't say "Enclose herewith." "Herewith" is superfluous.

Don't "reply" to a letter; "answer" it. You answer a letter and reply to an argument.

Don't use a long or big word where a short one will do just as well or better. For example: "begin" is better than "commence," "home" or "house" better than "residence," "buy" better than "purchase," "live" better than "reside," "at once" better than "immediately," "give" better than "donate," "start" or "begin" better than "inaugurate."

Carefully avoid even the appearance of sarcasm.

Be wary of adjectives, particularly superlatives. "Very," "great," "tremendous," "excellent," etc., have marred many an otherwise strong phrase and have propped needlessly many a good word, all-sufficient of itself.

Never use the first personal pronoun "I" when writing as a company; "we" is the proper pronoun. Where a personal reference is necessary, "the writer" may be used, but even this should be avoided wherever possible.

There are some common grammatical errors so inexcusable that no letter bearing the signature of the company should ever show them. "We was" should be cause for dismissal. "If I was," "would that he was," etc., are scarcely less excusable. Bear in mind the greater elegance as well as the correct grammar of "if I were," "would that he were," etc.

Don't forget that certain small words are in the language for a purpose. "And," "a," "the," are important and their elimination often makes a letter bald, curt and distinctly inelegant.

Examples of English "Bulls."

American operators are not the only ones in the world who commit errors. Following are a few made by English telegraphers, which show that our British friends are as skilful in making blunders as are their American relatives.

"Lizzie got a fire box. Come at once." A repetition revealed the fact that "Lizzie got a fine boy." "Send trousers lime seated" was evolved from "Send trousers time stated."

In reporting a cricket game, an operator got "bowling paralysis," for "bowling analysis."

The operator who received "Onward Christian Solicitors" for "Onward Christian Soldiers," must have belonged to the commercial department.

How the Telephone Talks.

The transmitter will be explained first. The sounds of the voice enter the transmitter through the hard rubber mouthpiece, which directs the sounds against the diaphragm.

The diaphragm, which is a metal disk of thin sheet iron or ferro-type, is pliable, so that sounds entering the mouthpiece and striking against it cause it to vibrate to and fro.

Now we come to the concealed part or heart of the instrument, so to speak. In the center of the diaphragm, and passing through it, will be noticed a small lug with two small nuts screwed onto its projecting end. This lug connects with a small flat disk of polished carbon, about the size and shape of a five-cent piece, back of the diaphragm, so that when the diaphragm is moved to and fro by sounds striking against it this carbon disk moves with it.

Facing the polished side of this carbon disk, but not touching it, is a similar polished carbon disk mounted solid in the rear of the transmitter. One wire of the telephone line is connected with one carbon disk and the other wire of the line is connected with the opposite carbon disk. The two line wires are termed a metallic circuit.

The small space or chamber between these two polished surfaces of carbon is partly filled with finely granulated carbon, which is held in place in such a way that the electric current from the exchange battery, in order to flow and complete the circuit from one line wire to the other, must pass through this granulated carbon.

The granulated carbon in this loose form does not allow as much current to flow through it as would flow through a solid piece of carbon occupying the same space. It follows then that the amount of current flowing over the telephone line depends on the condition of these tiny carbon granules, as to whether they are loose or compact.

When the diaphragm is made to move forward by a sound striking against it, the front carbon disk or button, fastened to the rear of the diaphragm, presses the little carbon granules against the opposite or rear carbon disk, packing them more solidly together and allowing a larger current to flow through the carbon chamber and out on the line.

Other sounds allow the diaphragm to move back again and the granules are loosened up and a smaller current is allowed to pass through. In this way the current is varied, the little cup of granulated carbon acting as a valve on the battery, one instant allowing a large current, the next instant a small current, to flow out over the line, as the action of the diaphragm varies the pressure on the carbon.

These varying currents pass over the line wires to the receiver at the distant end, the action of which will now be described.

The receiver is less mysterious than the transmitter, it being practically nothing more than that interesting toy of our school days, the horseshoe magnet, modified in form and mounted in a hard rubber casing.

Only the two projecting ends of the horseshoe magnet are visible when the receiver is opened at its end. Mounted on each projecting end of the magnet is a spool of fine insulated wire, so connected that it forms a continuous path or circuit for the varying currents coming over the line as follows: Starting from one metal post on the top of the receiver, through one spool of fine wire, then through the other, then to the remaining post on the top of the receiver. The two wires of the metallic circuit that connect with the transmitter eventually connect with the receiver at the distant end, one wire to each of the two metal posts.

Over the ends of the horseshoe magnet, but not touching the ends, is mounted a diaphragm similar to the one described in connection with the transmitter. A hard rubber cap to hold the diaphragm in place and to make the receiver fit the ear completes the description of this instrument.

When the rapidly increasing and diminishing currents of electricity caused by the action of the transmitter pass over the line wire and through the coils of fine insulated wire on the ends of the receiver magnet, the strength or attractive power of the magnet is alternately increased and diminished very rapidly, due to the known laws of electro-magnetism.

The receiver diaphragm, being made of iron, is attracted by the magnet with greater or less strength, depending on the condition of the current flowing through the receiver coils. This causes the receiver diaphragm to vibrate to and fro in exact unison with the transmitter diaphragm, and the small sound waves sent to the drum of the ear by the vibration of the receiver diaphragm are a faithful reproduction of the sounds entering the transmitter.

Other apparatus and principles enter into the transmission of speech by telephone; but these two highly sensitive and very simple instruments form the nucleus of the thousands of exchanges, with their complicated mechanisms, that are now in existence.

Magnetism.

It has been known from time immemorial that certain natural ores of iron possessed the property of attracting iron and steel, and that these metals were themselves capable, under proper conditions, of being endowed with a like property. This property, which is called magnetism, is also capable of being manifested, though in a less marked degree, by certain other metals, especially cobalt and nickel. Such a mass of magnetic ore is called a natural magnet or lodestone. A mass of iron or steel to which magnetic properties have been imparted by any known means, is called an artificial magnet. Soft iron is capable of retaining magnetic properties only during such time as it remains under the direct influence of the magnetizing force, and under such conditions is said to be a temporary magnet. Hardened iron or steel continues to retain magnetic properties after the withdrawal of the magnetizing force; and hence a mass of hardened steel, when magnetized, is called a permanent magnet.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

E. B. SHERBURNE, Advertising Manager.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, APRIL 1, 1913.

Practical Co-operation.

There was a time, until within recent years, that many honest and worthy operators throughout the country who, through misfortune, accident or other unavoidable causes, were compelled to go to professional money lenders for aid to tide them over financial stress. But now, thanks to the beneficence of the telegraph companies, this is no longer necessary, and the loan sharks are being driven out of business as far as telegraph employes are concerned. The telegraph companies have provided means of loaning money to worthy employes in times of need, and a great deal of good is thus being accomplished, directly and indirectly.

An interesting case recently brought to our attention is worthy of more than passing reference. A manager of an office in a small Mississippi town found it necessary, on account of sickness in his family, to borrow $100. Through his superintendent he obtained the loan from the proper source in New York, and in a recent letter he praises the good work of the association in assisting members of the craft in times of need. The money is being returned in monthly installments, and in a comparatively short time the debt will be wiped out. He referred particularly to the spirit of an editorial in this journal dated February 16, on the subject of co-operation. This he heartily endorsed, and in his own case found a practical application of the principles there enunciated. Had this man obtained his loan from the average money lender, his life would no doubt have been made miserable by importunities and petty annoyances, and he would certainly have been required to pay dearly for the use of the money.

The association from which he obtained the money takes a man's character as security for its loans. It is doing a great deal of good throughout the country for those in temporary distress, and it also makes secure investments for those who have accumulated a surplus from their earnings. Employes in small towns, as well as in large cities, however distant from headquarters, can borrow money from the association with no other required security than honesty and a good record.

Wasted Time.

Probably very few telegraph or telephone men have not, at some time, conceived an idea which they believed was patentable. In a few instances the idea has been developed, patented and a fortune made from it. In many cases, however, the inventor has spent much time and labor in developing his idea, only to learn, after months, and sometimes even years, of hard work, that the idea had either been previously patented, or that, for one reason or another, the product was not marketable. In other cases a really salable article has been produced, but the inventor either lacked the capital, the courage, or the business ability to reap his well-earned reward. An inventor's idea is like a silver mine: a great many things are to be considered after the "pay-dirt" has been struck.

It is surprising to see how many men will waste time and energy in the development of an idea, without once considering the advisability of conducting an investigation into the commercial possibilities of the scheme. As in the case of the old cook-book recipe for roast rabbit, which gave as the first operation the catching of the rabbit, the first proceeding would seem to be the acquisition of the idea; but many of the most successful inventors have worked from the other end. They have first hunted for the need, and then have proceeded to develop an article which would supply it.

The wisest plan for the amateur inventor to follow when he has an idea is to salt it down, and begin an exhaustive study, first, to determine whether the article in question would command a profitable sale; second, if so, can he command sufficient capital and ability to place it on the market; and third, is the idea really new and patentable. When these three questions can be answered in the affirmative, then, and only then, will it be sensible for him to commence work on the development of his idea.

Telegraph Instruments as Telephone Receivers.

Editor Telegraph and Telephone Age:

SIR: Referring to the paragraph in your issue dated March 16, headed "Induction in Australia," I wish to say that the same phenomenon has been observed here in connection with a "dummy" telegraph line, equipped only with ordinary keys and sounders, which paralleled a telephone metallic circuit on the same cross-arm for a distance of about 100 yards. The telegraph circuit was a ground return, and at the time the phenomenon was noticed, was partially crossed with the telephone circuit by a wet tree. At times whole conversations could be quite distinctly heard from the magnets of the sounders, when not in use. It was not noticed in the daytime, probably because there was very seldom anyone near by.

An explanation would be very much appreciated, if obtainable, as there is no existing condition approximating the working of the diaphragm of a telephone receiver.

Phoneton, Ohio. E. Eakin.

[It is a well-known fact that an electromagnetic, such as is used in telegraph instruments, will reproduce telephone speech and musical sounds under certain conditions. While a precise explanation of this phenomenon cannot be given, it is probably due largely to the fact that the armature of the telegraph instrument acts as a diaphragm, in its relation to the telephonic currents. If the armature is brought close to the poles of the magnets, and the armature lever is tightened between the two stops between which it plays, the telephone sounds will be much more distinct. The general belief is that, although the armature and lever are held practically immovable there is, theoretically, sufficient play at some point of the armature system to permit of minute vibration or distortion under the influence of the variations in the telephone currents. The length of the cores of electro-magnets varies under the influence of the electric currents traversing the coils, and this fact probably has some bearing upon the general result.

In the case cited, although there was no physical connection between the telephone and the telegraph circuits, there was sufficient leakage between the two lines through the wet tree to produce the effect of actual physical contact—Editor.]

Inspection for Loose Connections.

Loose connections are the cause of much serious damage to telephone lines, and eternal vigilance is the only safeguard. When a fire occurs, due to imperfect insulation or connections, the evidence of the cause is usually destroyed, and this makes difficult the placing of responsibility. Every telephone instrument should be regularly inspected to see that no cords are worn, and switchboards should be frequently overhauled for the detection of loose connections. Especial care is required in periods of damp weather, both in inside and outside work, as every lineman knows.

During rainy weather, all of the weak points are disclosed, both in cables and aerial work, and on switchboards. The insulation on switchboard wires should be the best possible. Double wrappings of silk and cotton should be used, and waxing and shellacking employed where the wire is not protected by the braided covering of a cable. It should be remembered, however, that wax and shellac are highly inflammable materials and greatly increase the fire risk.

Wireless Ocean Letters.

The Marconi International Marine Communication Company on March 1 instituted an "Ocean letter service" to meet the demand of passengers who desire to transmit inexpensive messages when they are beyond the range of direct communication with land stations. By the "ocean letter" it is now possible to send a wireless message from one ship to another ship going in an opposite direction for delivery by registered post from the first port of call of the latter vessel. When registration cannot be effected, the "ocean letter" will be forwarded by ordinary letter post.

The cost of such messages, which will only be transmitted when both vessels are beyond the range of communication with a shore station, is $1.32 for the first thirty words, including postage and registration fee, and two cents per word thereafter up to a maximum of 100 words, international counting.

The messages can only be transmitted between ship and ship, and between ships going in opposite directions. The sender of an "ocean letter" is not free to choose a ship to which the message shall be sent. Its disposal will depend entirely on local conditions.

"Ocean letters" rank in priority after fully paid and franked messages, and will only be dispatched after radiotelegrams accepted under the provisions of the International Convention, and after ordinary traffic. Nearly two weeks in some cases will be saved by those who use "ocean letters" as a means of communication. A business man leaving Southampton for New York on a Saturday will probably find his vessel out of range of coast wireless stations on the following Tuesday. Should he then desire to communicate with a friend in England he would have, in the ordinary way, to wait until he reached New York to post his letter. By means of the "ocean letter" he can now have a letter transmitted to a vessel approaching Queenstown which will be put in the registered post on arrival in that port and delivered in London or Edinburgh next morning.

Phantom Circuit.

Where two metallic telephone circuits run side by side it is possible to make use of each of these circuits as one side of a third circuit, which is called a phantom circuit because it is practically made out of nothing in so far as additional line wire is concerned. The original or side circuits are also called the physical circuits to distinguish them from the phantom. The latter circuit is connected through repeating coils to each end of the physical circuits. By using both wires of the side circuit to form one side of the phantom the inductive disturbances due to signalling and conversation in the side circuit are practically neutralized, and the phantom has really twice the conductivity that the side circuits possess. Phantom circuits are used principally on long-distance telephone lines.

Course of Instruction in the Elements of Technical Telegraphy—XXXVI.

(Copyrighted.)

(Continued from page 176, March 16.)

[We began in our issue for October 16, 1911, the publication of a course of instruction in technical telegraphy. The course, which was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, is published for the benefit of those of our readers who desire to fit themselves for better positions in their vocation. It is elementary throughout and is divided into chapters, following one another in logical order.

The course has received the hearty commendation of telegraph officials and experts for its scope and accuracy and its sound practicability. In each chapter examples are presented in order to illustrate the application of the rules to practical cases, and each chapter is followed by a series of questions pertaining to the subject of the chapter, to be worked out by the student in order to review his progress. Back numbers containing these valuable articles can be obtained on application, at 10 cents per copy.]

Wire Testing at Intermediate Offices

(Continued).

Now, consider the case of a dead ground, instead of a break; and suppose it to exist in the wire on the western side of the switch (Fig. 43). In such a case the intermediate relay would not open as it

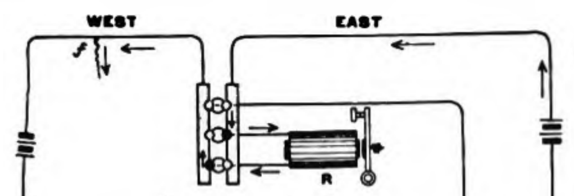


FIG. 43

did for the "break," because the eastern battery now finds a ground through the fault at *f*, thus completing its circuit through relay R, as indicated by the arrows.

If a plug be now inserted at A (Fig. 44) so as to ground both sections of the line—leaving R in the circuit of the western wire—the relay will immediately open, since no current reaches it from the western battery because of the fault; while the eastern battery current cannot affect it, on account of being diverted to ground at the switch. The opening of the relay under these circumstances will afford conclusive evidence both as to the nature of the trouble and its location in the line, relative to that of the testing station.

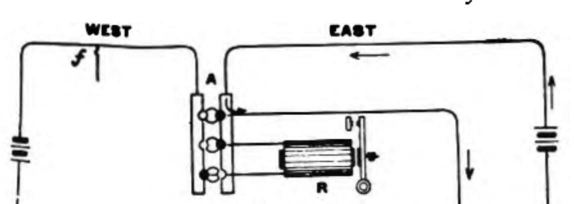


FIG. 44

The presence of such a fault on the eastern section of the line could be readily proved by grounding the western wire and battery, as shown in Fig. 45, which operation would transfer relay R to the eastern line and cause it to open through the absence of current from the eastern battery.

But let us suppose the ground to be only partial instead of total. In that case a fractional part of the current leaving the eastern battery (Fig. 46) will reach the intermediate relay and energize it,

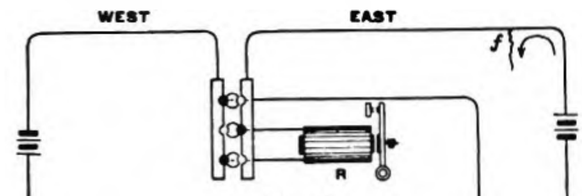


FIG. 45

but only to an extent that would at once suggest the character of the fault.

When one wire is "thrown out," to clear another with which it happens to be "crossed," or to which it "swings," the intermediate test office can readily discover when the trouble disappears by the method of "finger testing" previously described.

In Fig. 47 let L and L[1] represent two such wires crossed at *x*, the latter of which has been opened at the intermediate and terminal offices, so as to admit

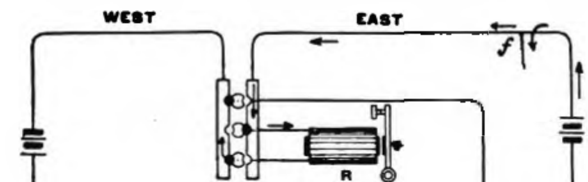


FIG. 46

of uninterrupted communication over L, the more important wire of the two. Then it will be obvious from the figure that whenever a swing appears, or so long as the wires remain in contact, a slight shock will be experienced every time the ground disk D and the line bar B are connected together through the tips of the moistened fingers, because a small portion of the working current is thereby

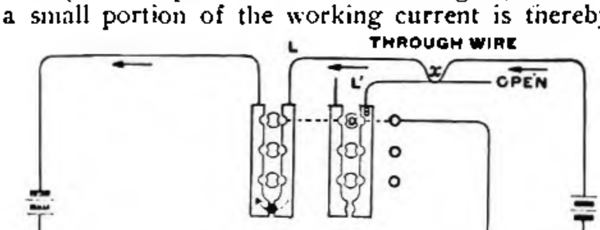


FIG. 47

diverted from L and conveyed to ground through the cross at *x* and the fingers of the testing operator. The "finger test" is to be preferred to that of inserting a plug at D, inasmuch as the latter operation would tend to disturb the regular working of the through wire L.

Voluntary efforts of this kind on the part of intermediate offices are highly appreciated, as they frequently lead to a more speedy restoration of communication on defective wires and otherwise tend to minimize the delay caused by line failures.

(To be Continued.)

Handling Messages Written in Spanish.

BY A WESTERN MANAGER.

I have been much interested in the comments on my communication, entitled "Handling Messages Written in Spanish," published in TELEGRAPH AND TELEPHONE AGE for December 16, 1912.

As I tried to make plain in my original article, the suggestions contained therein were for the benefit of the young and inexperienced members of the craft, but it appears that many of the experienced men felt that their "toes" were being trodden upon. Especially interesting is the defense of the Chicago office. Now, no one has ever doubted that there were men in Chicago who could handle Spanish or anything else sent them. (The writer knows there was at least one such there for four days in 1884, for he, himself, worked there that length of time), but I dare say that there are many, even in Chicago, who would profit by the suggestion relative to copying right up with the sender, instead of trying to think what the next letter or word will be.

We, who have served under the old "stick" régime, and later with the "bug" and "mill," have nothing but admiration for the younger generation, who know nothing of the difficulties experienced under the old system; but should such a thing happen that we were again compelled to depend upon the "stick," I fear that many of the latter-day stars would drop back a few notches.

The writer was recently in receipt of a very much appreciated letter from one of the New York higher officials, in which reference was made to the "fun we had clearing 'reds,'" etc., some thirty years ago, when he was at one end and I at the other, and I doubt if many in the service now a days could make a better average than we did under like circumstances. However, these matters do not alter the position that I have taken before, viz.: There is not enough attention given to the inexperienced operator by those in charge, and, as for that matter, to some who have been in the service for many years.

Two instances that have occurred in my experience within the past year will suffice to show that there is a great deal to be learned by operators all over the country—except, perhaps, in Chicago.

In one case I sent to a relay office an ordinary government cipher message, made up by transposition of plain English words. The receiving operator did not break on the message, but at the end said: "I can make no sense of that; what does it mean?" In a spirit of humor I replied: "It's every word plain English; if you can't understand you should attend night school for a while." The receiver then referred the message to the chief operator as a joke which I was trying to perpetrate. Another time I had occasion to send a "Paid Cable Service," and it took half an hour and the assistance of the traffic chief of the relay office to enable us to move it, and it developed that not one employe in an office employing perhaps one hundred operators knew what a paid cable service was.

With the assurance that my only object in these communications is to better the service and aid the younger members of the profession in their efforts to become a credit to themselves and to the service, and thanking our friend from far-away South America for his endorsement, we will let the subject drop.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What is the effect of a soft iron core placed within a wire helix?

When the number of ampere-turns is the same, what is the difference between the magnetic effect obtained from a few turns of wire with a large volume of current, and that from a large number of turns of wire and a small current?

What is magnetic permeability?

What is a numerical coefficient?

What is magnetic reluctance?

What is the magnetic flux?

How is the magnetic flux computed?

Write the fundamental equations representing the relations existing in the case of a magnetic circuit.

Write the corresponding equation for a magnetic circuit.

What relation exists between the length of an iron rod and its reluctance?

Between the cross-section area and its reluctance?

Between its permeability and its reluctance?

Is it possible to formulate a single statement which will express the relation between the distance between a magnet from its armature and the attractive force exerted by the magnet upon the armature?

Why is it not possible to frame an expression to fit all cases?

Name the three parts of the standard telegraph instrument magnet.

What has been found to be the required proportionate size and length of these parts in order to secure the maximum magnetic effect?

What are the two essential qualities of telegraph magnets?

What has been found to be the proper relation between the diameter of the coil of the magnet and that of the core?

What relation should exist between the length of the coil and its diameter?

(To be Continued.)

J. R. Beard, Secretary of the Mexican Telegraph Company and the Central and South American Telegraph Company, New York.

Mr. James R. Beard entered the service of the Western Union Telegraph Company, at 145 Broadway, New York, in the spring of 1871, being employed in the free message department, railroad accounts, which was at that time a part of the auditor's department under William H. Abel.

In 1873, it having come to the knowledge of Col. A. B. Chandler, then superintendent, that Mr. Beard was studying stenography, and there being two openings for stenographic clerk, one with Mr. Charles Wood, of Boston, and the other with Mr. D. H. Bates, of Philadelphia, Mr. Beard was given

JAMES R. BEARD, NEW YORK.

the choice of seeing those gentlemen, and after a conference with Mr. Bates, accepted a position as his secretary, the Western Union office then being at the corner of Third and Chestnut streets, Philadelphia.

On completion of the Western Union building at 195 Broadway, in 1875, Dr. Norvin Green, then vice-president, requiring a secretary, Mr. Beard was successful in making arrangements to return to New York in that position.

In 1876, he was appointed assistant secretary of the International Ocean Telegraph Company. In 1878 was made secretary, assisting materially during those two years in the work of retiring the International Ocean Telegraph Company's two classes of bonds, two classes of scrip and the preferred stock then outstanding.

In 1881 Mr. Beard resigned the secretaryship of the International Ocean Telegraph Company to join Mr. James A. Scrymser's companies, the Mexican Telegraph Company and the Central and South American Telegraph Company, he having been elected secretary in October, 1878, of the Mexican Cable Company, the parent company of the Mexican Telegraph Company. In 1879 he was also elected secretary of the Central and South American Cable Company, the parent company of the Central and South American Telegraph Company; and in 1881 was elected secretary of both the Mexican and the Central and South American Telegraph companies, which position he has held since that time.

Stain for Storage-Battery Shelves.

When wooden shelves are to be used for storage batteries, engineers often desire some good coating or treatment for the wood which will preserve it from the acid or alkali used. Wood seems, moreover, to be the most satisfactory material for such a purpose, since metal is so easily corroded, even when heavily coated with such protecting coatings as asphalt paint. Ordinary paint on wood becomes brittle and is liable to spall off, leaving the surface exposed to the corroding influences.

A treatment which has been used for a number of years on the desks of chemical laboratories has been found very satisfactory for storage-battery shelves and supports. It gives the wood a beautiful satin-like black finish, and not only makes it resist the action of acids and alkalis, but also raises the ignition point, so that it becomes, in a sense, fireproof. The stain is the well-known aniline black, which is produced in the fibre of the wood by alternately applying the following two solutions:

Solution A.—This is made by dissolving one part by weight of aniline hydrochloride or chlorohydrate, and one part by weight of sal ammoniac (ammonium chloride), in six parts by weight of water, warmed if necessary.

Solution B.—This is made by dissolving two parts by weight of blue vitriol (copper sulphate), one part by weight of chlorate of potash, in twelve parts by weight of water, warmed if necessary.

The surface of the wood should show a freshly planed surface and be free from oil, which would prevent the solutions from soaking in properly. Solution A is first painted over the dry surface, and allowed to soak in and dry thoroughly. Then a coat of B is applied. Two more coats of each are alternately applied in this way, and are usually sufficient. It is important that the drying should not be too rapid, otherwise the solutions do not penetrate the wood as they should. After the above treatment the surface takes on a yellowish-green tint, and is covered more or less with small crystals from the evaporated solutions. Soap, usually in the form of soap powder, is next sprinkled over the surface wet with water and scrubbed thoroughly, and the surface washed off with plenty of water. This soaping brings out the brilliant black color. When dry, raw linseed oil is rubbed well into the surface.

The acid and alkali-resisting quality of this stain is doubtless due most particularly to the pore-filling copper soap which protects the wood beneath by being, in a sense, water-repelling. It does not, in consequence, allow the surface to become wet with corroding liquids. The solutions keep very well in stoppered glass containers.

The London Radio Conference.

In all, about 350 amendments, additions and proposals were considered in some form by the London Radio Conference, held in June, 1912. About 100 of these proposals were accepted in full or in part, the majority of the amendments adopted, however, being of a minor nature. The important changes effected were of the following general nature.

Commercial, humanitarian, meteorological, technical. and military and naval.

Under the first heading every maritime country was requested to establish certain coast stations whose equipment and permanent service would be of such capacity and character as to meet the following requirements:

(*a*) An installation of appliances that would not only enable the station to hear all calls of distress from ships near by or approaching the coast, but which would also be able to expeditiously and effectively handle necessary or emergency commercial work.

(*b*) Technical complement and installations that would possess continuous facilities for forwarding at regular periods will be demanded on certain classes of ships.

Priority of transmission of weather messages was secured by a proposition which regarded meteorological radiograms as of an important official character. The American delegates reported that if the regulations will be consistently complied with, such a system of reports and forecasts can be acquired as will reduce the loss of life and property on the Atlantic Ocean to a very material extent.

With the successful development of the project for the Atlantic Ocean it is intended to extend the service to all seas and oceans. For example, through co-operation between European governments the Mediterranean may, by this method, be chartered every morning, and forecasts made accordingly. The utility of this service will be particularly apparent when one contemplates that, with the opening of the Panama Canal, there will be a great increase of shipping in the waters adjacent to the steamer centers of the Gulf of Mexico, Caribbean Sea, and certain ports of the Atlantic and Pacific Oceans.

In the technical section it is pointed out that it was finally agreed that long range ship to shore communication should be transmitted provided that a wave-length of 1,800 meters (2,000 yards) be used; that the ship should communicate only in this way to shore stations of its own country; and with the further restriction that such communication should not take place when a ship was within twenty-five miles of any coast station.

With the exception of the United States delegation, substantially every maritime power represented at the conference refused to consent to a proposition made for extending the range of wave-lengths for commercial and maritime purposes, due to the probability that such action might lessen the efficiency and reliability of the military and naval stations; particularly in England and Germany is the fact recognized that even now radio apparatus is an important weapon of war, and that international safety may be involved in the delay in developing and extending radiotelegraphy concomitary with the advance made by rival powers.

The United States delegates were strikingly impressed by the zeal, economy, and efficiency by which the Berne International Bureau has been conducted, and they report that, in view of the important and valuable service rendered by the officials of the Bureau, their emoluments and remunerations are not proportionate to the work performed.

There is a reference in the report to the chain of wireless stations which the British Government has in contemplation. It is pointed out that Germany and France are also contemplating the establishment of chains of high-power radio stations which are deemed absolutely essential for the development of their colonial trade and shipping, as well as for augmenting the efficiency of the fleet and the increased protection of their colonies.

The report concludes with a recommendation that the various executive departments of the government directly interested in various phases of radiotelegraphy should urge the Congress to make such liberal provisions as regards extension and development of this means of communication as would not only meet the early future requirements of the departments concerned, but likewise the military and commercial demands of the nation.

New Book on Storage Batteries.

Storage Batteries: Their Theory, Construction and Use. By A. E. Watson. Second edition. Price, $1.50.

This excellent work has been completely revised and enlarged and brought up to date. The author is assistant professor of physics in Brown University, Providence, R. I., and the manner in which he has treated his subject shows that he is thoroughly familiar with it. The contents are descriptive and general, and there are no mathematics whatever to confuse anyone not familiar with algebra.

The book contains chapters on the construction of plates, the action of the lead storage battery, how to make a storage battery, disease and remedies of the storage battery, boosters, etc., and gives much information valuable to anyone interested.

This book or any other on electrical and kindred subjects may be obtained of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

WORK OF PENNSYLVANIA SUFFRAGETTES.—Fifty-two telegraph and telephone wires in Glasgow, Pa., were cut recently, and placards reading "Votes for Women" were conspicuously displayed at the points where the cutting was done. It is believed that the damage was done by suffragettes.

ONE ADVANTAGE OF A TELEGRAPHIC TRAINING.—An employe of the Postal Telegraph-Cable Company, has been elected chief of police of a Western city. This is another illustration of how a telegraph training fits a man for any line of work.

Directive Wireless Telegraphy.

Increased strength of received signals is a matter of paramount importance in the development of radiotelegraphy. Such an absurdly minute quantity of the energy used in transmission is actually received that any present system is enormously wasteful compared with line telegraphy. It is, of course, impossible to make fair comparisons without taking into consideration the initial cost of cable laying, upkeep in each case, and so on. The fact remains, however, that a very real advance will be made in the day when less loss of energy is experienced in wireless transmission, says the London *Times*.

The direction of the energy radiated from the aerial helps to some extent to solve this problem, if the shape of the aerial tend to produce radiation within a limited area. Any method of direction which depends on the absorption or destruction of the radiations outside the desired area is, of course, useless as a means of concentrating the energy received and thus making radiation less inefficient. The whole problem of directing and concentrating the energy transmitted from a wireless station appears to depend on the aerial and the transformer of the oscillations. Ducretet showed in 1898 how by means of a transformer in the transmitting circuit the radiating power could be greatly increased, and on several occasions he referred to the necessity for the use of oscillation transformers and for the tuning of the sending and receiving aerials. It is only one step from the use of transformers in the transmitting circuit for producing persistent oscillations to their use for the direction and even the concentration of the transmitted energy. In Bellini and Tosi's arrangement for directing signals they employ what may be regarded as two aerials; one of these is composite, and its effect is to transmit a maximum of energy in one direction, while the other subdues or counteracts the radiations in the opposite direction. The shape of the aerial and its position relative to the earth have a marked influence upon the direction of the radiation, and Berthenod's discovery shows how productive a sphere of experiment the aerial still remains. The arrangement of some of the transatlantic antennæ is such that maximum radiation takes place in the direction in which the receiving station lies, and this has made the regular transmission of messages far more certain.

But the final problem in wireless transmission will be the confinement of the radiations to a small area, which area can be both controlled and directed, and some recent experiments made with this end in view have not been entirely unsuccessful. Using a large pitch prism, Hertz demonstrated in the very early days the fact that electro-magnetic waves could be refracted, and many experiments dealing with the reflection of the waves have been described. The experiments consisted in the use of "reflecting surfaces," which in themselves were radiators, and their radiations were in such phase that they appeared to converge the radiations emanating from a central large inductance aerial. The reflecting surfaces consisted of inductance coils wound round frames in which numbers of small, soft iron rods were fixed normally to the plane of the coils. Briefly summed up, the result was that a considerably larger amount of energy was picked up at the receiving station than was possible with the methods generally employed, and signals could be obtained at a distance at which, in the ordinary way, they were quite inaudible. It may be reasonably assumed from these results that is is possible to concentrate, as well as to direct, the radiations from a transmitting station; in other words, to get considerably more power with no increase in the energy used in sending the signals.

Combined with the extra power obtained through the use of continuous oscillations, the direction and partial concentration of the radiations should soon admit of direct relay work through a rectifier, or the use with a high frequency relay—an apparatus recently perfected in Germany—of a Morse inking apparatus coupled direct to the aerial and earth.

Ice Coating on Overhead Conductors.

As a result of observations made upon ice-coated wires after a sleet storm at Portland, Ore., on January 16, 1912, which brought down from 500 to 700 miles of live wire and caused the loss of from 300 to 500 poles, Mr. William R. King, consulting engineer, Portland, has arrived at the following conclusions:

Whether merely a coincidence or an exemplification of some unrecognized law cannot be definitely stated, but it is evident that some definite relation exists between the cross-sectional area of the original wire and that of the combined areas of the wire and its ice covering when the latter has been corrected for breakage and deformation. The combined areas seem to vary approximately as the square root of the diameter of the original wire.

Thus, where A represents the combined cross-sectional area of ice and wire in square inches, d the diameter of the supporting wire in inches and K a constant, we have $A = K \sqrt{d}$. The value of K was found to vary between the limits 2.640 and 2.357.

At the termination of the Portland ice storm the actual ice load carried by the wires was in close agreement with the maximum coating, "0.5 in. thick all around the wire," assumed by the committee on overhead-line construction of the National Electric Light Association. The meteorological conditions which obtained throughout the Portland storm, although not usual, were certainly not unique. Mr. King argues that, in the light of the above data, it would appear that the maximum loading assumed by this committee may possibly be too small to provide an adequate factor of safety.—*Electrical World*.

Mr. J. C. Cooney, chief operator, Canadian Pacific Railway Company's Telegraph, Ottawa, Ont., writes: "Thanks for renewing my subscription to Telegraph and Telephone Age. I cannot do without it."

Machine Telegraphy.

The fundamental principles of modern automatic telegraphs originated in the invention of Alexander Bain, of Edinburgh, who was granted his first patents in England in 1846. The message was prepared by perforating a strip of paper with round and elongated holes to represent dots and dashes. The strip was then passed at a uniform rate between a metal roller and the end of a flat spring, which pressed against it. The roller was connected to the battery and the spring to line. The contact between them was formed through the holes in the paper as it passed along. The receiving apparatus consisted of a metal roller, over which a strip of chemically prepared paper was fed, and an iron stylus resting on the latter. The roller was connected to the earth and the stylus to line. By the elimination of the positive or signalling impulse, the time of discharge is reduced because the difference of potential between the positively charged line and the negative pole of the battery is much greater than between the line and earth. With this arrangement the impulses required to transmit a signal consisting of a dot followed by a dash, would be a positive, a negative, a long positive, and another negative. The last negative terminates the dash distinctly.

In the Wheatstone transmitter the contacts are not formed directly through the holes in the tape, as in the Bain, but by fingers whose motions are controlled by them. The paper is fed under a corrugated roller by a clock movement or small motor. The fingers, mounted on the ends of levers, are pressed against the paper under spring tension and at intervals corresponding to the corrugations. If when a finger is raised there is a hole opposite its end, it passes through into one of the grooves in the roller and permits its lever to make a contact below. On the other hand, if there is no hole, the springs yield and the contact is prevented. This arrangement eliminates the difficulty experienced by Bain due to paper dust collecting on the springs and interfering with the formation of a good contact. The tape, instead of having a single row of perforations, has three. Those in the middle are used for feeding the paper positively and are spaced at regular intervals. The two outside lines control the positive and negative fingers respectively.

The receiver consists of a spring or motor-driven mechanism which feeds a strip of paper at a uniform speed over a small ink wheel. This wheel is mounted on the end of the tongue of a polarized magnet and normally stands partially submerged in a small tank of ink and just free of the paper. One side of the magnet is connected to line and the other to earth. A positive impulse coming over the line throws the ink wheel against the paper and a negative withdraws it. The message is recorded in the form of dots and dashes printed on the strip.

The system is very rapid and is widely used on the long lines of the two larger companies. Over the Western Union line from Chicago to San Francisco it transmits messages at an average speed of 100 words per minute. There are five repeaters in this line which slow down the transmission considerably because of the time consumed by their mechanical action. From Chicago to St. Louis it was in daily use for a long time at an average rate of 200 words per minute.

Electricity.

Electricity at rest on the surface of bodies was the original state in which it became known to the Greeks in the time of Thales, B. C. 600. They rubbed amber, and observed strange phenomena.

Gilbert in England, after an interval of twenty-two centuries, likewise rubbed amber, secured the mysterious entity and called it electricity, from elektron, the name given by the Hellenes to amber.

Everybody waited from A. D. 1600 to the year 1733 for Du Fay to rub a glass rod with silk. He was too poor to buy amber, so he rubbed a stick of common pine resin with fur or woolen cloth and also developed electricity. Then he made a ball of pith and suspended it by a silk thread and held the rubbed resin near it. The ball was attracted and began the chief thing in matter—motion. The ball drew nearer and nearer to the resin, touched it and instantly flew away as far as the silk thread would allow—that is, the ball became charged with electricity.

Du Fay, after the lapse of 133 years from Gilbert, enormously expanded the horizon of mental man by rubbing a stick of glass with silk and holding near the pith ball; it was at once attracted and flew to the glass rod. Two great facts of nature disclosed. Electricity is either of two kinds, or exists in two states or conditions.

Franklin, sixteen years later, in 1749, applied the impressive words positive and negative to these two states.

Twenty years after Du Fay, Canton, in 1758, discovered that the body used in rubbing was of as much importance as the body rubbed. Thus, if we rub glass with flannel or wool instead of silk, it will have the same kind of electricity as that on resin rubbed with wool, and repel the pith ball that was attracted when silk was used.

Hundreds of tests were made, and finally science agreed to call the charge established on glass positive and on resin negative. These distinctions, having the weight of Franklin's decision, are now in use.

Mr. C. L. Lathrop, superintendent telegraph and signals, Pittsburgh, Shawmut and Northern Railroad, Angelica, N. Y., writes: "I thank you for renewing my subscription, as I should very much dislike to miss a number of Telegraph and Telephone Age. The paper is indispensable to any person who wishes to keep in touch with the telegraph world, as well as being highly instructive, and ought to be in the hands of every electrical worker."

Mr. L. D. Wilbourn, district traffic superintendent of the Western Union Telegraph Company, Boston, Mass., writes: "I notice my subscription expires with the March 16 issue. Renew it at once. It is needed in our business."

The Berne International Telegraph Bureau.

The International Telegraph Conference meets about once in five years. At this conference fifty governments are represented.

The United States and Canada are not represented because the telegraph in these countries is controlled by private interests.

The International Telegraph Conference discusses and amicably arranges every point of every sort relating to the exchange of telegraphic communications between all the ends and parts of the earth.

If one should wish to travel from New York to, say, Manchuria, or to the interior of Argentina or of Persia, it would be necessary to spend quite a little time and anxiety in arranging for and securing permits in order to insure reaching one's destination unmolested by troublesome customs and military authorities, and to reach it in reasonable time.

If you wanted to telegraph to these places you would simply go to the nearest telegraph office, and hand in your message in the simple and sublime assurance that it would be delivered to your correspondent in Manchuria or Persia or Argentina within a few hours, and without the slightest trouble to you or to him.

This, though your message might convey immensely more important news to him than you could carry if you took the long journey yourself. And you would most likely complain strongly if your telegram were delayed an hour or two, though you in person might be delayed for days at some frontier by some officer.

All these delicate matters of the free passage of the telegraphic correspondence of the world all over the world the International Telegraph Conference arranges.

Though the International Conference meets only once in five years, there exists all the time an International Telegraph Bureau. This bureau is located at Berne, Switzerland. It is the nerve center of the world's telegraphs. It is the court of arbitration and medium of amicable arrangements of all the difficulties that arise in the way of the free interchange of telegraphic correspondence between all parts of the earth.

"Berne," as the bureau is known in every telegraph office in the world, is in closer touch with all the world than are all the world's rulers and politicians.

If storms or earthquakes or any other cause interrupt the free flow of the world's telegraphic correspondence, "Berne" is the first to know of it, and "Berne" notifies every member nation in the world, and immediately sets to work to contrive how best the break may be bridged without offending the national interests or susceptibilities of any nation.

The first duty of every nation is to notify "Berne" of any interruption or alteration in its telegraph arrangements. The first duty of "Berne" is to notify every other nation. "Berne" is the center of everything telegraphic and "CQ," in the nomenclature of telegraphy, is the circumference of everything.

A message from anywhere addressed "Berne" finds its way by the quickest route and ahead of every other message to the international bureau, and a message from "Berne" addressed simply "CQ" finds its way ahead of every other message to every telegraph office in the world.

Every city in the world has its recognized code. London is "LN," New York is "NY," Suez is "SZ," Montevideo is "MV." A message sent from Berne addressed simply "IQ" would quickly find its way to Iquique, far away on the west coast of South America.

But "CQ" means all stations, and a message from Berne telling, perhaps, of interruption to West Indian cables by reason of earthquake, or of the stopping of telegrams or cipher telegrams to Turkey because of revolution, would be passed from one station and government and cable company to another until it reached every telegraph administration.

This is only a minor duty of the International Telegraph Bureau at Berne, but it illustrates the world-wide touch the bureau has of the telegraphic communications of the world. And what Berne does in this detail it also does in every other detail affecting telegraphic correspondence.

Berne is very much more than a mere information bureau. It is an international clearing house and arbitration tribunal. It was created in 1868 as "a central office to collect, arrange and publish information of all kinds relating to international telegraphy; to circulate requests for modifications of tariffs and service regulations; to give notice of changes adopted and generally to study all subjects and execute all work intrusted to it in the interest of international telegraphy."

Everything relating to the internal telegraph service of the various countries is communicated to Berne, and so to one another; every improvement any country may introduce, all alterations of tariff, opening of new lines and closing of old ones, all about new experiments, even the times during which offices are open.

Every difficulty of that sort that might arise between nations in the transmission of telegrams is dealt with by Berne.

The expenses of the Berne bureau are borne by the respective governments, in the order of their telegraphic importance, as denoted by classes.

A Clean Record.—An old time telegrapher in making application for membership in the Old Time Telegraphers' and Historical Association, in giving his record states: "Never suspended nor dismissed; never caused a railroad wreck or loss of life. Always cheerful, happy and contented, and believe it is a good old world at that. Only partly in my dotage yet, and shall endeavor to not disgrace the brethren in the fraternity if my qualifications pass."

Care of Storage Batteries.

Just before a storage battery cell is placed on charge the voltage and specific gravity should be taken and recorded, and during the progress of the charge similar readings recorded, taken at intervals of about three hours. It will be found that both voltage and specific gravity will gradually rise until a point is reached where charging for two or three hours fails to raise either. Then, and not until then, is the cell fully charged. The maximum voltage at this time will vary for cells of different ages, although constant for any particular cell over a period of several months, but the specific gravity of the electrolyte at this point should always be adjusted, if below 1.270, to 1.300 for cells of all ages. It will be found that if cells have not received good care in the past and acid has been added unnecessarily, that the specific gravity will continue to rise greatly above 1.300. This indicates excessive sulphation of the plates, and in such cases the electrolyte should be successively reduced by dilution with pure water, the charge continuing uninterruptedly, until the cell no longer exhibits a tendency to exceed that point. It rarely occurs that a cell will fail to rise to 1.270, but in such an event, and the cell fails to show any rise during a period of six hours' charging, it should be taken off charge and discharged at about ten amperes to a voltage of 1.5 volts. The electrolyte, which will then register probably about 1.150 or less, should be replaced with new electrolyte of 1.170 specific gravity and the cell recharged. Replacement for ordinary evaporation should be made with pure water only, but in replacement for acid spilled of course a certain amount of electrolyte must be used.

Each month the cells should be superficially examined for damaged parts, and the outside of wood cases and tops of rubber jars thoroughly washed. The terminals should receive special attention and all corrosion thoroughly cleaned off and a wipe of vaseline applied. All connectors should be taken apart and rinsed well in bicarbonate of soda, then in water, and finally, when dry, dipped in some light mineral oil. It is important that corrosion be not allowed to accumulate on terminals and connections where it is almost certain to find its way into the cell.

Once in six months each cell should be taken apart and closely examined for damaged or defective parts. The sediment should be cleaned from bottom of jar and the plates lightly washed before being replaced. The same electrolyte may be used again. The principal object of this examination is to discover any cell which should be discarded as too old or too much worn to continue in service for another six months, the determination in this case being based principally upon the mechanical condition of the plates with regard to the amount of active material that has been lost out of them. A system of record should be adopted to insure that all cells receive the examination.

Once each year, the cell, after being charged in the ordinary manner, should be discharged at a rate of ten amperes to 1.5 volts and a record kept of the ampere-hour capacity of the cell as thus developed. The old electrolyte at this time also should be thrown away and immediately replaced with new electrolyte of the same specific gravity. This is done in order to discard all impurities held in solution in the electrolyte, as it has been found that after a year's work in this service the electrolyte is almost certain to contain a greater or less amount of such impurity. This discharge and subsequent charge are important in more ways than one, and should not be neglected, in that they give a reliable estimate of the value and condition of the cell. For practical use.

Sometimes a cell which has become so badly sulphated as to appear worthless, and one which no amount of continuous charging seems to affect in the least favorably, will be again brought up to first-class condition merely by charging and discharging a few times. If a cell fails to register forty ampere-hours or more on the first discharge, it should be charged and discharged a second time, and if necessary this process repeated until the requisite capacity is developed or the cell discarded as worthless. If the cell registers forty or more ampere-hours' capacity on the first charge, a subsequent charge of twenty-five or thirty hours at five amperes will place it in condition for service.

Theoretical Proportions of Telegraph Magnets.

The best theoretical proportions of electro-magnets to secure the maximum magnetic effect from a given quantity of current, has been found to be to make the parts of equal length, the yoke being of somewhat greater cross-section than the cores, and the armature of equal cross-section, but broader and thinner than the yoke. But inasmuch as quickness of movement is one of the most important considerations in telegraphic apparatus, experience has demonstrated that these theoretical proportions may be modified with practical advantage.

The dimensions and proportions of the iron cores of electro-magnets have been the subject of numerous experiments in order to determine the most favorable conditions in respect to the two qualities essential in telegraphic instruments: (1) maximum attractive force with a given current, and (2) quickness of action. These properties are in their nature antagonistic, and hence it is necessary in practice to sacrifice to a certain extent the first-named desideratum in order to more completely secure the second. The results of the investigations referred to have shown that the outer diameter of the coils or helices ought to be three times that of the cylindrical cores, and that the length of each coil or helix should be equal to its diameter. The magnetic intensity developed in the iron, within certain limits, being proportional to the quantity of current traversing the wire (measured in amperes), and also to the number of convolutions or turns of the wire, we may express the magnetism develpoed in the iron as a certin number of ampere turns.

How to Become a Successful Manager.

The question is frequently asked, how to become a successful office manager and what is necessary to fit one for such a position. There are so many details in connection with the successful management of an office that to disregard them would place the manager in bad repute with both his superior officers and the patrons of the company, who expect the best possible returns and treatment.

Mr. J. Levin, formerly general superintendent, Western Union Telegraph Company, at Atlanta, Ga., and now special agent for the same company at that point, some years ago contributed to this journal an article on this subject, which was so comprehensive and clear that we have deemed it expedient to reprint it for the benefit of those who are seeking information and advice on this important matter.

Mr. Levin emphasized the importance of educational requirements necessary to make a successful manager, not only in the telegraphic field, but in other pursuits as well; and stated that no success can be attained in the various pursuits of a business life unless strict regard is paid to the fundamental branches of an English education, with the ability to perform ordinary correspondence in a legible and grammatical manner.

"In addition to this," he continues, "a manager should be able to do ordinary testing and be competent to understand the operation of the various kinds of telegraph instruments now in use, and place them in actual service when necessary. The virtue of this knowledge has been of inestimable value to managers and the telegraph company in more than one way, but especially in the destruction of an office by fire, when the ability of the manager is taxed to its utmost capacity. I have several cases in mind where important offices were totally destroyed by fire; the managers, however, quickly equipped temporary quarters with but slight loss in the receipts and no great inconvenience to the public.

"The office furniture and instruments should be kept scrupulously clean and inviting to the public; when this is the case it invariably proves that the records are kept in order; the contrary will no doubt show that the records, as well as the entire working of the office, will be in a disorderly condition.

"Operators should, as far as possible, be selected to fill the positions of clerks, in order that they can be called upon to lend assistance in time of emergency, such as spasmodic increase in business or the temporary interruptions of wires when a large volume of the business accumulates. It is often difficult to provide help from outside points to properly take care of these conditions, and unless the manager can utilize his entire force in the operating department considerable delay to the business must necessarily follow.

"I find a number of managers conduct their business matters with customers of the telegraph company through the mails. This, in my opinion, is a mistake and should be discouraged. I do not believe good results can be obtained in this manner. It simply creates an endless mass of correspondence, taking the manager's time, and, in the majority of cases, the result is unsatisfactory. If differences are to be settled it should be done in a personal interview, when each party is prepared to meet the arguments presented and have the differences settled immediately.

"A manager who also has charge of the operating department should keep himself fully advised as to the record made in the transmission of messages, in order that any imperfection in this department can be speedily removed. He should at intervals ascertain the average delay to relay messages (if a relay office); the average delay to city sent messages; the number of messages handed to each operator. The result of this investigation will at once enable him to discover if any improvement is necessary in that branch of the service, and whether he has a sufficient number of operators to perform the work properly, and at the same time will enable him to reduce expenses should he find that he had more force than the volume of business would warrant; of course, local conditions, such as way and through wires, should be considered.

"The most important branch of the service is the delivery," says Mr. Levin. "Ninety per cent of the complaints that reach the manager emanates from this department, and too much care cannot be exercised here. Managers should use the best judgment in selecting a delivery clerk, choosing one who is fully acquainted with the city and capable of exercising full control over messengers without undue severity. A map of the city, protected by a glass cover and placed on a table before the delivery clerk, will assist him materially in locating places in the residence and remote sections of the city and guide him in routing his messages intelligently; upon the return of each messenger the delivery slip should be scrutinized closely, to satisfy himself that the messages entrusted to the messenger's care have been properly and promptly delivered. In order to determine the condition of the delivery department, managers should keep themselves fully informed at intervals as to the average delay of each message from the time of its receipt to the time handed to messenger for delivery; also from the time given to messenger to time delivered to addressee; the number of messages delivered per day to each messenger should also be considered. This record can be kept by either the delivery or address clerk (if one is provided), on a form used in most offices to facilitate the delivery of messages, with but little if any additional work.

"By the use of bicycles by messengers prompt delivery can be better secured; their use also reduces the cost of delivery, making it possible to dispense with some of the messenger force.

"The manager should see that each clerk employed in his office familiarizes himself with the work of the others, so that any clerk can be assigned to any department in case of sickness or absence of some member of the force without inconvenience to the service.

"Promotions should in all cases, where it is possible to make them, be selected from the office force. Managers should avoid keeping unnecessary records and adopt all time-saving methods. The best of feeling should exist between managers and their subordinates, the latter being treated justly and impartially; only under such conditions will they feel that their work is appreciated. Every opportunity should be given employes to acquire a thorough knowledge of the different branches of the service, in order to prepare them for something higher. A manager should bear in mind that it is very important that his superintendent should be kept fully advised in reference to all matters, legislative or otherwise, affecting the interest of the telegraph company; his superintendent depends in a great measure on the information furnished him by his managers.

"While thorough and systematic work of the manager will go far toward success, he will be deficient should he fail to understand the needs of the business public; while endeavoring to give them the best of service they should also receive the most courteous treatment; they have a right to expect this and it is due them. Managers should treat "complaints" from a business standpoint, and not consider it in any way personal. Patrons of the telegraph will favor the company that is represented by a thorough, practical and courteous manager. Such men attract the attention of the officials and in most cases are substantially rewarded. I have in mind a number of managers who have conscientiously performed their duties in the manner I have outlined, and I am glad to say that all of them have been justly recognized; vacancies are filled from this class. Such men are indispensable to the telegraph company and are always in demand.

"I have briefly dwelt on each point that I consider the most important in the management of an office," said Mr. Levin in conclusion, "leaving the regulation of branch offices and other matters not touched upon to the discretion of the manager, who should understand the local conditions with which only he is familiar."

Insulation of Telephone Train Dispatching Lines.

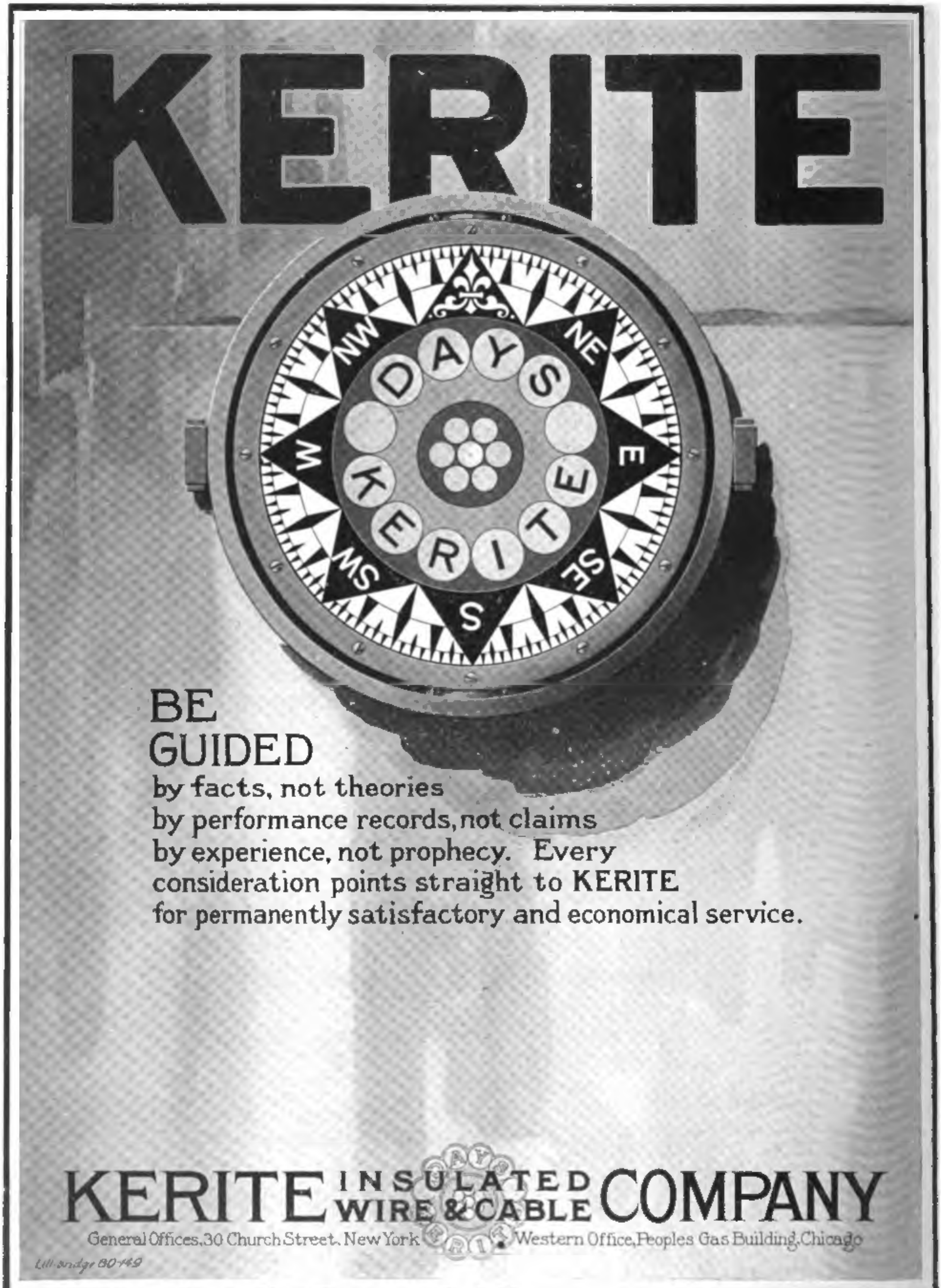
Insulators serve the purpose of separating the current-carrying circuit from other current-carrying mediums. The standard glass insulator gives a fixed separation between the circuit and other surfaces. "It is calculated to furnish an approximate fixed resistance between the conductor and the supporting pin or bracket," says Mr. J. A. Kick, in *Telephony*, "provided, however, that the tie is correctly made and all other physical requirements are complied with.

"Specifications which cover types and methods are founded upon standards, which have for a base the exposed area of the insulator, i. e., the distance from the wire groove to the point where the glass contacts with the pin measured on the surface of the insulator, the nature of the glass and its glazing, the style of the glass and its means of support, etc. While every means is exhausted to insulate the line proper, due care is not taken to extend this same high standard to all of the branch lines with the result that the insulation is collectively low. Every office loop or bridging drop is a branch line of varying length and must be added to the sum total of the circuit as a capacity to accumulate leaks due to poor insulation. Office loops and drops are very often run across tracks and exposed to worse conditions than the open line wires which take regular pin positions in the standard manner on the main lead.

"Many leading-in wires are in twisted pairs or single insulated wires. These are soldered direct to the line wires and, without weather loops through cable boxes or other means of creating a dry surface point on them, are run on small knobs. In many places these wires come in contact with surfaces having little or no insulation resistance. These leading-in wires must necessarily make physical contact with the line wires, and unless some means is devised for providing a halting point there is a surface leakage at various points. Twisted pairs run through cable boxes with weather loops where the pairs leave the box on the line-wire side, present no greater surface leakage possibilities than do cable strands. But the term "insulated wire" has caused a tendency to neglect the precautions which are exercised in handling the line wire. It is perhaps true that the insulation resistance of any given loop or drop may be relatively high when unfavorable weather conditions are considered, but the cumulative effect of a large number of such loops or drops may be so serious that frequent unsuccessful attempts to locate poor insulation may be accounted for in this way.

"Insulation becomes of greater moment when high voltage telegraph circuits are operated over a telephone circuit, either composited or simplexed. If the circuit is composited, the high voltages will tend to further decrease the insulation resistance of one or both wires, producing a noisy telephone circuit and perhaps causing the telegraph to be inoperative. A simplex circuit presents a double capacity for leak. While the possibilities of breaking down the insulation are not as great as on the composite circuit at the same voltage, yet the general effects are the same in a somewhat lesser degree. While the usual high standards of insulation should be maintained on the line wire proper, it might be well to use extra care in the insulation of leading-in wires, as it is there that unusual conditions are encounted. On loops and drops, difficulty of inspection is experienced. The original construction work should therefore receive special attention.

"The proper operation of selective signalling equipment must necessarily be on a basis of a specified current per unit of equipment, with allowable margins of variations. While these allowable variations or safety factors are purposely made to cover as great a range as possible, every extra effort toward a high standard of insulation is this safety factor plus your efforts."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Western Office, Peoples Gas Building, Chicago

THE RAILROAD.

Mr. P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railroad, Chicago, Ill., accompanied by Mrs. Drew, recently visited their son in Muskogee, Okla., where they spent ten days.

James L. Orbison, age 63, formerly superintendent of telegraph of the Cincinnati, Hamilton and Dayton Railroad, with headquarters at Cincinnati, died at his home in Carthage, Ohio, February 28.

William Ettenger, aged 64, division operator of the Pennsylvania Railroad for the past thirty years, with headquarters at Jersey City, N. J., died March 23. Mr. Ettenger was one of the best-known railroad officials on the Pennsylvania system. On account of illness he practically retired from active duties two years ago.

St. Louis Convention of Railway Telegraph Superintendents.

The next annual convention of the Association of Railway Telegraph Superintendents will be held at St. Louis, Mo., May 20, 21 and 22. The programme so far as has been determined upon promises an interesting meeting, and on account of the central location of the convention city there will likely be a large attendance. The entertainment will be interesting and extensive.

The convention headquarters will be at the Planters' Hotel, and many interesting and valuable papers will be read and discussed. Ample space will be provided at the hotel for exhibits, and there is every promise that this feature of the convention will be especially interesting.

Mr. P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railroad, Chicago, Ill., is secretary of the association. Mr. E. A. Chenery, superintendent of telegraph, Missouri Pacific Railroad, St. Louis, Mo., is chairman of the committee of arrangements.

Division Meeting of Railway Telegraph Superintendents.

A joint meeting of the Eastern and Western Divisions of the Association of Railway Telegraph Superintendents was held in the assembly room of the Chicago and Northwestern Railway, Chicago, March 19, at which about sixty-five persons were present. There was a general discussion of matters of interest to the members, including wire crossings. It is expected that the committee on wire crossings will be ready to make a final report at the annual meeting in St. Louis, in May.

Mr. E. C. Keenan, chairman of the topics committee, reported that eight papers had been promised for the annual meeting. These papers will be of a most interesting and practical character.

After the meeting the entertainment committee met and discussed the plans for the annual gathering at St. Louis. A very novel and interesting programme of entertainment is being arranged and much business is being layed out for the four days' session.

After adjournment luncheon was served by the Western Electric Company and other interests at the Grand Pacific Hotel, and the afternoon and evening were spent in inspecting the exhibits of the Railway Appliance Association, at the Coliseum.

Among the superintendents present were: W. W. Ashhald, Grand Trunk, Montreal, Que.; Wm. Bennett, Chicago and Northwestern, Chicago, Ill.; F. E. Bentley, Terminal Railroad Association, St. Louis, Mo.; W. J. Camp, assistant manager of telegraphs, Canadian Pacific, Montreal, Que.; G. A. Cellar, Pennsylvania Lines West of Pittsburgh, Pittsburgh, Pa.; E. A. Chenery, Missouri Pacific, St. Louis, Mo.; J. P. Church, Wabash, Decatur, Ill.; W. L. Connelly, Chicago, Indiana and Southern, Gibson, Ind.; J. H. Ditch, chief telephone inspector, Pennsylvania, Altoona, Pa.; G. A. Dornberg, general foreman, Pennsylvania Lines West of Pittsburgh, Pittsburgh, Pa.; P. W. Drew, Minneapolis, St. Paul and Sault Ste. Marie, Chicago, Ill.; L. M. Jones, Atchison, Topeka and Santa Fe, Topeka, Kan.; E. C. Keenan, general superintendent, New York Central Lines, Chicago, Ill.; V. T. Kissinger, Chicago, Burlington and Quincy, Chicago, Ill.; L. A. Lee, Pittsburgh and Lake Erie, Pittsburgh, Pa.; R. L. Logan, Kansas Southern, Kansas City, Mo.; W. Marshall, Canadian Pacific, Montreal, Que.; W. H. Potter, Southern, Washington, D. C.; C. S. Rhoads, Cleveland, Cincinnati, Chicago and St. Louis, Indianapolis, Ind.; J. J. Ross, Michigan Central, Detroit, Mich.; J. B. Sheldon, Union Pacific, Omaha, Neb.; H. D. Teed, St. Louis and San Francisco, Springfield, Mo.; J. M. Walker, Denver and Rio Grande, Denver, Col.; W. C. Walstrum, Norfolk and Western, Roanoke, Va.; L. S. Wells, Long Island, New York, and F. T. Wilbur, Illinois Central, Chicago, Ill.

Among the associate members present were: G. K. Heyer, Western Electric Company, New York; E. V. Adams, Western Electric Company, Chicago, Ill.; A. P. Eckert, National India Rubber Company, New York; L. H. Merrill, N. W. Telephone Exchange Co., Minneapolis, Minn., and W. L. Cook, General Railway Equipment Company, Chicago, Ill.; H. O. Rugh, Sandwich Electric Company, Sandwich, Ill.; E. E. Hudson, Thomas A. Edison, Inc., Orange, N. J.; A. G. Francis, Chicago Telephone Company, Chicago, Ill., and B. A. Kaiser, American Telephone and Telegraph Company, New York.

Wire for Telephone Lines.—Those who desire to construct private telephone lines in rural districts should be careful in the selection of the size of wire to be used. Since the price of copper wire is much higher than that of galvanized iron wire of the same size, the latter will usually be found as serviceable, although, for short distances, the cost of copper wire is not prohibitive, and its lower resistance permits the use of smaller wire than would otherwise be practicable. For distances not exceeding eight miles, No. 14 galvanized wire may be used, while No. 12 should be employed for greater distances, up to twenty-five miles. Between twenty-five and 100 miles No. 10 will be more satisfactory.

J. J. Bernet, Vice-President New York Central Lines West of Buffalo, a Former Telegrapher.

Mr. J. J. Bernet, who has just been appointed vice-president of the various New York Central Lines west of Buffalo, began his railroad career as a telegraph operator in 1889, for the Lake Shore and Michigan Southern Railway, and since his first official appointment fourteen years ago, has advanced rapidly up to the present time, when he has reached

J. J. BERNET
Vice-President New York Central Lines, Chicago, Ill.

one of the highest and most responsible positions in the railroad world. He is about forty-five years of age, and is stated to be one of the youngest railroad executive officers in the country.

Mr. Bernet's headquarters will be Chicago, and his many former telegraph associates and friends will be pleased to learn of his latest appointment, which has been won through merit and fidelity.

TELEPHONE DISPATCHING ON THE WESTERN MARYLAND.—The Western Maryland Railroad Company has recently ordered telephone train-dispatching equipment from the Western Electric Company. Twenty-three way stations will be equipped with selective signalling and telephone apparatus. Miscellaneous equipment and line material is also being furnished. The present equipment will be installed over a circuit extending from Hagerstown, Md., to Cumberland, Md., a distance of eighty miles. This section of road is the first of four hundred miles to be equipped with telephone train-dispatching apparatus.

OBITUARY.

W. P. HUNT, a well-known newspaper telegrapher, died in Chicago recently.

GEORGE J. TALMAGE, a telegrapher during the civil war, died at Galena, Kan., January 15.

MRS. PRESTON J. HURLBURT, the death of whose husband in Bridgeport, Conn., on March 3, was noted in our issue for March 16, died of pneumonia at the residence of her son, Arthur C. Hurlburt, in Hartford, Conn., on March 27.

CHARLES E. STONE, aged 56 years, a well-known telegrapher in the West, died in Portland, Ore., March 11. He was for several years connected with the Associated Press service in that city.

IRVING B. SHELDON, aged 65 years, an old-time and military telegrapher, and formerly manager of the Western Union office at Elko, Nev., died at that place March 4.

ARCHIBALD G. CHISHOLM, aged 52 years, for thirty years operator for Spencer Trask and Co., New York, died in Brooklyn, March 22. He was a Canadian by birth, and an excellent operator.

W. M. N. GATES, age fifty-six years, of Cleveland, Ohio, a well-known advertising agent, and for fifteen years advertising representative of TELEGRAPH AND TELEPHONE AGE, died of pneumonia on March 23 at the Elyria, Ohio, Memorial Hospital, of which he was a founder. Mr. Gates was well known throughout the advertising fraternity generally. He was interested in philanthropic and educational work contributing to numerous charities and institutions. He is survived by a wife and five sons.

New Edition of Schneider's Electrical Testing.

The fourth edition of "Electrical Instruments and Testing," by Norman H. Schneider, is now on the press, and will be ready for delivery in a few days.

The book has been carefully revised and enlarged, and much important new text and many illustrations and tables have been added. It is brought up to date in its descriptions and illustrations of new apparatus, and in the testing work much new material has been added, including a number of pages on testing in the telephone exchange. Much new information is given on the use of the voltmeter in testing resistances, and the new tables will be found exceedingly useful.

The book will have about 300 pages and 149 illustrations. The contents by chapters are: Laws of Electricity; Galvanometers; Rheostats; Voltmeters; Wheatstone Bridge; Testing Sets; Current and E. M. F. in a circuit; Potentiometer; Charge and Discharge of Condenser; Telephone and Telegraph Cable Testing; Testing with Voltmeter; Testing Telephone Lines with the Voltmeter; Early Morning Tests; Location of Grounds and Crosses.

This is not a theoretical work, full of mathematics, but a clear, straightforward, positive help for the practical man, written by one who has had a wide and varied practical experience.

Mr. Jesse Hargrave, superintendent Mackay Telegraph and Cable Company, Dallas, Tex., and an electrical engineer of ability and high standing, is the author of the chapters on testing telegraph wires and cables and locating faults.

The price of the book will be $1.15, postpaid to any part of the world, and orders will be filled by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, on receipt of price.

MUNICIPAL ELECTRICIANS.

The Watertown Convention.

Active arrangements are being made for the annual convention of the International Association of Municipal Electricians, which is to be held this year—probably in August—in Watertown, N. Y. President John W. Kelly, jr., is working hard to secure some papers that will be of unusual interest and value to the members, and if he is accorded the hearty support at the hands of the individual members that he deserves, he will succeed in making the convention worth attending.

The location of Watertown is an inviting and interesting one. It is within a few miles of Lake Ontario, and of the entrance to the famous St. Lawrence River, and although the entertainment programme has not yet been arranged, it will undoubtedly include a trip upon these waters.

It is hoped that the "Question Box" will be revived at the convention and liberally utilized by the members. It is one of the most useful means of obtaining special information, and any and all members are privileged to ask questions of the "Question Box."

At the Peoria meeting last year the "Sons of Jove" initiated seven municipal electricians into the mysteries of the order, and it is probable that a rejuvenation will take place at Watertown this year, and many more candidates from among the members of the association admitted to Jupiter's household. The object of the "Sons of Jove" is to cultivate a spirit of fraternity and incidentally boom electricity.

Exhibits of apparatus and appliances will form a feature of the Watertown convention, and those in attendance will have an opportunity of seeing the latest development in fire alarm and signal apparatus and accessories.

Mr. Clarence R. George, Houston, Tex., is secretary of the association.

Annual Election New York Telegraphers' Aid Society.

At the annual election of the New York Telegraphers' Aid Society held on March 25, the following officers were elected: President, A. M. Lewis; vice-president, J. F. Zeiss; treasurer, T. M. Brennan; financial secretary, C. A. Kilfoyle; recording secretary, Mary E. Saunders.

Members of the executive committee: Miss S. Dougherty and Messrs. F. J. Sheridan, W. W. Price and A. J. Fancell.

Auditors, F. J. Nurnberg, J. F. E. Hopkins and H. M. Heffner.

The statement of the New York Telegraphers' Aid Society, for the year ended March 6. is as follows:

Balance on hand March 6, 1912		$25,660.12
Receipts		7,714.20
Total		$33,374.32
Disbursements—		
Death Benefits	$1,700.00	
Sick Benefits	4,050.33	
Expenses	742.72	6,493.05
Balance on hand March 6, 1913		26,881.27
Total		$33,374.32

RELIEF FUND.

Balance on hand March 6, 1912	$5,928.43
Receipts	950.99
Total	$6,879.42
Disbursements	519.40
Balance on hand March 6, 1913	6,360.02
Total	$6,879.42

Since its organization (March 7, 1880) this society has paid out for sick benefits $99,950.87 and for death benefits $26,100, a total of $126,050.87. In addition to this, it has disbursed through its relief fund $12,104.31. These figures include the operations of the society for the year ending March 6, 1913.

THEORY AND PRACTICE.—The statement so often heard, "Theoretically this will work, but practically it will not," must always be recognized as an admission that the theory is at fault, for it is evident that, if the theory took into consideration all of the forces affecting the situation, the theory would coincide with the facts.

New Books.

AMERICAN TELEGRAPH PRACTICE.—Including Simultaneous Telephony and Telegraphy. By Donald McNicol, of the engineering staff, Postal Telegraph-Cable Company, New York. Published by The McGraw-Hill Book Company, New York. 522 pages, with 423 diagrams and illustrations.

The text of the work is based largely upon a series of lectures delivered by the author in the evening technical schools in connection with Columbia University, New York, and comprises a complete technical course in modern telegraphy.

An idea of the completeness of the work may be gained from a perusal of the chapter headings, which are as follows:

Electricity and Magnetism Units and Symbols; Primary Batteries; Dynamos, Motors, Motor-Generators, Dynamotors, Voltage and Current Regulators; Storage Batteries, Current Rectifiers, Mercury-Arc and Electrolytic; Power Board Wiring; Battery Switching Systems and Accessories; Circuits and Conductors, The Electric Circuit, The Magnetic Circuit, Electromagnets; Single Morse Circuits; Lightning and Lightning Arresters, Fuses, Ground Connections; Main-Line Switchboards for Terminal Offices and Intermediate Offices; Electrical Measuring Instruments, Telegraph Line and Circuit Testing; Speed of Signalling, Circuit Efficiency; Single Line Repeaters; Duplex Telegraphy; Quadruplex Telegraphy; Balancing Duplexes and Quadruplexes; Duplex and Quadruplex Local Circuits, Leg-Board and Loop-Board Connections; Branch Office Annunciators; Grouping of Way-Office and Branch Office Circuits, Needham Annunciator, Office Signalling Systems for Multiplex Circuits, Bell Wires, Main-Line Call Bells, Selectors; Half-Repeaters, Combination Half-Set and Full-Set Repeaters, "House" Repeater Circuits, Duplex and Quadruplex Repeaters, Direct Point Repeaters, Leased Wire Intermediate Drops; The Phantoplex, The Sextuplex; High Speed Automatic Telegraphy, Printing Telegraphy; Telegraph and Telephone Circuits as Affected by Neighboring Alternating Current Lines, Transposition of Lines Used for Telephone Purposes and for Simultaneous Telephony and Telegraphy; Telephony, Simultaneous Telephony and Telegraphy Over the Same Wires, The Simplex Circuit, The Composite Circuit, Phantom Circuits, Phantom Simplex, etc.; Specifications for Iron and Copper Wire, Aerial, Underground, Submarine and Office Cables; Electrolysis of Underground Cable Sheaths; Specifications for the Construction of High Tension Transmission Lines above Telegraph Wires.

The author has been in the telegraph and telephone business continuously during the past twenty-four years; in the service of the Bell Telephone Company, Western Union and Postal Telegraph Companies, and of two of the larger railroad systems.

In deciding upon the subject-matter, care has been taken not to omit any of the features of operation with which operators, wire chiefs, quadruplex attendants, and repeater attendants are concerned.

The chapter on circuits and conductors illustrates in detail the principle and laws of each form of electric and magnetic circuit used in telegraphy.

The chapter dealing with speed of signalling contains mostly new matter of the greatest importance to those responsible for maintaining high speed and efficient telegraph operation. Other chapters describe the latest types of duplex and quadruplex equipment used by the Western Union Telegraph Company, the Postal Telegraph-Cable Company, and the larger railroad telegraph systems, also up-to-date methods of circuit testing.

The matter dealing with simultaneous telephony and telegraphy is complete and up to date.

The size of this book is six by nine inches, and the price is $4.00 per copy. Copies may be had of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

THE BAUDOT PRINTING TELEGRAPH SYSTEM, by H. W. Pendry, London, is fully described and illustrated in a book just issued by Whittaker & Co., London and New York. This volume was produced to meet the demand for information on the Baudôt system, which has been adopted and developed by the British post-office, and the author has succeeded very well in his task.

The scope of work may be judged by the subjects of the eleven chapters, namely: I. Introduction; II. Baudôt Distributor; III. The Keyboard; IV. The Receiver; V. Baudôt Relay; VI. Electrical Connections; VII. Baudôt Double; VIII. Quadruple; IX. Duplex Baudôt; X. Baudôt Repeater; XI. Adjustments and Faults.

The foundation of the success achieved by the Baudôt system is laid to some degree to the simple telegraphic alphabet adopted by the inventor. The signals for letters, figures or symbols, consist of five units of minimum equal length. Each is formed by the interchange of positive and negative impulses in combination. Thirty-one different arrangements of current units are thus possible, and they are transmitted by means of a keyboard having five "double-current" keys. In their normal, or rest position, they send out "spacing" impulses and the various combinations are formed by the depression of the requisite keys, each depressed key transmitting a marking signal. Thus, when one key is depressed the other four keys continue to send "spacing" to line. At the receiving station the incoming "marking" signals act upon one or more of five electro-magnets in the receiving instrument. The result is the printing on a paper ribbon or tape of either a letter in roman type, or by the operation of the changing device, figures, punctuation marks, etc., are recorded.

While this system is about the least known to American telegraph engineers, the book no doubt will meet with an encouraging sale in this country among those who wish to keep informed as to general developments in telegraphy.

The book has 146 pages and 72 illustrations giving very clear views of the apparatus and details.

The price of this book is $1.50 per copy, and copies may be obtained of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Efficiency of Closed Circuit Cells.

BY E. E. HUDSON, MANAGER OF PRIMARY BATTERY SALES DEPARTMENT, THOMAS A. EDISON, INC., ORANGE, N. J.

The articles of Mr. W. H. Jones, published in your successive issues, are always interesting, but we cannot agree to a statement made by him in his contribution published in your issue, dated March 1, in which he states that the blue stone gravity battery represents the highest type of the closed circuit cell.

We are sending herewith several curves (not reproduced here), showing the voltage maintained by the gravity cell, and by the Edison BSCO 400 ampere-hour cell when discharged continuously at different rates. From these curves it will be noted that at very low discharge rates the gravity cell maintains a higher E.M.F. than the Edison, but at discharges of half an ampere or higher, the voltage of the gravity drops so low as to make it practically useless, whereas the Edison 400 ampere-hour cell can be discharged continuously at as high a rate as three amperes without seriously affecting the voltage.

In certain primary battery fields, railway signal work, for example, the Edison cell is used almost exclusively, for the reason that the gravity cell cannot deliver the high amperage required. In many systems the normal flow of current is from thirty to fifty milli-amperes, and 2½ to 3½ amperes are needed to clear the signal. In order to use the gravity battery a number of series connected in multiple would be required, and much better protection from the cold would be needed than is necessary with the Edison cell.

The Edison cell requires no attention between renewal periods, whereas, in order to obtain 400 ampere-hours from the gravity cell two charges of blue stone are necessary, and to keep the cell at its maximum efficiency the zinc must be cleaned at intervals.

These are a few of the features in which we believe the Edison cell out-classes the gravity, and we feel confident that anyone investigating the Edison primary battery will be satisfied that it is not only superior to the gravity, but a necessity for certain classes of closed circuit work.

System in Manufacturing.

Mr. P. R. Goodwin, of the Western Electric Company, gave a lecture on "System in Manufacturing," before the Electrical Engineering Society of Columbia University, New York, March 13.

"By many of the uninitiated," said Mr. Goodwin, "the term 'accountant' is considered a high sounding name for our old friend the bookkeeper. An accountant is pictured by popular imagination as a man with a large family who writes in a lot of books, and has to work nights at the end of the month because he made mistakes which he would not have made if he had been any good in the first place. The modern accountant occupies a very different position from that of the old-time bookkeeper. The accountant of to-day must be a systematizer, because the entire clerical system of a manufacturing plant exists largely in order that proper records may be kept whereby the cost of the manufacturing of various products may be obtained with accuracy.

"In manufacturing there are three things to be considered from a cost standpoint: Material, labor and expense.

Material is what is used to make the article, labor represents money paid out to employes working on the material, and expense, what it costs to maintain and operate a factory wherein employes work on material. These three items should be considered separately, and then it will be possible to bring them together to give the cost of the completed article."

Meetings of Associations, Societies, etc., During 1913 and 1914.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, at St. Louis, Mo., May 20. Secretary, P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION, New York, second Wednesday in March, 1914. Secretary, M. J. O'Leary.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS, at Watertown, N. Y. Secretary, Clarence R. George, city electrician, Houston, Tex.

OLD-TIME TELEGRAPHERS AND HISTORICAL ASSOCIATION AND SOCIETY OF THE UNITED STATES MILITARY TELEGRAPH CORPS, at Detroit, Mich., August 25, 26 and 27. Secretary of the Old-Timers, F. J. Scherrer, 30 Church street, New York; secretary of the Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

TELEPHONE PIONEERS OF AMERICA, at Chicago, Ill., October 16 and 17. Secretary, Henry W. Pope, 30 Church street, New York.

ENGLISH TELEGRAPH AND TELEPHONE DEVELOPMENT.—Some financial returns concerning the working of the British Post-office telegraphs and telephones have recently been issued. An account relating to the two services combined shows that there was an expenditure over receipts of $3,982,280 in the year ended March 31, 1912. On the receipts side the gross amount of $32,978,365 figures in respect of telegrams, telephone rentals and fees, private wire rentals and special wire rentals, but from that sum $3,793,300 payments to cable companies, foreign countries, etc., and $18,825 telegram moneys refunded has to be deducted. On the other side of the account, salaries, superannuation, maintenance of the telegraph and telephone systems, etc., claim payments amounting to $28,003,398.

MR. GEO. M. MYERS, of Kansas City, Mo., in renewing his subscription, writes: "It is with great pleasure I am sending you herewith enclosed check for renewal of my subscription to TELEGRAPH AND TELEPHONE AGE."

New York Staff French Cable Company.

In our issue, dated January 1, we published a reproduction of a group portrait of the London staff of the French Cable Company. The accompanying illustration is of the New York staff of the

E. C. SWEENEY, MANAGER FRENCH CABLE COMPANY, NEW YORK.

same company. The names of the persons shown are, reading from left to right:

Top row—E. Lavissiere, B. Jenkins, E. Lemeur, D. Powers, J. Mooney, J. McDermott, R. Anderson.

MEMBERS OF THE STAFF OF THE FRENCH CABLE COMPANY AT NEW YORK.

Second row from top—A. Lavissiere, J. O'Connell, A. Vuoto, E. McHugh, F. Fallon, M. Kelly, A. Theberge, E. Allain.

Third row—J. Chambert, V. Messanot, E. McGuire, A. Ronne, N. Weiss, R. Bain, D. Rosowsky, M. Nolan, Gaston Norgeot, A. Harrigan.

Fourth row—J. McCune, M. Martin, E. Lesage, F. Sherry, C. Shafer, G. Bain, W. Giles, C. Boulton, P. Larissy, C. Limbrick.

Bottom row—L. Lemeur, W. Marlow, W. Morrison, J. Standinger, J. Marlow, E. Etchemendy, M. Demontreux, W. Harrigan.

Following are the officers: E. C. Sweeney, manager (shown in the separate illustration); C. Shafer, superintendent; W. Giles, supervisor; G. Bain, electrician; A. Ronne, cashier; E. Lesage, assistant cashier; F. J. Sherry, auditor; C. Boulton, canvasser; C. Limbrick, receiving clerk

Old Timers' Reunion.

The annual reunion of the Old Time Telegraphers' and Historical Association and Society of the United States Military Telegraph Corps, which will be held in Detroit, Mich., August 25, 26 and 27, promises to be an unusually well-attended gathering. Mr. George M. Myers, the well-known capitalist of Kansas City, Mo., will formally invite the associations to hold their 1914 reunion in Kansas City, while the reunion of 1915 will probably be held in San Francisco during the Panama-Pacific Exposition.

President H. J. Kinnucan, of the old timers' association is now busily engaged in making preparations for the Detroit meeting this year, and he will spare no efforts to make the visit to that city an enjoyable one for all.

Mr. F. J. Scherrer, New York, secretary of the Old Time Telegraphers' and Historical Association, is busy arranging the details for the reunion, and will cheerfully give any further information on the subject.

Mr. David Homer Bates, New York, is secretary of the Society of the United States Military Telegraph Corps.

GRAVITY CELLS NOT FOR OPEN CIRCUITS.—A closed circuit gravity battery is not suitable for work on an open or intermittent circuit, because the zinc and copper solutions tend to mix when a current is not flowing, thus reducing the efficiency of the cell.

T. M. B. A. ASSESSMENTS.—Assessements Nos. 549 and 550 have been levied to meet the claims arising from the deaths of Nathan de Bree at Helena, Mont.; Horace M. Scholes at Kansas City, Mo.; John J. Hennessy at New York; Charles Catlin at Chicago; Perry Mulhollem at Bellwood, Pa.; George R. Slater at Washington, Va.; John N. Kates at Wilmington, Del.; Charles C. King at Albany, N. Y.; Robert Keley at Brooklyn, N. Y.; Benjamin W. Hard at Graniteville, S. C.; James D. Redding at Dade City, Fla.; Samuel Connor at Baltimore, Md.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

Mr. Edward F. Cummings, who prior to fifteen years ago was for many years night manager of this office, but who has been an invalid since that time, has entirely recovered his health. His many friends will be pleased to learn that he will soon be able to pay them a personal visit. For some time past he has resided at Lakewood, N. J.

Mrs. Margaret F. McGuire, aged 45 years, wife of J. F. McGuire, chief operator at 195 Broadway, died of pneumonia on March 24. Mrs. McGuire was a lady of most estimable qualities, and was widely known in telegraph circles, taking a warm interest in the different societies. She was a frequent attendant of old timers' reunions. Her funeral took place in Brooklyn, March 27, and was very impressive, large delegations from the Western Union and Postal Telegraph-Cable Companies being present. The floral tributes were numerous, and a large number of telegrams and letters of condolence were received by Mr. McGuire and his son.

PHILADELPHIA POSTAL.

Among recent visitors at this office were Messrs. C. P. Bruch, third vice-president; E. B. Pillsbury, general superintendent; Isaac Smith, superintendent of tariffs; and D. H. Gage, jr., assistant electrical engineer, New York; and H. L. Krum, of the Morkum Printing Telegraph System.

Chief Operator E. W. Miller was called to Atlantic City recently on company business.

Equipment Chief C. A. Currier has just completed the installation of selectors in all Lehigh Valley offices.

SEATTLE, WASH., WESTERN UNION.

Mr. John O'Brien, the night chief operator, has been absent for some time on account of sickness. Mr. G. B. Elmore is acting night chief operator during Mr. O'Brien's absence.

Mr. Jeff W. Hayes, of Portland, Ore., recently visited this city in the interests of his book, "Tales of the Sierras."

John Wray, one of our best operators, has accepted a position with the United States Government in its Philippine service, and left on March 24 for his new field.

Raymond W. Baker, age 29, an operator in this city, died March 15. The remains were taken to Norwalk, Ohio, for interment.

FOR SALE.—Bound volumes of TELEGRAPH AND TELEPHONE AGE for 1912. Price $3.50. Sent by express, charges collect. This price covers the bare cost of binding and handling in addition to the regular subscription price of the paper. The binding is of substantial black cloth, with neat gilt lettering. The index is even more complete than usual, comprising, in addition to the regular alphabetical classification: The Cable, Obituary, Postal, Radio-Telegraph, Railroad, Western Union, Authors, Biographical, Book Reviews, Canadian Notes, Editorial, Legal, Municipal Electricians, Some Points on Electricity, The Telephone, Telephone Pioneers. In addition to the index for 1912, a complete index for the year 1911 has been added, thus greatly increasing the reference value of the work. This complete record of events of the year and the latest developments in telegraph, telephone, cable and wireless science should be in the library of every progressive member of these professions.

Telegraph and Telephone Age

No. 8 NEW YORK, APRIL 16, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

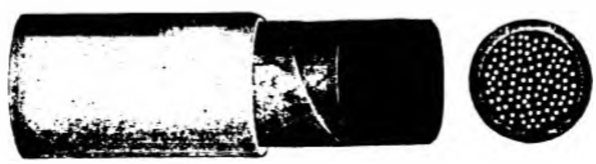
Telegraph Cables.

To look at one of the large lead cables wound on a big wooden reel, frequently seen on the streets, one would naturally conclude that it was strong and massive enough to be practically indestructible, or at least require little care in the manner of handling and installation. The truth is, however, that it requires a great deal of intelligence and care on the part of both engineer and lineman to properly lay and connect one. In fact its degree of utility and longevity depends largely upon the attention given to shielding it from various harmful influences and even structural damage during the initial process of installation.

Nor can one determine from its external sheathing the size and number of the wires and the character of the insulating material within. These depend upon the use to which the cable is to be applied. The construction of the conduit itself through which the cable is to be drawn must be considered. A conduit adapted for one type of cable may be utterly unsuitable for another, or even for the same cable operated in a different manner. For instance the proximity of iron to conductors greatly increases the self-induction of the circuit with consequent loss of energy, especially where alternating currents are employed. Hence for high-tension polyphase currents vitrified clay or some other non-magnetic material is required.

Again, two different cables may contain the same number of conductors of identical gauge, yet arranged and insulated so differently that only one could be used satisfactorily for a specified purpose, although both would be available for ordinary purposes. Thus for telephone circuits "cross-talk" must be prevented by means of a lead sheathing, or its equivalent, around and between each insulated conductor, cross-connecting the conductors at frequent intervals, or by other approved methods. Short underground telegraph cables are not usually constructed in this manner, as the operating conditions are not always so exacting. The general construction of underground and aerial cables, however, is quite similar in all types inasmuch as each consists of a number of insulated conductors twisted together in rope fashion or laid parallel with a final sheathing of lead, fibre or other weatherproof compound, and further protected when necessary by an armor of steel wire.

The inside of aerial and underground cables consists of a number of copper conductors, each of which is insulated from the others with a compound or wrapper, usually both, varying in composition



CONSTRUCTION OF CABLE.

and material, arranged in twisted layers as shown at the left of the accompanying illustration. The circular figure at the right shows a cross section view of the cable.

Ocean cables usually contain but one conductor, made up of several copper strands twisted together. This is then insulated with several separate coatings of rubber or its equivalent so that in case a defect should exist in the first coat the subsequent coatings will cover it. After this come several layers of other material differing in kind in different types of cables, after which they are reinforced and strengthened by an armor of steel wire wound closely around the outside.

Owing to the greater danger to which cables near the coast are exposed, due to rocky bottoms and the influence of waves and tides in shallow waters, the shore ends are usually armored much heavier than is required for deep sea cable.

After an ocean cable has been laid one wonders how, in case of a break, the deep sea portion can be located and brought to the surface for repairs. This is not so difficult to accomplish as might be supposed, because when the cable is being first laid its actual position at frequent short intervals of length is recorded in latitude and longitude and the record carefully preserved. Any changes which follow due to splicing or other repairs are in like manner recorded for reference. Whenever a repair or splice is made the resistance of the cable and the number of nautical miles on each side of the point are also carefully recorded. The sum of the resistances of the two ends, therefore, represents the true resistance and length of the entire cable after the repair has been effected. As a rule each splice shortens or lengthens the cable to some extent.

Since accurate records of this kind have been made at various points along the route of the cable a new fault may be located close to one of these positions by ascertaining the resistance of the cable to the fault from either or both shore terminals. In actual practice, however, the location of a fault is determined by a very fine test which calls for a knowledge of the various lengths of the different types of cable inserted, the sea temperature and other factors.

Nor should one conclude that a fault which shows to be, say, 100 nautical miles distant, is really that far from the testing point. It should be understood that since a cable contains a great deal of slack and alters its position at many points under various influences, the repair ship would find the actual distance somewhat less, should it proceed in a direct line.

In like manner aerial and underground cable fault measurements always indicate a distance a few feet or inches greater than that of the actual length to the fault, because of the somewhat spiral manner in which the twisted conductors are arranged within the cable.

Lead covered cables are obviously expensive and seemingly represent the last word in the way of construction, yet even they require protection, especially from the effects of electrolytic action. Hence great care and skill must be exercised in laying cables and in making the electrical connections.

Telegraph and Telephone Patents.

ISSUED MARCH 18.

1,056,300. Relay System. To E. W. Preston and G. L. Nickerson, Sioux City, Iowa.

1,056,350. Transmitter. To R. S. M. Mitchell, Syracuse, N. Y.

1,056,423, 1,056,424 and 1,056,425. Telephony. To M. L. Johnson, Chicago, Ill.

1,056,533. Working Submarine Cables. To J. Gott, Brighton, England.

1,056,637. Combined Telephone and Fire-Alarm System. To W. W. Dean, Chicago, Ill.

1,056,655. Locking Device for Telephones. To A. Fornander, New York.

ISSUED APRIL 1.

1,057,500. Lock-Out Switch for Party-Telephone Lines. To J. G. Roberts, Chicago, Ill.

1,057,516. Telephone Set. To A. B. Allen and L. Day, New York, N. Y.

1,057,595. Telephone System. To D. L. Temple, Chicago, Ill., and C. L. Goodrum, Atlantic City, N. J.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, April 10.

American Telephone and Telegraph Co.	131¾
Mackay Companies	82
Mackay Companies, preferred	68
Western Union Telegraph Co.	69

PERSONAL.

MR. C. W. MCKIBBON, superintendent of telegraph, Gulf Pipe Line, Beaumont, Tex., was a business visitor in New York last week.

MR. TAKETOMO IKEDA, telegraph engineer, Department of Communications, Tokio, Japan, is in New York studying American telegraph systems and methods.

MR. CHARLES W. HIGGINS, a former messenger boy for the Atlantic and Pacific Telegraph Company, at St. Louis, Mo., has been appointed Sargeant-at-Arms of the United States Senate, Washington, D. C.

MR. ANDREW CARNEGIE has presented $1,000,000 in cash to the Carnegie Technical Schools of Pittsburgh, Pa. This makes a total endowment of $8,000,000, the former gifts being in bonds.

MR. THOMAS J. BISHOP, of Baltimore, Md., a well-known old-time telegrapher, who recently retired, was presented by some of his former associates with a gold watch a few days ago. Mr. Thomas A. Edison was one of the contributors toward the fund. He and Mr. Bishop worked side by side in New York many years ago.

MR. J. H. W. REES, former executive advertising manager of the National Progressive Party, and until recently advertising and sales manager of Lint-Butcher-Ross, Inc., New York, has accepted a position with the Metropolitan Telephone and Telegraph Company, of New York, as manager of the advertising and publicity department

MR. DAVID HOMER BATES, author of "Lincoln in the Telegraph Office," will deliver his illustrated lecture on Lincoln in the Summerfield Methodist Episcopal Church, corner Washington and Greene avenues, Brooklyn, N. Y., on the evening of Thursday, May 1. This will be a favorable opportunity for the members of the fraternity in this vicinity to hear Mr. Bates lecture on his favorite topic.

MR. T. C. ASHCROFT, a widely known newspaper man, has resigned from The Associated Press after an active service of twenty-six years. Mr. Ashcroft is an old-time telegrapher, and was employed in the New York offices of The Associated Press several years ago. For sixteen years he has been in charge of the Southwestern District of the Southern Division, with headquarters at Memphis. Mr. Ashcroft will give his time to his banking and personal interests at Memphis. He has been elected second vice-president of The Security Bank and Trust Company, one of the largest financial institutions in that city.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. J. S. ELLIS has been appointed assistant superintendent of construction to Mr. C. A. Lane, superintendent of construction of the Eastern Division. Mr. R. Gould, district foreman of the first district, New York, has been attached to the office of Mr. W. I. Capen, general superintendent of plant. Mr. J. Ellis, son of Mr. J. S. Ellis, has been appointed district foreman of the second district, Eastern Division, vice R. Gould.

MR. M. J. FINNELL, chief of the delivery department of the Pittsburgh, Pa., office was in New York recently on a business trip studying the conditions of the New York delivery and messenger departments.

THE 1140 BROADWAY branch office of this company will be moved to 1142 Broadway, New York, on May 1, where larger and more up-to-date quarters have been secured.

CHANGE IN DISTRICT NUMBER.—What was formerly known as the eighth district of the Western Division, with headquarters at Chicago, will hereafter be known as the sixth district. Mr. C. A. Comstock is superintendent.

THE FOLLOWING CHANGES have been made in the second district, Southern Division, which is presided over by Mr. G. W. Ribble, at Atlanta, Ga.: Mr. J. E. Munns has been appointed manager at Brunswick, Ga., relieving Mr. E. N. Brignoni, who was transferred to Augusta as operator. Mr. Munns was formerly operator at Thomasville, Ga. He was succeeded at Thomasville by Mr. H. M. Tullis, of Moultrie, Ga., who was acting manager at that point. Mr. Tullis in turn was relieved by Mr. Y. McCall, formerly operator at Brunswick, Ga. Mrs. L. G. Hall, manager at Fernandina, Fla., has resigned to go elsewhere, and is succeeded by W. L. Lamar.

What Is a Wire Lease?

An interesting letter from Mr. C. C. Adams, vice-president of the Postal Telegraph-Cable Company, New York, on the subject of wire leases appears in the April number of the *Postal Telegraph*. It was addressed to the New York City authorities, and deals with the question raised by the city as to whether or not the United States and Hayti Cable Company is using the streets of New York without a grant from the city for two wires "leased" from the Commercial Cable Company.

Mr. Adams's discussion of the subject seems to prove that a so-called "lease" of a wire by a telegraph or telephone company is really no lease at all.

"No wire is turned over to the so-called lessee," he states. "On the contrary the possession of the wire is always retained by the so-called lessor. The lessor retains not only the possession of the wire, but repairs it, substitutes another wire for it when it is broken or interfered with, and, in fact, the so-called lessee could not identify any particular wire as coming within the terms of his contract if he tried to. All that the lessor gives is an electric circuit, and all that the lessee gets is the right to direct in the office of the lessee the electric current to or from the end of the wire, and apply it to electrical instruments designed to produce the dot and dash signs of the Morse alphabet.

"The electric light company runs a wire into your house," Mr. Adams continues, "and delivers an electric current, through a fiber, and that produces light for which you pay. There is no lease of the electric light *wire*.

"Similarly a telegraph company runs a wire into your office and there delivers an electric current, through a 'sounder,' and that produces sounds which you translate into words. There is no lease of the telegraph *wire*. In both cases—electric light wire or telegraph wire—you simply pay for what is delivered, namely, an electric current.

"Again, the telephone company runs two wires into your office and gives you telephone connection. Those two wires go through the streets to Central and are assigned to you exclusively. Yet you are not the lessee of those wires, and you need no grant from the city."

The Magnetic Club's Twenty-fifth Anniversary.

At the twenty-fifth anniversary of the Magnetic Club, which will be held at the Broadway Central Hotel, New York, on April 19, all past-presidents of the club who are present will make addresses. There will be an exhibition of telegraph relics and portraits of telegraph veterans. One of the most interesting features of the evening will be direct Morse communication between the banquet hall and London by means of the recent invention of John Gott, engineer of the Commercial Cable Company. Morse signals will be transmitted directly through ocean cables and land lines connected by automatic repeaters.

Mr. T. E. Fleming will organize an old-time "chorus table," and the Harmony Orchestra, led by Mr. D. E. Van Orden, will play a few selections. The entire programme will be one of special interest and a large attendance is expected.

DAYLIGHT ABSORPTION PHENOMENA.—Dr. A. E. Kennelly, professor of electrical engineering at Harvard University, Cambridge, Mass., and a former telegrapher, spoke before the New England Wireless Society in Boston, April 7, on the subject of daylight absorption phenomena and the relation of the waves used in wireless telegraphy to those electric waves sent over an ordinary telegraph wire. He explained daylight absorption of wireless impulses on the basis of ionization of the atmosphere by the ultra-violet waves in the sun's rays changing the air's absorption quality for electromagnetic waves.

MR. F. O. NOURSE, district traffic superintendent of the Western Union Telegraph Company, Richmond, Va., writes: "This is the thirtieth time I have written you on this subject, each time enclosing a remittance to cover a yearly subscription. I hope to be able to write you thirty times more, and have the $2.00 each time, as nothing gives me more pleasure than TELEGRAPH AND TELEPHONE AGE."

Western Union Telegraph Company.

EXECUTIVE OFFICES.

MR. THEO. N. VAIL, president of this company, is expected back from his trip through the West Indies in the early part of May. When last heard from he was in Havana, Cuba, and was in excellent health and enjoying his vacation.

MR. E. J. HALL, vice-president of the American Telephone and Telegraph Company, New York, has returned from Florida, where he spent six weeks.

MESSRS. C. F. AMES, A. C. Terry and J. W. Reed, district commercial superintendents at Boston, Pittsburgh and Philadelphia, respectively, were in New York, April 8, on company business.

MR. S. M. WILLIAMS, manager press service, New York, has resigned to join the editorial staff of the *Evening World*, New York.

MR. H. E. ROBERTS, for many years identified with the Western Union Telegraph Company at New York, and for the past ten years its superintendent of supplies, has been appointed service manager of the general purchasing department of the Western Electric Company, New York.

MR. A. C. KAUFMAN, division cable manager, New York, has been appointed commercial manager Commercial News Department, with headquarters at the same place.

MR. J. SIMMONDS, commercial agent, New York, has been appointed division cable manager, to succeed Mr. A. C. Kaufman, promoted.

MR. MARTIN J. BROOKS, solicitor, has been appointed district commercial manager at New York, vice John Simmonds, promoted.

MR. J. B. CHEATHAM, special agent, Atlanta, Ga., was a recent New York visitor on company business.

MR. H. B. THORNTON, manager of the Winona, Minn., office has been given a leave of absence on account of illness, and is now visiting his son at Tuscola, Ill. Mr. E. W. Sloan has been appointed manager of the Winona office, vice Mr. Thornton.

DURING THE PAST SEASON the office at Palm Beach, Fla., was remodeled in order to better handle the large volume of business. Quadruplex and duplex sets of the latest pattern were installed, and an up-to-date generator equipment was substituted for the several hundred cells of battery hitherto used. The staff consisted of Messrs. W. W. Scott, manager, and C. W. Samuels, wire chief, and operators Rufus Lee, Mitchell Williams, W. A. Sheppard, H. V. Olmstead, C. A. Franklin and J. Murphy; delivery clerk E. J. Sullivan and bookkeeper F. A. Sheppard.

DECORATING A NEWLY-WED TELEGRAPHER.—In order to express their joy over the marriage of an operator in a Pennsylvania town his friends decorated him with tin vessels of every description and drove him through the streets of the town.

THE CABLE.

NEW CABLE.—A new submarine cable is being laid between Prince Edward Island and New Brunswick.

TRAWLERS AND CABLES.—The Commercial Cable Company has for several years past carried on a vigorous campaign against fishing trawlers which destroy submarine Atlantic cables, especially off the coast of Ireland. Japan has a very effective way of dealing with such depredators. Japan has prohibited fishing on either side of the Japanese cable running from Japan to Formosa. For three miles on each side of the cable in deep sea fishing is prohibited. As the cable approaches the land the prohibited zone is made more narrow, but there is a prohibited zone running the entire length of the cable from end to end. These orders of the Japanese Government went into effect August 3, 1912. The ordinances were violated by trawlers and thereupon the Japanese prosecuted six of them. In addition the Government maintains patrols to watch the trawlers at work.

New Cable from England to China.

The Eastern Telegraph Company and the Eastern Extension Company will this year lay a new cable direct from Lands End, England, to Hong Kong, China, by way of Suez, Aden, Colombo, Penang and Singapore. The Malta section to Alexandria has already been laid, leaving about 9,000 miles to be completed out of a total of 12,000 miles. The new cable will cost about £1,500,000 ($7,300,000).

The cable as far as Colombo will be laid by the Eastern Telegraph Company, while that beyond will be laid by the Eastern Extension Company. With the exception of a small land cable from Alexandria to Suez, the whole line will be under sea. It is said that it will be the largest cable ever laid.

It now takes about two and one-half hours to transmit a 20-word message from Bombay to London, and a further hour or hour and a half for the message to be sent from Colombo to Bombay. By the new cable, on a message from Colombo to London, a saving of three hours and fifty minutes will be effected in transit, while on a message sent to Bombay there will be a saving of two hours and twenty minutes. This great saving of time is due to the fact that by the new system, known as the slot system, a message is mechanically transmitted from section to section of a cable and is not relayed by hand until it reaches its ultimate destination, thus avoiding or reducing to a minimum the chances of mutilation in retransmission. Under the present system a message has to be deciphered and retransmitted at Lisbon, Gibraltar, Malta, Alexandria, Aden, and Bombay. The new cable is to be entirely under European management with European operators.

WIRE WANTED BY GOVERNMENT.—Major W. L. Clarke, disbursing officer Signal Corps, U. S. A., Washington, D. C., will receive until April 24 bids for 528,000 feet of outside distributing wire of 45 mils in diameter.

THE TELEPHONE.

CHARLES E. WILSON, aged 45 years, general manager of the Keystone Telephone Company, Philadelphia, Pa., died in that city, March 30.

MR. P. KERR HIGGINS, of Little Rock, Ark., has been appointed general superintenedent of the Brazos Valley Telegraph and Telephone Company, with headquarters at Waco, Tex.

CHANGE OF NAME.—The name of the Central District and Printing Telegraph Company, with headquarters at Pittsburgh, Pa., has been changed to The Central District Telephone Company.

OLD NAME DISCONTINUED.—On March 24 the name of the Bell Telephone Company of Missouri, was changed to Southwestern Telegraph and Telephone Company, in accordance with a recent order to that effect.

AUTOMATIC TELEPHONE IN BUFFALO.—The Federal Telephone and Telegraph Company, Buffalo, N. Y., will adopt the automatic telephone, and expects to have the system in operation throughout its Buffalo district by January 1.

THE BOSTON PLANT CHAPTER of the Telephone and Telegraph Society of New England gave an entertainment at Jordan Hall in that city April 2 and 3. The title of the play was the Minstrel Regatta, and the performers were employes of the telephone companies in Boston.

TRI-STATE TELEPHONE.—The Tri-State Telephone and Telegraph Company reports for the year ended December 31, 1912: Total income, $1,476,570; expenses, taxes, interest, etc., $926,421; balance, $550,149; dividends, $274,891; balance, $275,258; appropriation for reserves, $175,258; surplus, $100,000.

TELEPHONE SERVICE BETWEEN ENGLAND AND GERMANY.—A five-minute conversation was recently conducted between the office of a newspaper in London and the office of a newspaper in Frankfort, Germany. On the preceding day connection was established with a Berlin newspaper office. The British Post-Office does not possess exclusive rights over the cable from St. Margaret's Bay to Lapanne on the coast of Belgium, and this cable can be used for yeoman traffic only when it is clear. German authorities have been discussing with a British Post-Office official the laying of a new submarine cable from England to the German coast.

STRIKE AVERTED.—Twenty-two hundred telephone operators of the New England Telephone and Telegraph Company, in the metropolitan district, Boston, Mass., asked for an increase of pay, and threatened to strike if their demands were not granted. The differences were compromised April 10, the company agreeing to adopt a plan of "anniversary payments," instead of increasing wages. These payments are to be $25 at the end of the second year, $50 annually from the end of the third to the end of the ninth year, and $100 at the end of the tenth and each succeeding year. The agreement also provides for the creation of an adjustment committee of three operators and three representatives of the company.

TELEPHONE CALLS DURING THE INAUGURATION.—The number of telephone calls handled in Washing, D. C., on March 3 and 4 during the Presidential inauguration exceeded all records and expectations. It had been estimated that it would be necessary to handle approximately 400,000 calls a day on these two days, but records show that the aggregate calls handled reached a total of 500,000 a day. The Washington operating force was increased by twenty-three operators from the Baltimore central office. Long distance traffic showed an increase of fifty-four per cent, and traffic between Washington and Baltimore an increase of 100 per cent.

TELEPHONE CABLE.—The *Elektrotechnische Zeitschrift* of Berlin, Germany, describes the new telephone line between Vienna and Dalmatia, which includes a line across the sea over a series of islands. The submarine section is a continuously loaded cable of the Krarup system. The copper conductor has a cross-section of 5.5 sq. mm. (.009 sq. in.). Around it are wound three layers of soft iron wire of 0.2 mm. (.08 inch) diameter, and around this a special form of gutta percha is applied for the purpose of reducing the leakage. The speaking tests between the two ends of the combined overhead and submarine lines are said to have been very satisfactory. The line was later extended, and speaking tests between Vienna and Sarajevo (at a distance of 840 miles) have given good results.

ILLUSTRATED LECTURES ON TELEPHONE SERVICE.—About two years ago the New York Telephone Company came to the conclusion that information regarding certain phases of its business could best be shown by means of pictures, and it is now using this method for educational publicity. Frequent lectures are given before schools, societies, clubs, etc., in every part of the company's territory and illustrated by means of lantern slides. The lecturers tell about the work of the telephone girl; describe the plant necessary for the operating telephone company, and illustrate some of the problems that the telephone company has to contend with. Pictures of telephone exchanges in remote parts of the world are shown and any other pictures that will introduce in the lecture interesting information. Many of the public schools have incorporated these lectures in their lecture programmes. At the close of the lectures, as a rule, questions are asked the speaker, who is invariably a telephone man, and who thus has an opportunnity to further explain the plans and policies of the company.

ELECTRIC SUPPLIES WANTED FOR THE ARMY.—The Signal Corps of the United States Army, Washington, D. C., is advertising for proposals until April 20 for furnishing the Signal Corps with four hundred metal case, wall, common battery, artillery type telephones. Bids will also be received until April 23 for three hundred camp telephones and fifteen camp-telephone switchboards. Bids will be received by Major W. L. Clarke, disbursing officer, Signal Corps, Washington, D. C.

Some Reminiscences.

BY G. T. WILLIAMS, CLEVELAND, OHIO.

As the recent death of A. M. Vanduzer, former manager of the Western Union office at Cleveland, Ohio, leaves me the only "forty-niner" of the telegraph residing in Cleveland, I thought a few reminiscences of the early telegraph days in the West would be apropos.

The early spring of 1854 found me in the office of the National Lines at Pittsburgh, Pa., where I was operator for the Western Telegraph Company. My associates in the office were William Curtis, Marion H. Markle, W. H. McCalla, John C. Bowles, Andrew Carnegie, Robert Pitcairn, Thos. B. A. David, George E. McLean, Benj. F. Woodward and others whose names have escaped my memory.

In March, 1854, I was solicited to exchange places with Geo. B. Hicks at Cincinnati, Ohio, who desired to come to Pittsburgh on account of some study he was engaged in. He had previously worked there, and was generally known among the boys by the name of Barney Hicks.

The exchange was made and early in April I went to Cincinnati, reporting to Frank Stevens, chief operator. George C. Swan was manager of the office, but did not have much to do with the operators. My other associates were Byron Hoyt, W. H. Cody, Geo. W. McCann, Ed. I. Lane, Hess Duncan (a student), son of Jackson Duncan the superintendent, and possibly others. In a rival line office were William Hunter, Mr. Armstrong and others. Mr. Hunter was afterwards the supply agent of the Western Union Company for many years. The superintendent of this rival line was Anson Stager, of the House Line, which was then reaching out for consolidations of the many small companies between the East and the West.

Sometime in the summer of 1854 a meeting was held at Cincinnati of men opposed to these efforts at consolidation, among whom were Ezra Cornell, J. N. Alvord, J. D. Reid, Emery Cobb and others. Reid's *History of the Telegraph in America* shows how they failed to accomplish their purpose. My work at Cincinnati was uneventful, and in the spring of 1855, my health becoming somewhat impaired, I decided to go home to my parents in Chautauqua County, N. Y., and recuperate. A few weeks after my arrival at home I received a letter from W. H. McCalla, chief operator for the Eastern National Line at Pittsburgh, stating that he was about to resign his position, and wanted me to take his place. This I declined, as I had not fully recovered my health. This invitation was soon followed by a letter from Wm. Curtis, of Pittsburgh, saying that the superintendent, Jackson Duncan, wanted me to go to Louisville, Ky., as chief operator at an advanced salary. This offer I also declined for the same reason.

In the spring of 1856 I received a letter from my friend O. P. S. Plummer at Chicago, who said that he was about to resign as chief operator for the "Caton" Lines, and that he had negotiated with Judge D. Caton, the president, for me to take the place.

I had then been out of sight and hearing of a telegraph instrument for fourteen months, as the line on which I had learned had gone to wreck. However, I decided to accept the offer. Mr. Plummer sent me the necessary passes, and on May 19, 1856, I mounted a neighbor's wagon-load of potatoes headed for Dunkirk. Arriving there, I, of course, took a bee-line for the telegraph office where my friend John A. Townsend (who is still living), held forth. There I found a message for me from Plummer, saying that while he had negotiated for the place for me with the president, Judge Caton, the superintendent, J. J. S. Wilson, had got a different man for chief operator, but that if I would come on I could have a place at the going salary.

I thought this was as it should be, and started for Chicago. Upon reaching Ashtabula, Ohio, I saw Anson Stager enter the car, and as he passed through I accosted him. I told him of our meeting at Cincinnati nearly two years previous, and of my present situation. He did not know me very well, but knew that a man who had, as it were, graduated under Frank Stevens was fit for almost any place, and as he needed a man at Cleveland, he offered me a place at a fair salary, which I accepted.

After getting supper, I sought the telegraph office where my arrival was expected. I met Mr. Vanduzer, who was next to the manager, and he took me up to the operating room and introduced me to E. P. Wright, chief operator. I soon after heard a man at an instrument say, "Who will relieve me for supper?" I stepped forward, and said, "I will," and did so. This was rather bold, as I had not handled a message for fourteen months. But I worked that wire (the Chicago) until 10 p. m., and sat down to it the next morning.

Mr. E. P. Wright came around, and said I might work that wire. I soon found that it was the "roast" of the office. I worked it for three and one-half years, however. The receivers at the Chicago end were A. H. Seymour, Marvin Hughitt, now president of the Chicago and Northwestern Railroad, and Geo. A. Burnett. Thus I entered the service of the Western Union Telegraph Company.

Besides Messrs. Wright and Vanduzer, my office associates were Fred H. Tubbs, A. C. Bassett, Elisha Frary, W. H. Bixby, C. F. and Frank A. Stumm, E. L. Norcross, B. F. Coan, E. T. Tindall, H. L. Melton and others. Many of these named are still living.

Geo. B. Hicks came to Cleveland soon after as Associated Press agent. This was my first meeting with him personally. He soon became engaged in inventing his repeater, but was not employed in the office.

While in Cleveland I became associated more or less with J. H. Wade and his son Randall P., and with Thomas T. Eckert.

The Western Union Company had recently been formed, and was rapidly acquiring control of other companies west of Buffalo and Pittsburgh. I remained in Cleveland until November, 1859, when, at the request of Charles M. Stebbins, president of the Missouri and Western Company, I went to Leavenworth, Kan., as manager, under the superintendency of Robt. C. Clowry, who also acted as chief operator at St. Louis, of the Western Union and Caton Lines.

A Magnetic Wireless Sender.

From small wireless equipments, such as may be used in outlying stations by explorers, etc., where storage batteries cannot be conveniently charged and maintained, quite good wireless signals can be emitted by aid of a simple magnetic tapper. As early as 1855 Ruhmkorff observed that, under certain conditions, the sparks obtained from the secondary circuit of his induction apparatus were longer and more intense when the primary circuit was broken by hand than when a high-speed hammer break was employed. This phenomenon was attributed partly to incomplete saturation of the magnet core in the latter case (owing to the short current duration), and partly to the effect of "extra current" on closing the primary circuit. These facts are applied in the apparatus described below:

The core of a Ruhmkorff apparatus, without primary winding, is excited by a bundle of high-class permanent magnets (weighing a few pounds). To obtain a long spark from a light apparatus, the reversal of flux in the core must be as rapid as possible, the magnetising period must be as long as possible, and the air-gap in the magnet circuit must be reduced to a minimum. A convenient arrangement is to place a number of highly saturated U magnets of decreasing perimeter parallel to each other and so as to form opposite poles in two straight, somewhat divergent extensions. The ends of the magnets terminate in soft-iron blocks. This arrangement permits the core of the induction apparatus to lie between the two poles, and the core is provided at its ends with two pairs of iron arms, of which one surrounds the two poles at the end where the latter lie closer together, and the other lies between the poles at the other end. This arrangement enables the magnetic circuit to be completed through the core, and practically the whole of the flux can be made to traverse the latter if care be taken that the movable arms make good contact with the magnet extensions. The displacement of the magnet core and arms, to reverse the direction of flux through the core, requires a certain expenditure of energy, but can easily be effected by hand. —L'Elettricista.

Glass and Porcelain Insulators.—Experiments upon the electrical and physical properties of glass and porcelain insulators of European and American manufacture have been made by Mr. G. Rebord, and are described in the proceedings of the Italian Electrotechnical Association. A summary of the tests show that glass insulators have a superficial resistance not inferior to that of porcelain under various conditions of humidity, and the glass does not retain moisture to any greater extent. The sparking distances over glass and glazed porcelain are from 10 to 30 per cent lower than the sparking distances in air; ebonite, ambroin and unglased porcelain show similar behavior. When smooth, the curved surfaces of glass and porcelain are equivalent. The mechanical strength of glass is satisfactory and the surface is not attacked, but glass will not stand sudden changes in temperature as well as porcelain does.

Telephone Pioneers of America.

E. M. BURGESS.

Mr. Edwin Miles Burgess, vice-president and general manager of The Mountain States Telephone and Telegraph Company, Denver, Col., entered the telephone service in Pueblo, Col., in the autumn of 1881 as operator for the Mountain States Company, with which he has ever since been continuously associated. He was advanced to be inspector, and later became agent, chief inspector and superintendent, successively. His wide and increasing knowledge of the details of the business fitted him for higher positions and his next promotion was to the position of general superintendent of the company, and finally he became general manager, which position he still holds with great credit and ability.

E. M. BURGESS, DENVER, COL. (1881.)

More Mental Anguish.—A young Kentuckian recently sued a telegraph company for the loss of his sweetheart, $1,999 being the value placed upon his wounded feelings. He telegraphed to his intended to meet him in Louisville for the wedding ceremony, but the message she received called her to Nashville. She went to Nashville and waited and he went to Louisville and waited. Her disappointment was followed by anger and she would not listen to any explanation. She thereupon broke off the engagement and the disconsolate young man calculates that it will take about $1,099 in money to re-establish his former condition of mind.

Damage to Telegraph and Telephone Lines by the Recent Storms.

In our issue dated April 1 brief reference was made to the damage to telegraph and telephone lines in the West and in Ohio and Indiana by cyclones, sleet storms and floods, the latter part of March. The telegraph and telephone companies are rapidly recovering their normal facilities, although it has taxed their energies to the utmost.

The Postal Telegraph-Cable Company suffered severe damage over the entire territory between Omaha, Neb., and Albany, N. Y. It managed, however, to keep a limited communication between New York and Chicago all through the storm period. The flood in the river at Cleveland, Ohio, carried away all the company's cables, thus cutting off all repeatering at that point.

Floods in Northern New York and Northeastern Pennsylvania also did much damage to the lines, the water at Meadville, Pa., being so high as to cover the electric generators. In Albany the power station was under water, thus depriving the Postal Company of its supply of power.

The Mississippi flood is now causing trouble south from Cairo, Ill., and on April 7 a heavy wet snow in Iowa and Colorado broke down many lines. This, it is stated, was the worst storm of the winter in that section of the country.

An army of construction men is now employed in repair work, and the company is gradually restoring communication, and the general situation is now well in hand.

The following Western Union offices in Ohio and Indiana were under water and practically destroyed with their records during the floods: Hamilton, Findlay, Troy, Dayton, Miamisburg, Middletown, Zanesville, Tiffin, Piqua, Marietta and Portsmouth, Ohio, and Logansport and Peru, Ind. The records at many small joint offices were lost.

Practically all of the wires crossing the State of Ohio, along the lines of the great railroads, were destroyed by the floods. There was no direct communication from Cincinnati and Columbus for two or three days. On the Baltimore and Ohio Railroad all the wires west of Parkersburg were down.

The sleet storm, which was particularly severe around Chicago and Toledo, caused a loss of about 4,000 poles, and east of Toledo as fas as Cleveland 1,500 more poles came down when the rain turned into sleet. There were nine miles of poles down in one stretch. In the districts adjacent to Toledo and Cleveland 500 more poles were leveled.

The Western Union Company never once lost Chicago entirely during the flood. The first wires restored were by way of Canada and through Michigan via Detroit, thence to Chicago. Owing to the washing out of the road beds in many places the work of restoration has been extremely difficult. About 75 or 80 miles of temporary cable were used to make patches in breaks, and repair gangs were sent to the flooded districts from New York, Denver, Texas and Atlanta—between 500 and 1,000 men being thus engaged.

The news service was paralyzed, and the little information that was obtainable during the first days of the flood was gathered in the face of danger, and much ingenuity was displayed by the newspaper men in their quest. After the Omaha storm the United Press obtained wires from the American Telephone and Telegraph Company, and it was by this means that the first definite story of the disaster was sent out. The Associated Press was able to reach Ohio in a roundabout way, via Washington, Atlanta, Ga., St. Louis, and Chicago to Cincinnati.

The American Telephone and Telegraph Company established a telephone station to the flood limit in North Dayton, placed an operator in charge, and turned the station over to the Committee of Safety for its uses. The telephone wires were successively tapped by company employes at gradually nearing points to the flooded city, and messages transmitted to the Phoneton station. Telephone lines suffered in the other storm-ridden sections, but the restoration of the service to the normal is practically complete.

Latest Book on Wireless.

"Wireless Telegraphy and Telephony, Simply Explained," is the title of a recent book by Mr. Alfred P. Morgan. As is usual with most of the writers of books on radio subjects, the author makes his appeal entirely to the amateur and to the casual reader who desires to familiarize himself with the general principles of the science.

The book contains ten chapters as follows: I, Principles of transmission and reception; II, Means of radiating and intercepting electric waves; III, Transmitting apparatus; IV, Receiving apparatus; V, Tuning and coupling; VI, The dignity of wireless telegraphy; VII, The ear; VIII, The telephone; IX, The wireless telephone; X, General remarks.

The descriptive matter is sufficiently complete and comprehensive to give the student a good understanding of the wireless art in theory and practice, and is totally devoid of mathematics. Some good illustrations are used to show the analogy between familiar phenomena and wireless theory.

The book contains 154 pages and 156 illustrations, and besides the information on the two main subjects, there is a great deal of other matter of a kindred nature that will be found highly interesting and instructive. The reading and study of this volume will give one a good general knowledge of modern wireless telegraphy and telephony.

The price is $1.00 per copy, and copies may be obtained of Telegraph and Telephone Age, 253 Broadway, New York. Books on any other electrical subject may also be obtained at the same address.

How to Show a Magnetic Field.—A graphic illustration of a magnetic field may be secured by placing a piece of blue print paper on a permanent magnet and over it sprinkling iron filings. If the paper is then developed, a picture of the magnetic field will be had, showing the lines of force.

Intercommunication Between Cables and Land Lines.

A United States patent was issued March 18 to Mr. John Gott, of London, England, engineer for the Commercial Cable Company, on an improved method of working long submarine cables.

The purpose of the invention is to apply the international Morse code to the transmission of messages over long submarine cables, in place of the code now used, whereby uniformity of working with land lines and other connections may be established.

It is well known that reversed currents sent rapidly through a long submarine cable are the most effective in definition as received at the distant end of the cable—each following current having the effect of neutralizing the preceding one. In Mr. Gott's invention every unit of each letter is formed by a reversed current, so that in no case during transmission does a current of the same polarity follow.

At the receiving end of the cable these reversed units of letters are transformed in a simple manner

JOHN GOTT, ENGINEER COMMERCIAL CABLE COMPANY, LONDON, ENGLAND.

so that the alphabet comes out in Morse characters as if received through a short land line and are therefore easy to read and transcribe.

To obtain the reversal of polarity for each unit of a letter with absolute uniformity and certainty Mr. Gott makes use of the discharge of current from the cable itself, which, having considerable energy, is able to act upon a polarized relay and cause the desired change of direction for the following signal. The direction of the discharge is a factor of the polarity of the charge, and changes in accordance therewith, so that the reversals produced by this action on the polarized relay follow in sequence with infallible regularity. Another method of effecting the reversal of the polarized relay consists of a transformer provided with primary and secondary coils, the primary being placed in the earth circuit of the split or double battery. Currents are induced in the secondary, which is connected to and actuates the polarized relay. The induced currents in the secondary coil are reversed according to the polarity of the last current sent into the cable and these reversals take place in regular sequence, assuring that no two successive currents are sent of the same polarity. One advantage of this last method is that on making contact with the key to charge the cable the battery contact in the relay is reinforced at the moment the key is depressed, thus assuring perfect transmission. This is brought about by the action of the secondary coil. The sending of messages through the cable is effected by the working of a single Morse key of the usual type so that the operator's mode of manipulation is exactly the same as if he were sending into any ordinary line.

Where it is desired to send messages automatically the message is prepared on a perforated slip and the Wheatstone transmitter takes the place of the key, the reversing polarized relay being connected in circuit as for hand keying with the ordinary and well-known Wheatstone transmitter. The two upper contacts of the vibrating contact arm are used to take the place of the key. So also, where the system is applied for translation from a land line or short connecting cable, the usual receiving relay is connected to the reversing polarized relay in the manner described for the hand key and the received Morse signals are translated into the cable in the form of a "reversed current alphabet" or alternating current alphabet devised by Mr. Gott. Also the relay referred to may work a sounder-relay in a local circuit, which, being connected in place of the single Morse key, translates the signals from the short connecting lines or cables into the main cable.

It remains now to point out how the Morse code, which is sent through the cable in the form of reversals for each unit of a letter, is retransformed into the common Morse code. In all systems of relay repeaters on long cables hitherto used the contact arm when at rest occupies a neutral position (known as no man's land) between two contact plates which are connected to the local battery intended to actuate local instruments for repeating the signals either into another cable or to record the received signals. If we connect the two contact plates together it follows that the movable contact-making tongue will record signals made on either side, and these signals will appear on the local apparatus as if made continuously on one contact. For example, two reversals will appear as four dots (the letter "h" in Morse), and we shall have all the reversed signals received through the cable transformed into the well known Morse characters. These may be read by sound or printed on a Morse slip and similarly they may be repeated automatically to another distant station in the Morse characters. It follows from these observations that the cable relay, with its contact tongue and neutral center, will faithfully transmit the reversed Morse code into another cable in the form received, and that the final transformation takes place at the terminal station of the main cables where the message is either transcribed for delivery or repeated inland.

In the diagram Fig. 1 *a* designates a cable; *b* the artificial cables used for duplex working; *c, c'* the sending condensers; *e* the wire connecting the key *d* to the apex of the bridge arms; *f* the front contact of the key; and *g* the back contact thereof. The front contact *f* is connected to the tongue or vibrating arm *h''* of a polarized relay *h* by wire *j*; and the back contact is connected to the coils of the relay *h* by wire *i*. When the key is depressed the battery is connected to the cable, and when the key is open and in engagement with the back contact the cable discharges through the relay coils and to earth at *k*. To the two stops *h' h'* of the relay *h* are connected the opposite poles of a split battery *l l'*, the center part of battery being grounded at *M*. The tongue or vibrating arm *h''* of the polarized relay is adapted, as is usual, to make contact with either of the stops *h' h'*.

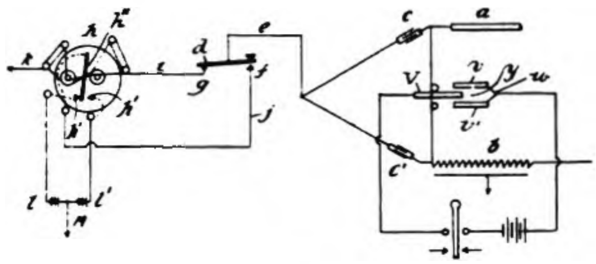


FIG. 1

When the key *d* is depressed the battery *l* or *l'* is connected to the cable through the wires *j* and *e*. When the key is opened the cable discharges through the polarized relay to earth and in doing so causes the tongue of the relay to be thrown to either contact *h' h'* according to the polarity of the discharge. As this polarity is always opposite to the polarity of the preceding discharge it is manifest that the tongue or arm *h''* will be thrown from one contact *h'* to the other at the end of each key operation, so that the battery to the line will be reversed each time the key is opened and the cable discharged. The result of this is that the current impulse sent to the line at each key operation will be opposite in polarity to the previously sent current impulse. It is therefore evident that in operating the key for sending Morse code signals each signal unit impulse will be opposite in polarity to the preceding signal unit impulse and no two succeeding signal unit impulses will be of the same polarity.

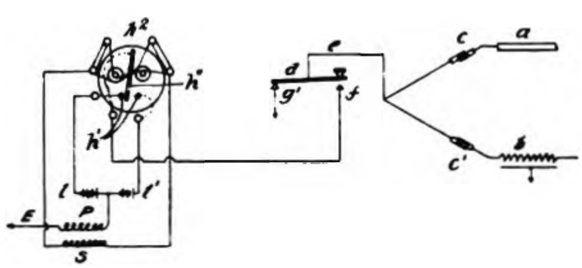


FIG. 2

Owing to the considerable energy of the discharge from the cable and condensers (not heretofore utilized) the resistance of the coils of the polarized relay may be negligible and still afford ample opportunity for the discharge to be effective for good signaling.

Referring to the construction diagrammatically illustrated in Fig. 2, the back contact *g'* of the sending key *d* is connected to earth and the discharge from the cable and condensers is directed to earth through said contact when the key is open. The reversal of the polarized relay h^2 is brought about by the split battery making earth at *E* through the primary coil *P* of a transformer, the secondary coil *S* being connected to the relay coils. The opposite poles of the two portions of the split battery are connected to the contacts *h' h'* of the polarized relay in the same manner as shown in Fig. 1, and the front contact of the key is electrically connected to the movable tongue or vibrating arm *h''* of the polarized relay. It is manifest that when the key is depressed a current will be induced in the secondary coil of the transformer, which current will firmly hold the tongue of the polarized relay against one of its stops. It is also evident that when the key is opened a reversal of current in the secondary coil will take place and the vibrating tongue or arm will then be thrown against the other stop of the polarized relay, thereby reversing the polarity of the current to the front stop *f*, and consequently to the line, when the key is again depressed or closed. The same cycle of operations follows each depression and raising of the sending key.

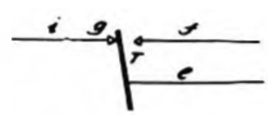


FIG. 3

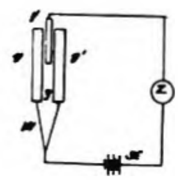


FIG. 4

Fig. 3 simply illustrates how the tongue *T* of a relay connected to a land line or short cable takes the place of the key either in Fig. 1 or Fig. 2. It also illustrates how the rocking contact bar of a Wheatstone transmitter is connected in place of the key to send automatically into the cable, the upper two contacts of the transmitter only being used.

Fig. 4 represents the apparatus used at the receiving or terminal end of the cable. The two metal plates *v* and *v'* are separated by an insulator *y*. The contact making tongue *V* is actuated by an attachment to the signal coil of a recorder, which coil is in circuit with the cable. Arriving signals move this tongue from zero to *v* or *v'* according to the polarity of the arriving current. For the purpose of this invention the two metal plates are connected together by the wires at *W* and are in circuit with the local battery *x*, etc. The instrument at *Z* may be a Morse recording instrument, a sounder or relay or other instrument. It will be clearly seen that rapid reversals will be indicated by the sounder, for example, as dots or dashes, as if made on one contact only, as in ordinary Morse working.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, APRIL 16, 1913.

STATEMENT.

Statement of the Ownership, Management, etc., of Telegraph and Telephone Age, published 1st and 16th each month.

Editor,	Thomas R. Taltavall,	253 Broadway, New York.
Publisher,	John B. Taltavall,	253 Broadway, New York.
Owners,	John B. Taltavall,	253 Broadway, New York.
	Thomas R. Taltavall,	253 Broadway, New York.

Known bondholders, mortgagees, and other security holders, holding 1 per cent or more of total amount of bonds, mortgages, or other securities: None.

JOHN B. TALTAVALL, Publisher.

Sworn to and subscribed before me this 17th day of March, 1913.

Theodore L. Cuyler, Jr., Notary Public, Kings County

Certificate filed in New York Co.

(My commission expires March 30, 1914.)

Damage to Lines by Storm and Flood.

During the past month cyclones, sleet storms and floods in quick succession have wrought great damage to telegraph and telephone lines in some of the States of the Middle West. Beginning with a cyclone in Omaha, where much damage to lines resulted, the storm took on the character of a blizzard when it reached Chicago, and the attendant sleet ruined telegraph and telephone property over a wide expanse of territory. In Ohio and Indiana a vast downpour of rain caused several floods, which destroyed much more property. So, altogether, the telegraph and telephone companies have had a hard time. It is interesting, however, to note how readily their organizations responded to these emergencies, and before the storms and floods had expended their fury linemen were on the ground repairing the damage.

As a rule communication is seriously crippled under such circustances, but it is not always that it is entirely destroyed. There are so many lines running in different directions from the principal cities that it is generally possible for the companies to establish communication between the large telegraph centres in a roundabout way if the direct lines are destroyed, but unfortunately the destruction of property goes on year by year as of old.

Much improvement has been made in line construction in late years, but the forces of nature still remain superior to man's efforts, and how to minimize the destruction is a problem that yet baffles telegraph and telephone engineers. Apart from the enormous cost of placing important circuits underground over large areas of territory, the operation of such lines would be attended with difficulties that are not encountered in the working of aerial lines. This fact, together with many other important considerations, does not hold out much promise for relief in that direction. The best the companies can do is to build their lines in as substantial a manner as possible, and take chances of their destruction by storm.

Make the Best Use of the Present.

In most every human breast there is a yearning to be different to what we are—in other words the average person is dissatisfied with his present environment and condition. Many entertain the notion that if they were placed in different circumstances they could accomplish something in this world, and because they cannot at once attain their hearts' desire they simply neglect the opportunities of the present, with the result that they do nothing at all. They fail to see that they can accomplish something where they are.

Many an operator has set his thoughts upon a manager's or a superintendent's position, or some other post of greater importance than his present one, and expects it to come to him by wishing for it. If it does not he becomes dissatified with his lot, and allows the foolish idea to gain entrance to his mind that he is a victim of adverse influences. He should be preparing himself to fill higher duties and responsibilities if he would succeed.

Emerson says: "Knowledge comes by eyes wide open and working hands; and there is no knowledge that is not power."

The great trouble with many is that they want to realize their ambitions without work, but such a result is impossible. If one will take the trouble to think he will soon realize that progress and knowledge come by slow degrees. To travel a mile you must pass over a space of five thousand two hundred and eighty feet, and there is no possible way of making the number of feet any less. The same law applies to progress in the material world, and the law is inviolable. Each step we take brings into our lives an experience that we did not before possess and then we are ready to take another step; and so it goes.

When one realizes the object of his desire does he find it to be all that he pictured? Usually not. That "distance lends enchantment to the view" is a truth that all must admit, and as a rule things viewed from a distance generally fail to come up to our expectations in the reality. However, this is as it should be, for if one were perfectly contented with the things of the present he would become inactive. But the fact that there is always something beyond, something better to look forward to, should inspire us to do the best we can under present conditions, and thus lead us to realize our ambitions.

The fact remains, however, and it is unalterable law, that we must learn the lessons of to-day before we can take up those of to-morrow. No one has yet succeeded in getting a better position by sitting down and waiting for it to come to him. He must be prepared for it and work for it. If by any chance he gets into a position for which he is unfitted, the fact will soon be found out, and he must step aside for one better qualified to fill it. Learn all you can, and do the best you can in the present circumstances, and the future will bring its rewards.

English Government Officials Dabbling in Wireless Stock.

The parliamentary inquiry into the wireless contract between the British Government and the Marconi Wireless Telegraph Company has developed some astonishing facts which involve several high officials in speculating in Marconi stock. Sir Rufus Isaacs, attorney-general, and David Lloyd-George, Chancellor of the Exchequer, are implicated in these transactions.

Mr. Lloyd-George stated that beyond the two deals, which were now known to the public, he had never directly or indirectly bought or had an interest in any wireless concern. He asserted that there was nothing about the investment except what was perfectly reputable and creditable for anyone. He remarked that he was not a speculator, and had never bought to sell again. He later admitted that he had sold upward of 800 shares within three days of their purchase, realizing a profit of $3,745.

"Do you call that an investment?" asked one of the committeemen.

"What would you call it?" retorted Mr. Lloyd-George.

"I should be inclined to call it a gamble," was the reply.

Subsequently Mr. Lloyd-George divulged the fact that the second batch of shares he purchased was still in the hands of his bankers, who advanced the money. "I have paid one-third," he said. "I am paying interest on the loan."

Postmaster-General Herbert Samuel stated that he had had no dealings in any Marconi concern. He thought it would be highly improper for any postmaster-general to have an investment in any telegraph, telephone or similar concern.

Transmitting Photographs by Telegraph.

In the practical work of transmitting photographs from Southern France to the Paris morning papers, the use of the selenium cell of the Korn apparatus has been discontinued. The modified process uses films of etched gelatine, mounted on copper, ruled paralleled lines like those of half-tone being added for better effect in printing, and the copper-backed photograph is fitted around a cylinder. As the latter is rotated a metal point traces a spiral course over the surface of the photograph. Wherever the point touches the copper it completes an electric circuit, but the current is interrupted by the gelatine of the thicker parts of the picture.

At the receiving station a second cylinder is rotated in a dark box, in exact unison with the transmitting cylinder. This second cylinder carries a photographic film, and receives a beam of light, which is flashed intermittently by the current sending the picture. A synchronizing impulse sent at each revolution keeps the two cylinders rotating in perfect time. A much stronger current is employed than when the selenium cell is used, and the method therefore has the important advantage of being less susceptible to the disturbances inevitable on long lines.

Corners in Electrical Circuits.—Attention has been called by an investigator to a curious property of an electric current in that, when passing round a sharp corner, it apparently projects a discharge along its original line of motion. Another authority advances the theory that it is evidence of the existence of a true electric momentum, resembling that of water flowing in a pipe. Faraday had thought of the possibility of such a thing; but his experiments led him to conclude against its existence. Clerk Maxwell afterward raised the question again, and he also decided it in the negative. But it has lately been pointed out that the phenomenon is in accord with the most recent theory of the atomic nature of electricity, which, of course, had not been worked out in Maxwell's day.

Western Union *vs.* Louisville and Nashville in Louisiana.—The United States circuit court of appeals at New Orleans, La., on April 1 affirmed the judgment of the lower court in the suit of the Western Union Telegraph Company *vs.* the Louisville and Nashville Railroad Company. The Western Union asked for the right to erect and maintain its telegraph poles, wires and appurtenances along the line of the railroad and upon its bridges for thirty-five miles in Louisiana. Judgment for $6,000 was given in favor of the railroad company, the court giving the telegraph company the right of way for telegraph purposes asked for in its petition. The railroad company appealed against this decision with the result stated.

State Commissions.—In addition to the Inter-State Commerce Commission there are now commissions with jurisdiction over telephone companies in thirty-three states.

Course of Instruction in the Elements of Technical Telegraphy—XXXVII.

(Copyrighted.)

(Continued from page 207, April 1.)

[We began in our issue for October 16, 1911, the publication of a course of instruction in technical telegraphy. The course, which was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, is published for the benefit of those of our readers who desire to fit themselves for better positions in their vocation. It is elementary throughout and is divided into chapters, following one another in logical order.

The course has received the hearty commendation of telegraph officials and experts for its scope and accuracy and its sound practicability. In each chapter examples are presented in order to illustrate the application of the rules to practical cases, and each chapter is followed by a series of questions pertaining to the subject of the chapter, to be worked out by the student in order to review his progress. Back numbers containing these valuable articles can be obtained on application, at 10 cents per copy.]

The Detector.

A magnetic needle placed under a wire in which a current is flowing tends to assume the direction of the lines of force around the conductor.

Assuming the direction of current to be such that the N pole of the needle is deflected to the left when the needle is under the wire, then when the needle is placed over the wire the N pole will be deflected to the right, for the direction of the lines of force on one side of the conductor is of course contrary to that on the opposite side.

Ampere gives the following useful rule for determining the direction of the needle deflection: *Suppose a man swimming along the wire with the current and that he turns so as to face the needle, then the N pole of the needle will be deflected toward his left hand.* If the current is flowing along the wire in a direction from north to south, and the needle be placed under the wire, the man's left hand will point to the east, and the N pole of the needle will be deflected in that direction; but if the needle be placed over the wire, the man must swim on his back to face it, and his left hand will now point to the west. If, however, instead of changing the position of the needle, the wire be carried over the needle and then back in the opposite direction under it, both forces will act on the needle in the same direction, for when the man is on his back he is returning, and his left hand points to the east as before.

The needle will not stand out completely at right angles to the wire, owing to the directive forces of the earth's magnetism which are tending to make the needle point north and south, and if the current in the conductor is very feeble, and the lines of force correspondingly weak, the needle, being under the stronger influence of the earth's magnetic force, will move very little. If, however, the current in the wire is increased the needle, influenced by the stronger lines of force around the conductor, will be more widely deflected.

By increasing the number of turns around the needle a rough "indicator" or "detector" is obtained which shows by the movements of the needle the direction of the current, and indicates by the angle of deflection whether it is strong or weak.

The detector is useful in telegraph offices for localizing office faults: For instance, in the case of a disconnection, by placing the detector in the circuit at different points, and substituting a ground for the line connection, the current can easily be traced from the battery to the point of interruption; or, in the case of an office ground, by opening the wire at the switchboard and testing with the detector at different points along the current path in the direction of the battery, the fault can be placed between the point where a full deflection is obtained and the last point tested.

While exceedingly sensitive galvanometers, or current measurers, are constructed on the principle of the detector they are not direct-reading instruments, that is, they do not give the values of the currents directly in amperes, nor can they be quickly moved from one place to another owing to their delicate needle suspensions, so that for telegraph purposes, where direct readings and portability are necessary, Weston instruments are generally used.

QUESTION PAPER.

(1)—*a*. The bottom row of disks on a switchboard at an intermediate office is connected with ground. Show by a diagram the test necessary to prove a break east of the intermediate office. (See Fig. 40.)

b. Make a diagram showing the necessary test to prove a break on the western section.

c. Show the position of the plugs necessary to prove a ground on the eastern section.

d. On the western section.

e. Using the same switchboard, show two wires running through the board and explain the method of finger testing for a cross.

(2) In Fig. 41, disregarding the earth plug, what is the circuit of the western battery with a dead ground at *f*?

(3)—*a*. A magnetic needle is placed under a wire running east and west. In what direction will the N pole of the needle point if the western end of the wire is at a higher potential than the eastern end?

b. If the eastern end is at a higher potential than the western end?

(4) A magnetic needle is placed in the center of a coil of wire. How is it that the forces exerted on the needle by the current passing over and under it are not counteracted?

(5) Explain the construction of a detector.

(6) How many forces act upon a magnetic needle placed under a wire in which a current is flowing?

(7) There is a break in the circuit of the local apparatus in connection with a spring-jack wedge. Draw a diagram and show how, by using a detector, you would locate the disconnection.

(8) Make a similar diagram including battery wedge, local apparatus and line, and show how you would locate a ground in the home office by means of a detector.

(To be Continued.)

Rapid Transmission of Cotton Reports.

One of the greatest events with the telegraph companies and the Atlantic cable companies is which shall be the first to announce to the Cotton Exchanges throughout the United States and Europe the United States Government cotton report. The United States Government issues these reports periodically on a fixed day, at a fixed hour, and at a fixed minute. The Postal Telegraph Company and the Western Union Company's representatives wait eagerly at the government office at Washington to get the report on the instant that it is issued. The report is then flashed on the wires and through the cables to the various Cotton Exchanges, where it is instantly announced.

On March 20, 1913, when the report was issued at Washington by the government at 10 o'clock a. m. the Postal Telegraph and Commercial Cable Companies announced it in the Liverpool Cotton Exchanges in less than one minute thereafter.

New Books.

Regulation, Valuation and Depreciation of Public Utilities, is the title of a book by Samuel S. Wyer just issued by The Sears & Simpson Company, Columbus, Ohio.

This book is, as the author states, an unbiased discussion and concise compilation of the pertinent, economic, engineering and legal facts relating to the public and public utilities, and not a partisan appeal for the rights of either. The aim of the author has been to establish a code for both, rather than an ex parte argument for either interest.

The book is limited to the discussion of basic principles, and the author's own argument is fortified with numerous digested opinions of experts and judicial opinions, many of the latter being from the United States Supreme Court. The book is therefore the summation of the amassed thought and experience of many minds covering a period of several years.

The volume covers the following subjects: The public and the public utility; fundamental definitions; economics of utility problems; governmental power to regulate utilities; protection of utilities from adverse regulation; requirements of regulations; relief from oppressive regulation; depreciation; electrolysis as a form of depreciation; legal status of electrolysis; valuation; going value, and going concern value of utilities; principles governing cost of utility service, and engineering data pertaining to utility regulation; valuation and depreciation problems. In addition to these there is a chapter giving reference data, which contains several tables of value to the public utility engineer. Electricity in every phase of its relation to the main subject is treated very completely, and, altogether, the book will be one of great service to the managers of public utility corporations. It has forty-seven illustrations, including curves of costs and operation, and showing the depreciating effects of various adverse influences upon timber, pipes and other forms of property.

The book is bound in flexible leather and has 314 pages printed on extremely thin paper, which reduces the thickness of the volume very materially. The price is $5.00 net, postpaid, and copies may be obtained from Telegraph and Telephone Age, 253 Broadway, New York.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

Why is it possible to express in ampere-turns the magnetism developed in a piece of iron about which a coil of wire is wrapped?

Does the position of any particular turn of wire affect the quantity of magnetism developed in the core?

Will the turn closest to the core develop more magnetism in the latter than one on the outside of the coil?

What relation does the quantity of wire, which can be wound within a certain space upon a magnetic core, bear to the diameter of the wire?

How may the number of turns of wire in a coil be estimated without measuring it?

By what other name is the American standard wire gauge known?

Is it based upon any fundamental relation between the sizes of wire designated by the different numbers?

What other gauge is in common use, and in what country is it largely used?

Describe the general features of the gauge of the ring pattern.

What is meant by the term residual magnetism?

Is it desirable in a magnet?

What relation exists between the length of the core, and the amount of residual magnetism in the core?

What is meant by the term magnetic inertia?

What is the effect of filing a magnet, and what is the ultimate result?

What is a polarized armature?

What is a neutral armature?

What is the "spectrum" of an electromagnet?

What is the effect of bringing the armature of a magnet into actual contact with the pole faces?

What becomes of the lines of forces which pass through the air when the armature is in contact with the cores of the magnet?

What is magnetic "hysteresis," and what is the cause of it? *(To be Continued.)*

Union Pacific's New Telegraph Headquarters in Omaha.

The telegraph operating room in the Union Pacific Railroad Company's new general office building in Omaha, Neb., is 53 feet square, affording ample space for present and future requirements. A commodious locker room adjoins the main office, while lockers are placed near the telegraph tables for the telegraphers' typewriting machines. All furniture

FIG. 1—NEW HEADQUARTERS UNION PACIFIC RAILROAD, OMAHA, NEB.

and fittings are new, and in harmony with the woodwork finish of the building.

Cables and wires are brought into the telegraph office, and to the telegraph tables by a complete and comprehensive conduit system, consisting of pipes of various sizes. Approximately 25,000 feet of rub-

FIG. 2—J. B. SHELDON, SUPERINTENDENT OF TELEGRAPH.

ber covered wire is laid in these conduits, extending from the distributing frame to operating, repeater and multiplex tables. This is sufficient to care for all present and future connections.

In addition to the conduits within the office, there are three two inch pipes leading from the office distributing frame to the wire shaft, extending up and down between floors, for the main cables coming in from the outside underground; and also three similar pipes leading to the telephone terminal room to carry cables or wires from the telegraph office to other locations in the building.

The operating tables are of solid quartered oak, quartette style, and of special design. Drawers are provided on each side for the various kinds of blanks; and a wire runway extends lengthwise underneath leading to and connecting with the floor conduit, thus affording a convenient and satisfactory way of taking care of instrument wires.

The repeater and multiplex tables are of the

FIG. 3—TELEGRAPH OPERATING ROOM.

standard American Telephone and Telegraph Company pattern, and have been furnished by the Western Electric Company, which has also furnished the entire equipment of telegraph and telephone apparatus.

The switchboard is a combination telegraph and

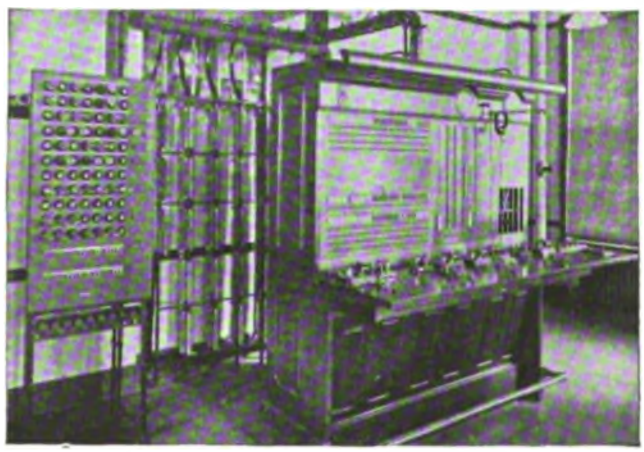


FIG. 4—MORSE AND TEST SWITCHBOARD.

telephone Morse board with special features to meet the Union Pacific's conditions. The present capacity of the board is for forty wires, each carried through eleven jacks. Six are used for making tests and patches in the test panel. The other five are in the Morse panel, and are used for cutting in loops to outside offices. Telephone jacks are also provided, the circuits being composited. Composite, simplex or phantom coils may be connected direct to jacks, while the leg from each duplex set to operating table is carried through four jacks, which have a high insulation resistance value. Four sets of Morse instruments are located conveniently for testing purposes. Under normal operating conditions the board is entirely free of cord and plug connections.

FIG. 5—ONE OF THE TELEPHONE MESSAGE ROOMS

A double scale voltmeter, a combination milammeter and voltmeter, a Wheatstone bridge and a galvanometer, together with keys, jacks and plugs, complete the equipment required in testing and locating trouble.

FIG. 6—J. HILBERT, ENGINEER.

FIG. 7—P. F. FRENZER, LOCAL MANAGER.

FIG. 8—A. O. NICHOLS, CHIEF CLERK.

The distributing frame, located back of the switchboard, has an ultimate capacity of 100 lines and 600 pairs of terminals for local wiring.

The coil rack for composite, simplex and phantom equipment is located to the right, back of the switchboard, while a slate base panel is also provided adjacent to the switchboard for resistances, fuses and "time" relays. Sixteen time repeater relays are installed, each with contacts for operating two "time" circuits. The contacts are brought out on cords and plugged in at the switchboard at the "time" set for sending out "time" signals over the entire road each day to all offices and for regulating electric clocks at division and district terminal points.

Adjoining the telegraph operating room are two sound-proof telephone message rooms used for handling messages by composite telephone service. The equipment consists of a table of special design used in connection with a composite switchboard having a capacity of eighteen lines. By means of a key, the operator can cut any line through to the private branch exchange for long distance connections.

A pneumatic tube system consisting of approximately 17,000 feet of three-inch tubing is installed throughout the building. It connects with each department and with a central station in the southeast corner of the telegraph room. In and out tubes are provided for each of the thirty-six pneumatic tube stations. The system is used principally for handling messages to and from the telegraph office, but also serves in delivering correspondence and memoranda from one department to another by transfer carriers at the terminal station.

The private branch telephone exchange occupies a room on the same floor with and adjoining other offices of the telegraph department. Connecting with it is a comfortably furnished rest room for the telephone operators.

There are 251 local telephones connecting with the exchange, as well as four long distance composite lines. A chief operator and six operators are required for the operation of the switchboard. Service is continuous day and night.

Adjoining the telephone exchange room is a well-lighted and well-ventilated room in which are installed the terminal frame, storage battery and charging plant used in connection with the telephone exchange.

Mr. J. B. Sheldon, the superintendent of telegraph, had the direction of the work entailed by the transfer to the new quarters. It is probably due more to his executive ability and zeal than to any other factors that a high standard of efficiency has been maintained at all times on the telegraph and telephone lines of the road. It is also due to his foresightedness that all of the equipment installed is of the most modern obtainable. Mr. Sheldon is fortunate in having under him a capable staff, consisting of A. O. Nichols, chief clerk, John Hilbert, engineer, and P. F. Frenzer, manager in charge of local operations.

How Telephone Cable Is Made.

Merely stating that modern telephone cable consists of a group of copper wires, insulated by a wrapping of manila paper twisted into pairs and enclosed in a lead sheath, does not convey any idea of the complexity of the processes by which it is manufactured. These processes, as carried on in the Hawthorne factory of the Western Electric Company are described in a recent issue of the *Western Electric News*.

The materials of which cable is composed are copper wire, manila paper, tin and lead. The wire is known as "soft drawn," and differs from the so-called "hard drawn" wire used in outside line

FIG. 1—STRANDING MACHINES.

construction in its toughness and flexibility. The paper, which varies in thickness from 2½-1,000ths to 14-1,000ths of an inch, is especially made from the best manila rope fiber, and is consequently very tough and durable. The metals are chemically pure tin and lead.

The first process that is actually carried on is that of insulating the copper wire with its paper wrappings. The paper is applied to the wire at the rate of 2,400 to 3,000 "wraps" or turns a minute. Various colored papers are used, in order to make it easy to identify different sizes of wire or different pairs of wires in the finished cable.

The machine for pairing the wires is so adjusted that the length of the twist, that is, the number of twists to the foot, may be altered at will. Different lengths of twist are used for different "gauges" or sizes of wire. The twisted pairs of wires then go to the stranding machine to be formed into a cable.

After leaving the stranding machine the entire length of cable core is carefully tested, to make sure that none of the wires are broken, and also that the paper insulation is perfect. The next process, that of drying, is very important, for the quality and efficiency of the cable depend to a large extent upon the care with which it is carried out.

The core is placed in gas ovens heated to 215 or 230 degrees Fahrenheit, and is kept there for a period ranging from fifteen to forty-eight hours, depending on the size and length of the core, the amount of insulation, and the character of service for which the finished cable is intended.

When the core has been thoroughly dried it is put through the last manufacturing process, that of applying the lead sheath. The lead press, or sheathing machine, on which this operation is performed, is practically a machine for making lead pipe. It consists of a huge pot, or container for holding the metal, a core and die box and a hydraulic press.

The container is filled with molten lead, to which an alloy of three per cent tin has been added. The bottom of the container opens into the top of the core and die box. The "core" is a pipe through which the cable passes; the "die" is a mould surrounding the core. The cable to be covered passes into the back of the machine, through the core and the die. By this time the lead in the container is no longer liquid, but has cooled sufficiently to be in a plastic state. It would not do to apply the molten lead to the cable core, because the hot metal would burn the paper insulation off the wires.

The hydraulic press, working at an enormous pressure, forces the plastic lead through the die, or mould, and around the cable core, thus surrounding the paper-covered wires with a continous lead sheath of any length.

As soon as the finished cable is cool enough to handle, it is given a final and very thorough electrical test. The ends of the core are then impregnated in paraffin, and the sheath is sealed up so as to prevent possible entrance of moisture, after which the finished product is ready for shipment. Testing of the cable is one of the most important phases of its manufacture.

The processes described are those for making telephone cable in general. There are, however,

FIG. 2—CABLES REELED.

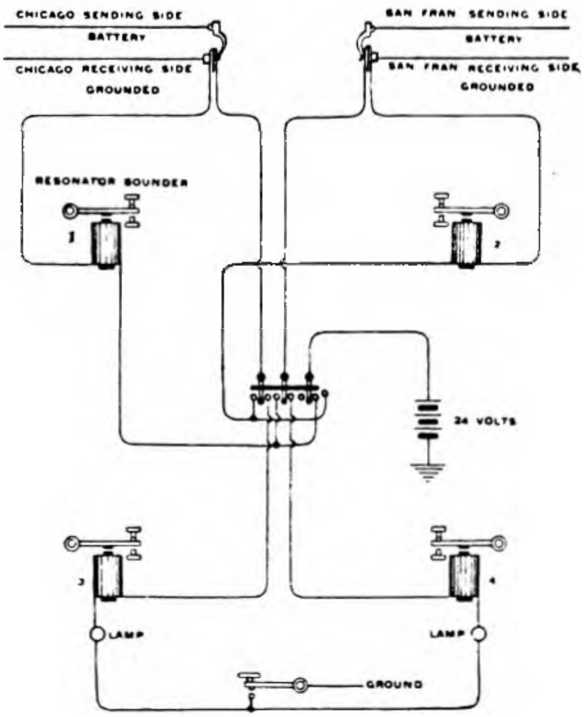
different types of cable, and their manufacturing processes vary. The so-called "silk and cotton cable," which is used largely on the telephone subscriber's premises, particularly for inter-phone installations, differs from the standard in that the wrapping of the bare wire consists of silk and cotton in place of paper. The so-called "wool cable," which is used in telephone exchanges between the manholes underground and telephone exchanges, has a wrapping of wool in place of the paper, the wool offering a greater resistance to moisture. Submarine cables carry both heavier insulation and heavier sheath.

Improvement in Quadruplex Operation.

BY J. B. DILLON, DALLAS, TEX.

In quadruplex operation an intermediate office cannot break unless one of the distant offices tells the other to "close," and even then an impatient operator may take possession of the circuit while the intermediate office is using it. Such a circuit might be from Chicago to San Francisco, via Dallas, Tex., Chicago wishing to send to Dallas, while San Francisco is sending to Chicago. In order to overcome the confusion which usually attends the effort of a way station to break in on such a circuit I have devised an arrangement, which I have called "The Little Precious Jumper," and which is described and illustrated herewith.

The apparatus consists of a nine-point switch and the usual line instruments. Single-conductor cords are used. The points of the switch are arranged as shown in the diagram, the levers being capable of rapid transposition. The lever at the right is of a width sufficient to cover two buttons, which engage the lever when the latter is thrown to the right.



IMPROVEMENT IN QUADRUPLEX OPERATION.

The diagram designates terminal offices at San Francisco and Chicago and an intermediate office at Dallas. The local duplex switches of the Dallas office are thrown for the Athearn duplex cut through and the nine-point switch is thrown to the left. With this arrangement Chicago sending will actuate the Dallas resonator sounder (No. 1) and pass on to San Francisco, while San Francisco will pass on to Chicago. Now, if Dallas wishes to break, the nine-point switch is thrown to the right, placing both pole-changers through sounder circuits 3 and 4, and thence through lamps to key, and therefore any movement of the key is heard by both terminal offices simultaneously; in other words, the intermediate office can break independently of either terminal office. When the lever at the right covers the two buttons, it carries twenty-four volts to sounders 1 and 2, and Dallas hears what either end says, although the circuit is cut.

If San Francisco wishes to send to Dallas, it is only necessary to switch the wires at the jack so as to place the resonator sounder (No. 1) on the side of the sending office.

If the nine-point switch lever is moved to the right and but one pair of leads is connected with the jack, the device can be used as an ordinary grounded leg, the only requirement being that the multiple switches be thrown as if cut through the Athearn.

If the switch is properly constructed, the movement of the lever will require no more effort than the manipulation of the ordinary telegraph key.

Telegraphers of Today.

An excellent opportunity is offered to telegraph people in general to become acquainted with over 600 prominent telegraph officials and others identified with the telegraph, the railroad, the submarine cable and press associations of the past generation, through their portraits and sketches of their careers as published in "Telegraphers of Today."

This work was issued in 1894 and includes photographic engravings and biographical sketches of all the individuals connected with the interests mentioned at that period, many of whom have passed away from their earthly labors. The younger generation, however, will find much of interest in looking upon their portraits and reading of their achievements in life. Many of them are still alive and in harness in the telegraph and other fields of activity.

Mr. J. J. Ghegan, president of J. H. Bunnell & Co., New York, who recently received a copy, expresses his appreciation of the work as follows: "Copy of 'Telegraphers of Today' received. I casually saw a copy of the book when first published, but never had I an idea that it was so beautiful, interesting and historically accurate. It should be of great interest to telegraphers with any sentiment in their make-up. It is magnificent, unique, and I truly pity those of the fraternity who fail to secure a copy before the edition is exhausted. Kindly send me five additional copies. I can use them to good advantage."

This book, which is 11½ x 14 inches in size, was originally published at $5 per copy, but in order to close out the remaining copies we offer them at $1 per copy by express, charges collect.

Address orders to J. B. Taltavall, Publisher, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Mr. R. H. Hathaway, superintendent Great Northwestern Telegraph Company, Toronto, Ont., writes: "Your excellent publication should be in the hands of everyone in any way connected with the telegraph business."

The Opposition Press Associations.

BY WALTER P. PHILLIPS.

At the close of the civil war, in 1865, quite a crop of newspapers was started which were debarred from receiving the Associated Press service. By 1872 there was a considerable number of these, notable among which was the *Boston Globe*. Several incipient associations for gathering news and concentrating it in New York for distribution had strutted their brief hour, these spasmodic attempts to organize something tangible finally resulting, in 1870, in a news-collecting agency called the American Press Association. Its president was Francis Wells, of the *Philadelphia Bulletin*, and John Hasson, an all-around newspaper man, was its general manager. Associated with Wells and Hasson were John Russell Young, who had recently been superseded as managing editor of the *Tribune* by Whitelaw Reid, and who had started the *New York Standard*; Joseph Howard, jr., of the Tammany organ, the *New York Star*, and Thomas Kinsella, of the *Brooklyn Eagle*. After Mr. Hasson's death, in 1872, his news gathering association was reorganized under the name of the National Associated Press. In due course Mr. Wells got his paper, the *Philadelphia Bulletin*, into relations with the Philadelphia branch of the Associated Press, and resigned as president of the opposition press association. James H. Goodsell, of the *New York Graphic*, an illustrated daily, was elected in his place. There were several managers of the National Associated Press, including George H. Sandison and William B. Somerville. Although John Russell Young had abandoned the *Standard*, and transferred his brilliant services to the *Herald*, the National Associated Press, as it went on, had as allies some of the most progressive newspaper editors and proprietors in the country, including General Taylor, of the *Boston Globe*; Joseph Howard, jr., of the *New York Star*; James H. Goodsell, of the *Graphic*; Colonel Johnson and Major Bundy, of the *Mail*; Stilson Hutchins and Colonel John A. Cockerill, of the *Washington Post*; Colonel Hermange, of the *Baltimore News*; and James E. Scripps, of the *Detroit News*, while its chief Western coadjutor was Melville E. Stone, of the *Chicago News*.

When James H. Goodsell failed in his general publishing and lithograph business in 1880, the prosperity of the National Associated Press began to decline, many of its papers having, through consolidations with Associated Press papers and the purchase, outright, of franchises, obtained Associated Press privileges, and two years later what was left of it was sold, for a song, to a newly organized company known as the United Press Association, Limited, of which Colonel Hermange was made president and Francis X. Schoonmaker, general manager. Colonel Hermange shortly afterwards got his paper, the *Baltimore News*, into affiliations with the Baltimore branch of the Associated Press, and resigned the presidency of the new press association. General Taylor was elected to succeed him. The most active men in this new enterprise were General Taylor, James W. Scott, of the *Chicago Herald*; Arthur Jenkins, of the *Syracuse Herald*; Edward H. Butler, of the *Buffalo News*; James E. Scripps, of the *Detroit News*; Louis A. Leonard, of the *Cincinnati Times-Star*; Charles R. Baldwin, of the *Waterbury American*; Colonel William L. Brown, of the *New York News*; and John H. Farrell, of the *Albany Press and Knickerbocker*. Colonel Brown was elected treasurer.

This organization, which began business in 1882, was the first press association to lease wires on any extended scale. It had lines to all points reached by the Mutual Union Telegraph Company, arranged for between Mr. Somerville, who was then in the service of the Mutual Union, and his former associates in the National Associated Press, to Boston, Buffalo, Cleveland, Detroit, Philadelphia, Baltimore, Washington, Pittsburgh, Cincinnati, Louisville, Chicago, Milwaukee, etc. A few months after these wires were leased, the Mutual Union Telegraph Company was absorbed by the Western Union and the United Press Association, Limited, being somewhat irregular in the payment of its accounts, lost its system of leased wires, the Western Union taking advantage of a terminating clause in the contract, and early in 1883 abrogated the agreement for non-payment of indebtedness.

At this juncture Walter P. Phillips, who had been manager of the Associated Press at Washington since 1878, was engaged to reconstruct the business of the United Press Association, Limited, on such wires as were available. Charles R. Baldwin, who besides being manager of the *American* was the cashier of the Manufacturers National Bank, of Waterbury, Conn., undertook to finance the enterprise. Under Mr. Phillips's administration the old debts of the company were paid off, and new contracts entered into with the Baltimore and Ohio Telegraph Company. Mr. Baldwin succeeded William L. Brown, of the *New York News*, as treasurer.

The following year, in 1884, a successor organization. The United Press, with an increased capitalization, was created, and General Taylor, Mr. Baldwin and Mr. Phillips continued to hold, in the new organization, the positions of president, treasurer and general manager, respectively. The United Press flourished on the wires of the Baltimore and Ohio Telegraph Company, and so quickly achieved a reputation for paying its bills promptly that it rapidly established cordial relations with the Western Union Telegraph Company, and obtained much more favorable rates to small cities and towns than had ever before been granted to a competitor of the Associated Press. This enabled The United Press to extend its business in every direction and to serve clients, outside the limited plant of the Baltimore and Ohio Telegraph Company, as far away from New York as the Pacific Coast. So friendly had the relations between the Western Union and The United Press become that when the former, in 1888, absorbed the Baltimore and Ohio Telegraph Company, no question was raised as to the carrying out of the extremely easy fifteen-year contracts that had been arranged between the Baltimore and Ohio and The United Press, although, during the time they yet had to run, a saving to The United Press (compared with the regulation Western Union rate of thirty-six dollars per mile per annum, for day and night wires) of more than half a million dollars was involved.

In 1887 a financial organization was created under the favorable laws of Illinois, with a capitalization of $1,000,000, with John R. Walsh as president. The object of this company, which was known as The United Press of Illinois, was to furnish a means of consolidating the telegraphic news interests of all the newspapers forming The United Press, and those which were members of the various Associated Press organizations. The first step taken was to lease The United Press of New York, which, however, continued to be the operating concern, to The United Press of Illinois, and the next step was the making of a working arrangement with the New England Associated Press, through which the newspapers of both that and The United Press were served with the same report from one wire throughout the New England States. This combination saved the cost of the second wire from New York to Boston, Taunton, Fall River, Newport and New Bedford. The plan so favorably impressed the New York Associated Press papers that first the *Sun* and eight months later, the *Herald, World, Tribune, Times, Journal of Commerce, Mail and Express, Commercial Advertiser, Evening Post,* the *Staats-Zeitung* and the Brooklyn papers became members of The United Press. This was in 1891. Charles A. Dana, who had headed the consolidation movement and aided in carrying through the New England amalgamation, was chosen president, and John R. Walsh treasurer, the latter the president of the Chicago National Bank and owner of the *Chicago Herald.* General Taylor resigned as President of The United Press of New York in favor of James W. Scott, and William M. Laffan, of the *Sun,* was elected vice-president. The entrance of the Associated Press papers in New York to the new organization was the signal for the Baltimore Press Association, the Philadelphia Associated Press, the Southern Associated Press, the Associated Press of the State of New York and the former allies of the New York Associated Press in Canada, to make terms with The United Press. The stock of The United Press of Illinois was redistributed, and its ownership, which had been practically confined to John R. Walsh, Charles A. Dana, William M. Laffan, James W. Scott, Charles R. Baldwin and Walter P. Phillips, was extended so as to include James Gordon Bennett, Joseph Pulitzer, Whitelaw Reid and the *New York Times.* Up to this time, 1893, everything worked beautifully. But it still remained to join The United Press and the Western Associated Press, an antiquated and factional organization incorporated many years before under the laws of Michigan, and of which the president was Isaac F. Mack, of the Sandusky (Ohio) *Register.* For many years previously William Henry Smith had been its general manager, and since 1884 he had also been general manager of The New York Associated Press, with headquarters in the East, where he was very successful, in conjunction with Mr. Dana, in bringing the members of the Associated Press and The United Press into one organization, over which Walter P. Phillips was chosen to preside as general manager.

But the West was not so easy to manage as the East had been, and after putting the matter plainly before the members of the Western Associated Press, without carrying any plan for a permanent co-operation between it and The United Press, Mr. Smith wearied with well doing, resigned his position and retired to his home at Lake Forest, Ill., where he died in 1896. His attempts to harmonize differing views had revealed that there had been many internal disturbances in the Western Associated Press, extending over several years, and its most progressive members became convinced that the best plan would be to abandon it and form a new organization. Under the leadership of Victor F. Lawson, of the *Chicago News,* Charles W. Knapp, of the *St. Louis Republic,* and Melville E. Stone, president of the Globe National Bank of Chicago, who started the *Chicago News,* and sold it to Mr. Lawson, several years before, a new Associated Press was organized under the laws of Illinois, and eventually the business of the Western Associated Press was transferred to it. Mr. Lawson was elected president and Mr. Stone secretary and general manager. Various plans were made for operating the new organization in combination with The United Press, and for a wider distribution of United Press stock, but they came to nothing. Although the attitude of Messrs. Lawson, Knapp and Stone, who spoke for the new Associated Press, was apparently friendly and their propositions generous in the extreme, as far as could be judged by surface indications Mr. Laffan, who had been made vice-president of The United Press of Illinois, as well as The United Press of New York, was suspicious of some deep-laid scheme to overthrow The United Press, and Mr. Dana, sharing his views, all overtures from the Chicago people were rejected, one after another. The situation became strained and unsatisfactory, and when it was decided, in September, 1893, to go on separately, there followed immediately an odor of powder in the air, and the newspapers began choosing sides for a contest, the *World,* the *Press,* and the *Evening Post,* in New York; the *Inquirer, Press, North American, Bulletin,* in Philadelphia; the *Sun, American* and *Herald* in Baltimore; the *Star* in Washington; the *News* in Detroit, and others joining the Associated Press, and the *Chicago Tribune,* the *Detroit Journal,* the *Ledger, Evening Telegraph* and *Record* in Philadelphia, the *Washington Post,* the *Journal* and *Evening Times,* of Louisville, the *San Francisco Call,* and others coming into The United Press. The failure to complete the combination was a great disappointment to Mr. Walsh, and he soon ceased to be in sympathy with the plans and purposes of Messrs, Bennett, Reid, Dana and Laffan. He finally resigned as treasurer and joined

Mr. Medill in taking sides with their Chicago friends. This lost to The United Press the *Chicago Tribune* and *Chicago Herald*, to say nothing of the financial support of Walsh, whose influence with the newspapers of the West was very strong. He immediately induced the *Louisville Courier-Journal* and the *Evening Times*, and many others to change their allegiance. Incidentally, he was made treasurer of the Associated Press, and his chief object in life, thereafter, seemed to be the ruination of The United Press. The revenues fell off $70,000 per annum in Western territory alone, and ground was constantly lost in other directions, because Mr. Walsh's moral and financial support had been withdrawn. But the fight was kept up, and an unequal and expensive one it was with Walsh turned traitor, until April, 1897, when Mr. Reid, who had been somewhat disaffected for some time, and Mr. Bennett, whose interest in a contest that had cost him, as well as Messrs. Reid and Hearst and the *Sun* and *Times*, a lot of money, had never made him particularly keen to prolong hostilities, were understood to be wandering along the banks of the Jordan, casting furtive and friendly glances toward the land of Canaan. Reports to this effect, coupled with many others, such as the intended withdrawal of the *New York Times*, the *Boston Herald* and the *Washington Post*, and the delivery, to the Associated Press, by James E. Scripps, of his brother's Cleveland, Cincinnati and St. Louis papers at the proper and appointed time, were dinned into the ears of Messrs. Dana and Laffan, and were unquestioningly accepted as facts. And although they had said all along, in face of Walsh's disaffection and in the presence of numberless small calamities, "We will go on; the *Sun* will pay its share of the losses no matter what they are—it is never too late to surrender," Mr. Dana gradually lost confidence in his immediate associates and nothing could restore it. One of the outcomes of his disturbed state of mind was that he instructed, or at least permitted, Mr. Laffan to say editorially, in the evening edition of their newspaper, that the *Sun* had withdrawn from The United Press. This startling piece of news was known all over the country in an hour. Some of the Associated Press papers added, on their own account, that very shortly The United Press would have passed "to where, beyond these voices, all is peace," as Tennyson expresses it, and others were very impolite in what they said. The *Sun's* unexpected announcement was as the earthquake shock that destroyed the house that was builded upon a rock. In a few weeks the disintegration of The United Press was almost complete. Most of its members and clients were taken into the Associated Press with open arms, particularly the *New York Herald*, *Tribune* and *Times*, the *Boston Globe*, *Herald*, *Post*, *Advertiser*, *Record* and *Transcript*: also the *Philadelphia Record*, *Ledger* and *Evening Telegraph*, but Messrs. Dana and Laffan extended and expanded the "Laffan" service, both here and in Europe, and relied on it for the *Sun's* use, refusing, steadfastly, to have any dealings with their former New York allies or with the Associated Press. "We want no more partners. We have had a few and we didn't like them," said Mr. Laffan when the *Sun* was invited to join the *Herald*, *Tribune* and *Times* in a transfer of their allegiance to the Associated Press.

As for The United Press, it was obvious that the day of its destiny was over, and with characteristic alacrity it made an assignment, and retired from the field. Such of its papers as could not make satisfactory terms with the Associated Press, or which had reasons of their own for not joining it, organized under the banners of Scripps-McRae and the Publishers' Press, now merged in the United Press Associations, and proceeded to work out their own salvation.

This is the sixteenth year that The United Press has been out of business, but even yet it is remembered by its army of employes as a thing of most fragrant memory, and veteran telegraph editors, throughout the country, often recall the efficiency and sprightliness of its service. Some of them contend that its existence marked an epoch in the history of journalism by bringing the business of news gathering and distribution nearer to an exact science than it had ever been brought before. "Approbation from Sir Hubert Stanley is praise indeed." An editor of national distinction, a man of few words and a seasoned believer in the Associated Press, in whose service he had served his apprenticeship as one of its Washington staff, once said of The United Press, "It is very ably administered." Be that as it may, the present generation of press association people may rest assured that it set a swift and uncomfortable pace for its rivals in the decade approaching the end of the nineteenth century, and those who regret its disappearance from among the world's activities may find a continuing solace in that precious thought of Longfellow's:

"The rapture of pursuing
Is the prize the vanquished gain."

Important Telegraph Engineering Articles.

Among the important telegraph engineering articles which have appeared recently in our paper, and which ought to be in the hands of every student member of the profession, is the description of the new quadruplex system of the Postal Telegraph-Cable Company described in the December 1, 1912, issue. The bridge duplex adopted by the Western Union Telegraph Company was described in our issues of December 1 and 16, 1912, January 1 and 16, and February 1, this year. These articles were fully illustrated, and copies can be obtained at ten cents each. We are now preparing articles on the Western Union new standard quadruplex system and the new switchboard, which will find space in our columns at an early date.

Eliminating the "Rattle" on Single-Line Weiny-Phillips Repeaters.

BY PHILIP G. MURPHY, POSTAL TELEGRAPH-CABLE COMPANY, PHILADELPHIA, PA.

Those who are concerned with the care of repeaters realize that the prompt elimination of a "rattle" is essential to good service, particularly when the set is on an important circuit. The habit of many, in their attempts to eradicate the trouble, of moving up one or sometimes both holding coils without first ascertaining on which side the rattle originates is a slipshod remedy, and generally results in a recurrence of the fault.

While quick action is desirable it is not good judgment to sacrifice effectiveness in obtaining it. Sometimes a repeaterman may successfully remove the "bug" in this manner, but his failures are likely to cause a prolonged interruption to the most important circuits. The proper method would be to locate the cause quickly, and then make necessary adjustments.

In order to determine the cause it is quite necessary that one should understand the principle upon which the automatic action is based. By studying the diagram of a repeater closely this is very easily acquired.

Assuming that we have one set of single-line repeaters in a circuit and that all the switches are normal, I have found that the best way to proceed is as follows:

1. Lift the transmitter armature on the left side with the left hand and hold it open. Now note carefully whether the relay armature on the right side is open or closed. If it is open and there appears to be ample room between the holding magnet and the armature move up the coil (coil and magnet are used here synonymously) until the magnet pull is sufficient to attract the armature quite firmly. In doing this care should be taken not to "freeze" the armature by jamming it with the coil. When the armature responds to the increased pull of the holding coil the circuit is ready for use.

2. If the armature fails to make contact the next step would be to reduce the tension of the retractile spring. My experience has been that in many cases of "rattling" repeaters the retractile spring was under an excessive tension, leaving no working margin for abrupt weather changes. It is obvious that should reducing the tension remove the trouble it would be necessary to move the main-line coils away from the armature in order to compensate for the change of adjustment which naturally results from reducing the pull of the retractile spring.

3. If the armature still remains open it is evident that there is no current in the holding coil. There are several causes from which this condition may arise, but the most likely one is that of a blown fuse, which can be readily replaced. In any other case it would be advisable to change sets.

4. If the right-hand relay armature remains closed when the left transmitter is opened by hand it is evident that the "rattle" does not come from the right side. As a test for residual magnetism of the main-line coils or inertia of the right hand relay armature it would be well to touch the top of the relay armature with the finger, pushing it away from the closed position. By feeling of the pull in this manner you can readily decide whether or not it has the proper strength.

5. Having adjusted the right side, pull open the transmitter on the right side with the right hand, and go through the same process on the left hand relay until the seat of the trouble has been found.

When there are two or more repeaters in the same circuit probably the quicker way to find the one that is causing the trouble would be to look for the set which is rattling on both sides. The others, if rattling, would only show it on the one side.

With a little practice this process of elimination can be executed in a few seconds, and will prove far more satisfactory than making the adjustments unsystematically.

Talking Moving Pictures.

Mr. Thomas A. Edison's latest invention, the Kinetophone, more popularly known as the "talking moving pictures," is a combination of film and phonograph. In producing these talking pictures it is, of course, essential that the film reel and phonographic record should be perfectly synchronized; that is to say, when the actor's lips form a word, that word must be reproduced by the phonograph at that instant, otherwise the effectiveness of the combination is entirely destroyed.

After a number of methods were tried it was found that by making use of an intercommunicating telephone system the best results were obtained. Where the talking pictures are shown the two attendants—the one operating the reels and the one

TELEPHONE USED FOR TALKING MOVING PICTURES.

operating the phonograph—are connected by means of a special three-wire private line circuit. At each end of the line a Western Electric inter-phone hand set affords a means of constant and instant communication between the two men, and in this way enables the operator of the picture machine to synchronize the pictures with the phonographic record. In addition to the hand sets a push-button and buzzer are installed at each station for signaling.

As a further aid to the moving picture operators the Edison Company is furnishing them with double head receivers, which act as an auxiliary for the hand set. This makes it possible for the machine man to attend to his work, and still be in constant communication with the phonograph man, and able to hear what he has to say at all times.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KERITE is time-proof. Installations, of which records extend back over thirty years, show no impairment in its reliability, and no variation in efficiency
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THE RAILROAD.

Mr. B. A. Worthington, president of the Chicago and Alton Railroad, Chicago, and a former telegrapher, made an address at the annual dinner of the American Railway Engineering Association, in Chicago, March 19. His subject was "Looking into the Future," and related to railroad development.

Mr. A. D. Hardin, a former telegrapher, has been appointed vice-president in charge of operation, maintenance and construction of the New York Central and Hudson River Railroad Company and the Ottawa and New York Railway Company, with headquarters at New York. Mr. Hardin is a graduate of the South Carolina University.

Mr. C. S. Rhoads, superintendent of telegraph of the Big Four Railroad at Indianapolis, Ind., has the sympathy of his friends in the untimely death of his youngest son, who was killed on March 31 by stepping on a heavily charged wire.

The Chicago Meeting of Railroad Telegraph Superintendents.

At the joint meeting of the Eastern and Western Divisions of the Association of Railway Telegraph Superintendents, which was held in Chicago, March 19, Mr. G. O. Perkins, chairman of the membership committee, reported that seventeen new members had been added since the annual meeting in New York last year, and Secretary P. W. Drew stated that there were now 111 active and seventy-five associate members. It was decided to hereafter print and bind the minutes of the division meetings, to be of the same size and form as those of the annual meetings.

In the discussion of the matter of wire crossings Mr. E. C. Keenan, of the New York Central Lines, stated incidentally that one of the best papers to be read and discussed at the St. Louis convention in May was on the subject of lightning arresters. Regarding wire crossings he said that all of the New York Central allied lines west of Buffalo had adopted specifications C-62-B. Also that these specifications were favored by the wire-using companies along his road, particularly by the Western Union's plant department.

Mr. George A. Cellar, of the Pennsylvania Lines west of Pittsburgh, said that one of the most difficult questions with which the wire crossings committee has had to contend is that of a uniform size of wire for signal circuits used at crossings.

Mr. F. T. Wilbur, of the Illinois Central, said that a new question had arisen, that of paralleled wires having to be transposed every three miles to avoid disturbances on railroad circuits, and he spoke of the difficulty of getting all concerned to agree upon plans to prevent these troubles.

Mr. W. J. Camp, of the Canadian Pacific, Montreal, Que., stated that in Canada a set of specifications had been formulated inferior in a way with those of the United States, but after test cases these specifications were endorsed by the railroad commissions. Originally, wires were required to be twenty-two feet six inches above the rail. The Canadian Pacific fought for and succeeded in having this distance increased to twenty-five feet, and also insisted on all crossing wires being all copper. Referring to the subject of telephone train-dispatching circuits, he stated that the Canadian Pacific had authorized the construction of 1,100 miles of circuit this year, which would make a total of 6,000 miles on the Canadian Pacific.

Railway Telegraph Superintendents Convention.

Arrangements for the St. Louis convention of the Association of Railway Telegraph Superintendents, May 20-22, are now assuming definite form. The proceedings of the joint meeting of the Eastern and Western Divisions at Chicago on March 19 fairly foreshadowed the character of the convention, and it was developed on that occasion that the annual meeting will be a most important and interesting one. Papers of unusual excellence are promised, and many pressing matters will come up for consideration. Questions of growing consequence are constantly developing and demanding attention of the superintendents, and it is interesting to note the increasing technical character of the association.

As already announced the convention headquarters will be at the Planters' Hotel, where ample provision will be made for the display of apparatus. In this direction many improvements have been made in methods and applicances during the past year, and the exhibition feature of the convention will no doubt be an unusually attractive one.

The occasion will be one of such importance and interest that it is likely to bring out a large attendance.

Mr. P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railroad, Chicago, is secretary of the association.

Telephone Equipment for Erie Railroad Company's Private Cars.

The Erie Railroad Company is equipping its private cars with intercommunicating telephone systems which are similar in effect to those used in business offices and factories. President F. D. Underwood's car was the first to be equipped. It has a system of six stations interconnecting the staterooms, observation room, stenographer's desk and the kitchen. A conversation may be carried on between any two of the telephones, and orders transmitted, without either person leaving his place. The apparatus used was furnished and installed by the Western Electric Company. The telephones are hand sets, each equipped with a cord and plug. Jack plates are mounted on the car wall, each having a push-button and jack into which the plug of the hand telephone is inserted. When not in use the plugs are withdrawn, and the hand sets are stored away. The different stations are called by means of a buzzer system. The call buttons are arranged on a dial plate, and the system is so wired that only the buzzer at the telephone wanted is rung.

The telephone system is also arranged for making connections with an outside telephone line, so that local or long distance calls may be had from the car. The signaling current for calling the telephone exchanges is obtained from an interrupter operated from batteries.

EMERGENCY TELEPHONES ON PENNSYLVANIA ROAD.—It is stated that the entire main line of the Pennsylvania Railroad between New York and Pittsburgh will be equipped with emergency telephones. Every half mile, or as near to those locations as possible, a telephone will be installed for train, patrol, section and other employes to use in reporting accidents and anything else of immediate interest to the officials.

MORE TELEPHONES ON THE CHESAPEAKE AND OHIO.—The Chesapeake and Ohio Railroad officials have placed an order with the Western Electric Company for the apparatus necessary to equip the Big Sandy division with telephone train dispatching facilities. The circuit covers the entire section, a distance of approximately 135 miles, and extends from Ashland to Elkhorn City, Ky. The dispatcher will be located at Ashland. Twenty-eight way stations will be equipped with selective signaling and talking apparatus.

RADIO-TELEGRAPHY.

Institute of Radio Engineers.

At the regular meeting of the Institute of Radio Engineers, held in New York April 2, Messrs. A. E. Seelig and F. Van der Wonde, of the Atlantic Communication Company, presented a paper on the Sayville, L. I., high power radio-telegraph station. The description was of a general rather than technical nature, and was illustrated by a number of lantern slides. Much interest was shown in the paper, and the discussion was for the most part in the form of questions. In the absence of the president, Mr. G. W. Pickard, the chair was occupied by Mr. R. H. Marriott, who commented upon the paper as being the first detailed description of a powerful radio plant made public by presentation before a general engineering body. A vote of thanks was extended to the authors of the paper.

The next meeting of the Institute will be held at Columbia University, 8.15 p. m., May 7. In addition to the reading of an original paper, the new number of the proceedings, together with the Institute badges, will be distributed. Non-members who are interested in radio signaling are invited to attend.

PROTEST AGAINST GOVERNMENT WIRELESS SPECIFICATIONS.—Protests have been made to Secretary Daniels of the Navy by the Marconi and Telefunken Wireless Telegraph Companies against the form and character of the specifications drawn by the Naval Bureau of Steam Engineering for the new wireless station to be erected at Colon. The contention is made that the specifications are drawn in such a manner that they favor the Federal Electric Company of Pittsburgh, which built the Arlington naval radio station. The two protesting companies state that they are practically shut out, and that the Federal will be the only bidder.

DISTRESS CALL.—Axel H. Geerman, an electrical engineer, and a passenger on board the Swedish steamer "Texas," under trying circumstances sent a wireless distress call from that vessel which was disabled in a storm. The wireless equipment of the "Texas" was destroyed in the storm and it took Geerman thirty-six hours to repair it so he could send out the signal. The call was answered by the steamer "C. F. Tietgen" and the "Texas" passengers were all saved.

WIRELESS IN CHINA.—The Chinese Ministry of Communications proposes to erect wireless stations at Peking, Shanghai and Canton, and will erect other stations along the coast and in the northwest for military convenience. A wireless telegraphic department will be added to the College of the Ministry of Communications for the purpose of training men for this service.

TRANSATLANTIC RADIO EXPERIMENTS.—The radio experiments, which have been conducted for the past month between the Eiffel Tower in Paris and the Arlington station, near Washington, D. C., have been suspended temporarily.

WIRELESS IN BRAZIL.—The Brazilian Government will erect radio telegraph stations at Fortaleza, capital of Ceara, and at Porto Murtinho, State of Matto Grosso. The construction of a special telegraph line between Rio de Janeiro and the State of San Paulo has also been authorized.

The Old Timers' Reunion.

Much interest is being taken by the members of the Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps in the reunion at Detroit, Mich., August 26, 27 and 28, and from the inquiries coming in it is evident that there will be a large attendance.

Great enthusiasm is manifested over the event, and extraordinary preparations are being made by the officials and committees in charge to make the gathering a successful one in every respect.

Mr. H. J. Kinnucan, Detroit, Mich., president of the Old Timers, is succeeding in getting the people of that city interested in the reunion, and they will undoubtedly pay their respectes to the veterans in a manner befitting the occasion.

Mr. Frank J. Scherrer, New York, secretary of the association, is also very busy arranging the details of the reunion, as is also Mr. David Homer Bates, New York, secretary of the Society of the United States Military Telegraph Corps.

A. I. E. E. CONVENTION.—The annual convention of the American Institute of Electrical Engineers will be held at Cooperstown, N. Y., during the week of June 23. Mr. F. L. Hutchinson, 33 West 39th street, New York, is secretary.

BULLS AND LOVE.—One dot more or less does not often alter the complexion of things, but an extreme example is "Pop Hearts" for "606 Pearl St." It is stated that the operator who performed this feat was in love.

New Edition of Schneider's Electrical Testing.

The fourth edition of "Electrical Instruments and Testing," by Norman H. Schneider, is now on the press, and will be ready for delivery in a few days. Much new information is given on the use of the voltmeter in testing resistances, and the new tables will be found exceedingly useful.

The book will have about 300 pages and 149 illustrations. The contents by chapters are: Laws of Electricity; Galvanometers; Rheostats; Voltmeters; Wheatstone Bridge; Testing Sets; Current and E. M. F. in a circuit; Potentiometer; Charge and Discharge of Condenser; Telephone and Telegraph Cable Testing; Testing with Voltmeter; Testing Telephone Lines with the Voltmeter; Early Morning Tests; Location of Grounds and Crosses.

This is not a theoretical work, full of mathematics, but a clear, straightforward, positive help for the practical man, written by one who has had a wide and varied practical experience.

Mr. Jesse Hargrave, superintendent Mackay Telegraph and Cable Company, Dallas, Tex., and an electrical engineer of ability and high standing, is the author of the chapters on testing telegraph wires and cables and locating faults.

The price of the book will be $1.15, postpaid to any part of the world, and orders will be filled by Telegraph and Telephone Age, 253 Broadway, New York, on receipt of price.

For Sale.—Bound volumes of Telegraph and Telephone Age for 1912. Price $3.50. Sent by express, charges collect. This price covers the bare cost of binding and handling in addition to the regular subscription price of the paper. The binding is of substantial black cloth, with neat gilt lettering. The index is even more complete than usual, comprising, in addition to the regular alphabetical classification: The Cable, Obituary, Postal, Radio-Telegraph, Railroad, Western Union, Authors, Biographical, Book Reviews, Canadian Notes, Editorial, Legal, Municipal Electricians, Some Points on Electricity, The Telephone, Telephone Pioneers. In addition to the index for 1912, a complete index for the year 1911 has been added, thus greatly increasing the reference value of the work. This complete record of events of the year and the latest developments in telegraph, telephone, cable and wireless science should be in the library of every progressive member of these professions.

MUNICIPAL ELECTRICIANS.

Convention of International Association of Municipal Electricians.

The eighteenth annual convention of the International Association of Municipal Electricians will be held in Watertown, N. Y., August 19 to 22. The headquarters will be at the new Woodruff Hotel and the convention meetings and exhibits will be held in the Odd Fellows Temple, near by.

Arrangements are being perfected for what will undoubtedly be the largest convention of municipal electricians that has ever been held. Valuable papers on live and up-to-date subjects are being arranged for and these will all be of vital interest to the members.

The time when the municipal electrician was only a signal man has passed, and it is now necessary for him in order to be abreast of the times to be able to handle electrical problems that a few years ago were unthought of. The scope of the association has been extended and the papers and discussions will include not only fire alarm and police signaling, but also electrical inspection, municipal lighting, the joint use of poles, permissible voltages on overhead wires in cities, standardization of specifications for cables for municipal purposes and municipal ownership.

A special committee has been appointed to prepare a new constitution and by-laws, and report to the executive committee for its approval prior to the convention. There will be a meeting of the executive committee on Monday, August 18, at Watertown, N. Y.

Special attention will be given to the ladies attending the convention. On Wednesday they will be tendered a fifty-mile automobile ride "Round the Horn," stopping at Henderson's Bay for a fish dinner. They will also stop (on their way out) at Sackett's Harbor, and inspect the government reservation at that point. In the evening they will have a card party while the gentlemen are holding a "Rejuvenation of the Sons of Jove," after which all will join in a midnight luncheon. On Thursday the ladies will be entertained by the merchants of Watertown.

The annual dinner of the association will be held at the new Woodruff on Thursday evening.

On Friday all those attending the convention will be taken on a tour of the paper mills in the city, after which a special train will carry them to the St. Lawrence River and a steamer trip will be made through and around the Thousand Islands, the party returning by moonlight.

The entertainment for the men attending the convention will be confined to the evenings of Tuesday, Wednesday and Thursday and all day on Friday, so that nothing will interfere with the business sessions.

A novel feature has been arranged for by President John W. Kelly, Jr., i. e., all the official announcements, programmes, menu-cards, etc., will be printed on special paper made in Watertown. Another unique feature of the entertainment will be the automobile ride for the ladies in automobiles built in Watertown.

Mr. C. H. Bundy, superintendent of fire alarm and acting fire chief of Watertown, is chairman of the executive committee. He states that President Kelly has promised him that there will be an airship on hand, and as the president always keeps his word members are advised to keep an eye open for the airship.

Special arrangements are being made with the railroad companies for transportation. Special sleeping cars will leave the Grand Central station, New York, at 9:30 and 11:30 on the evenings of August 17 and 18, running through to Watertown without change. Further arrangements for the comfort of those coming from the West and Southwest will be announced later.

President Kelly, together with Clayton W. Pike, chief of the electrical bureau of Philadelphia, and J. Delmar Underhill, of the Okonite Company, New York, attended a meeting of the executive committee with chairman Bundy, at Watertown, on March 28 and 29, the other members of the committee being prevented from attending by the floods. They went over the situation thoroughly and the preliminary arrangements are now in splendid shape.

President Kelly's address is City Hall, Camden, N. J., and he will be glad to give any further information relative to the convention.

ATLANTIC CITY FIRE ALARM SYSTEM.—The engineers of the National Board of Fire Underwriters recently investigated the fire hazard at Atlantic City, N. J. In reporting their conclusions they refer to the fire alarm system. It is of the automatic type, is well maintained and in good condition. The headquarters are in a poorly protected building, jeopardizing the entire system. Only one box is successive, but all are non-interfering. The circuits are not overloaded, the underground work is extensive and construction good. The overhead circuits are on poles carrying high-potential lines, the leads down the poles being in iron pipes. The wiring in the fire stations and at headquarters is "only fair," the report states.

CANADIAN NOTES.

Canadian Telegraph Statistics.

According to statistics prepared by the Dominion Government there are fifteen companies engaged in commercial telegraph business in Canada. Fourteen of these companies reported, as follows: Cable companies—Anglo-American Telegraph Company, American Telegraph and Cable Company, Commercial Cable Company, Direct United States Cable Company, Halifax and Bermuda Cable Company, Pacific Cable Board; while those operating on land comprise—Anglo-American Telegraph Company, Canadian Northern Telegraph Company, Canadian Pacific Railway Telegraphs, Dominion Government Telegraphs, Grand Trunk Pacific Telegraph Company, Great North Western Telegraph Company, North American Telegraph Company, Timiskaming and Northern Ontario Railway Commission, and Western Union Telegraph Company.

The Anglo-American Telegraph Company provides land and cable service, while the Marconi Wireless Telegraph Company occupies a unique field, and cannot be classified with other telegraph organizations.

The cost of real property and equipment is given as $184,149,677, of which a large percentage refers to foreign corporations. The revenue from operation was $5,216,170.92, this referring wholly and definitely to Canadian business. Operating expenses are reported as $3,379,336.96.

The total wire mileage reported is 168,017.23, and pole mileage 40,783. There were transmitted during the year 9,252,540 land messages and 768,559 cablegrams. The Pacific Cable Board reported 2,131,376 words as compared with 1,849,613 in the preceding year.

There were 2,579 operators employed in the service, including 166 females.

News Service in Canada.

The morning paper section of the Eastern Press Association, Limited, of Canada, has completed arrangements for leased wire service, and the proposition for a day leased wire service has been submitted by the Canadian Pacific Railway Company's Telegraph. Mr. W. M. Godsoe, superintendent of the company at St. John, N. B., was present at the recent meeting of the Eastern Press Association in that city, and discussed the question of leased wire service.

The Canadian Pacific has leased a wire to the Eastern Press Association from Halifax to Montreal, and now has leased wires for press service extending from Sydney, C. B., to Victoria, B. C., as well as covering the territory from Quebec to London, Hamilton, Ont., and various points on the main line through Western Canada; also Saskatoon, Saskatchewan, Edmonton, Lethbridge and MacLeod, Alberta, and Nelson, B. C.

Canadian Telephone Statistics.—According to Canadian statistics there are in Canada 683 telephone companies, an increase of 146 during the past year. In Manitoba and Alberta the telephone systems are owned by the provincial governments. The aggregate capital of all the companies is $46,376,851, an increase of $6,232,869 over the previous year. The gross earnings of all companies were $12,273,620; operating expenses $9,494,688, and net earnings $3,178,987. There is a total of 370,884 telephones in use in Canada, equal to about one for every eight of the population.

Wireless in Northern Canada.—It is stated that the Dominion Government will erect radio telegraph stations at Pas, Man., and the proposed terminus of the Hudson Bay Railway, on Hudson Bay.

Telegraph Extension.—The Grand Trunk Pacific Telegraph Company of Canada, has recently established telegraph service between Regina, Sask., and Winnipeg, Man.

Mr. W. J. Camp, assistant manager of telegraphs of the Canadian Pacific Railway Company's Telegraphs, Montreal, Que., has returned from an extended trip of inspection to the Pacific Coast.

Meetings of Associations, Societies, etc., During 1913 and 1914.

Association of Railway Telegraph Superintendents, at St. Louis, Mo., May 20. Secretary, P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill.

Telegraphers' Mutual Benefit Association, New York, second Wednesday in March, 1914. Secretary, M. J. O'Leary.

International Association of Municipal Electricians, at Watertown, N. Y., August 19-22. Secretary, Clarence R. George, city electrician, Houston, Tex.

Old-Time Telegraphers and Historical Association and Society of the United States Military Telegraph Corps, at Detroit, Mich., August 25, 26 and 27. Secretary of the Old-Timers, F. J. Scherrer, 30 Church street, New York; secretary of the Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

Telephone Pioneers of America, at Chicago, Ill., October 16 and 17. Secretary, Henry W. Pope, 30 Church street, New York.

Sending Pictures by Telegraph.—Mr. Edouard Belin, the well-known French inventor of a system of transmitting pictures by wire, has succeeded in telegraphing a photograph from Bordeaux to Paris in four minutes.

Dinner of the Dot-and-Dash Club, Philadelphia.

The dinner of the Dot-and-Dash Club, of Philadelphia, held at Kugler's, March 28, and briefly referred to in our issue dated April 1, was a highly successful affair. A feature was the address of Mr. David Homer Bates, the veteran war telegrapher, and known all over the land as one of "Lincoln's telegraph operators." Mr. Bates gave an extremely interesting account of his experiences in the War Department, and told how President Lincoln spent most of his time in the telegraph office watching and deciphering telegrams received during the war period.

President S. S. Garwood, who acted as toastmaster, thanked Mr. Bates for his excellent address, and requested the diners to arise and remain standing with bowed heads for one minute, as a mark of respect to the memory of Abraham Lincoln.

This touching tribute was followed by the singing of "America" under the direction of Mr. W. W. Donnelly.

Mr. Charles P. Bruch, vice-president of the Postal Telegraph-Cable Company, New York, was the next speaker. He gave a brief biography of John Fitch, who invented and built the first successful steamboat in the world and launched and navigated it on the Delaware River at Philadelphia in May, 1787.

Mr. T. E. Fleming, of the Western Union Telegraph Company, New York, made a few interesting and witty remarks, and was followed by former assistant postmaster-general P. V. DeGraw, a well-known old-time telegrapher. Mr. DeGraw described the operation of the parcel post, with which he was prominently identified.

Secretary C. B. Wood referred to the growth of the Dot-and-Dash Club, and read several letters of regret from invited guests who were unable to attend the dinner, among them being Messrs. A. G. Saylor, general manager Eastern Division Western Union Telegraph Company, New York; C. C. Adams, vice-president, and E. B. Pillsbury, general superintendent, Postal Telegraph-Cable Company, New York; and H. D. Reynolds, superintendent, Postal Company, Buffalo, N. Y.

Mr. Frank E. Maize spoke of the Electrical Bureau of Philadelphia of which he is manager, and Mr. A. S. Weir, vice-president of the club, told of the birth and growth of the Electrical Aid Society of the City of Philadelphia. The society was organized February 17, 1888, and over $40,000 has been expended in sick benefits and more than $6,000 paid to the beneficiaries of deceased members. The relief fund, which was started with a donation of fifty cents, has done much good among distressed members of the craft. The society has a cemetery lot in which are buried the bodies of those of its members whose interment has not otherwise been provided for.

Mr. John A. Chapman, of the American Telephone and Telegraph Company, followed Mr. Weir with interesting remarks, and Mr. C. H. Congdon, an old-time telegrapher, now in the newspaper business, spoke on "Fraternity." The dinner was concluded with the singing of "Auld Lang Syne."

Among those present were: V. J. Albert, J. V. Berger, B. F. Bryant, W. S. Burleigh, W. P. Bowers, O. C. Balmer, C. P. Bruch, R. A. Black, F. D. Byrne, E. W. Bartholomew, E. C. Boileau, C. E. Bagley, C. H. Bigler, M. D., C. H. Congdon, S. M. Custer, J. A. Chapman, J. W. Collins, W. W. Donnelly, C. E. Diehl, S. Doherty, A. W. Ford, L. D. Firman, S. S. Garwood, F. W. Griffin, D. R. Gibbs, H. W. Hetzel, J. E. Janney, C. M. Knapp, F. J. Kernan, E. H. Locke, W. V. Madden, F. E. Maize, I. D. Maize, R. C. Mecredy, R. L. Massey, J. A. McLeod, R. C. Murray, Dr. R. F. MacDonald, W. A. Maloney, W. H. Pearson, J. S. W. Phillips, J. W. Reed, A. G. Strickland, J. T. Sheldrake, M. N. Redding, E. H. Shriner, A. S. Weir, C. B. Wood, J. H. Wilson, A. G. Wallace, F. R. Webb, H. Williams, C. W. Wendel, A. E. Zintl, C. W. Zecher.

OBITUARY.

John F. Jones, aged 52 years, assistant superintendent of the North Side Bureau of Electricity, Pittsburgh, Pa., died in that city, March 22.

John D. Cruise, aged 69 years, a member of the United States Military Telegraph Corps and a well-known member of the telegraph profession, died in Osawatomie, Kan., March 26.

John R. Dixon, aged 71 years, an old-time telegrapher and a member of the United States Military Telegraph Corps, died at La Grange, Ill., March 27. This is the thirteenth death among the members of the United States Military Telegraph Corps, since the Jacksonville reunion last October.

George M. Schuster, aged 59 years, a well-known old-time New York telegrapher, died in Brooklyn, April 3. He was for many years an employe in the commercial news department at 195 Broadway, but for the past twenty years had been identified with the Dow-Jones financial news bureau, on Broad street, New York.

The Death of J. P. Morgan.

J. P. Morgan, the eminent American financier, who died in Rome, Italy, April 1, was a director of the Western Union Telegraph Company, the Central and South American Telegraph Company and other electrical interests.

Mr. James A. Scrymser, president of the Mexican Telegraph Company and of the Central and South American Telegraph Company, in referring to Mr. Morgan's death, related several anecdotes showing the financier's readiness to aid a good cause.

"I knew Mr. Morgan for more than forty years," said Mr. Scrymser, "during which period I was associated with him both socially and commercially. On one occasion he invited me to meet at dinner a group of business men at the Union League Club. After the dinner had been served I made a personal appeal to him and there ensued a discussion which lasted less than fifteen minutes. At the end of that time Mr. Morgan arranged a subscription of $5,000,000 for the Central and South American Telegraph Company."

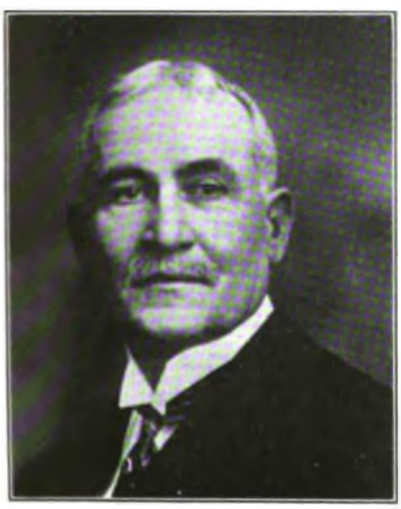
Colonel C. P. Higgins, Sergeant-at-Arms United States Senate, a Former Telegrapher.

Charles Patrick Higgins, of St. Louis, Mo., whose appointment to the position of Sergeant-at-Arms of the United States Senate at Washington, D. C., is announced in another column of this issue, is an old-time telegrapher, and, as is usually the case with successful men graduated from the telegraphic ranks, began as a messenger. Starting his active career with the Pacific and Atlantic Telegraph Company he soon became an operator, and afterward worked for the American Union and Western Union Telegraph Companies.

Between 1878 and 1879 Mr. Higgins handled the St. Louis end of the *Globe-Democrat* wire from Washington, and for several years worked for the Associated Press. He was one of the fastest receivers in the business when he was at the height of his career as an operator. This was in the days before messages were taken from the wire on a typewriter; the receiving operator had to copy with pen and stylus. Mr. Higgins held the record for speed in receiving, which was then much harder work than it is now.

The title of "Colonel" is always given to the Sergeant-at-Arms of the Senate, and the subject of this sketch now bears this distinction.

Colonel Higgins was the unanimous choice of the Democratic caucus when he was nominated for the



COLONEL C. P. HIGGINS, WASHINGTON, D. C.

high office he now holds, and was elected in the Senate by acclamation. He has held other important offices in his day, having been Excise Commissioner of St. Louis, in which trying position he made a very satisfactory record, and was chairman of the board of election commissioners under Governor Stone. He has been active in State and national politics. He was delegate to two national conventions, and alternate-at-large to the Democratic National convention held in Baltimore last year.

R. W. Daniels, Former Telegrapher, Now Prominent Lawyer of Chicago.

Mr. Robert W. Daniels, a well-known Chicago lawyer, whose portrait is presented herewith, was a former telegrapher, in which line of work he had a large experience before he entered the legal profession. He was born in Mansfield, Ohio, February 5, 1880, and entered the telegraph service October

R. W. DANIELS, CHICAGO, ILL.

26, 1897, on the Cleveland, Cincinnati, Chicago and St. Louis Railroad. He was subsequently employed on various railroads as telegrapher, station agent, wire chief, chief train dispatcher's clerk, train dispatcher and freight claim investigator. Later he worked for the commercial telegraph companies at Pittsburgh, Cleveland, Indianapolis, Detroit, St. Paul, San Francisco and Chicago, being assistant wire chief for the Postal Telegraph-Cable Company at Chicago in 1906 and 1907.

Mr. Daniels received the degree of LL. B., from the Chicago-Kent College of Law in June, 1911, and was admitted to the Illinois bar. He immediately thereafter began the general practice of law at Chicago as the assistant to Felix J. Streyckmans, Interstate Commerce attorney. On May 1 he will become a law partner of Benedict J. Short, formerly first assistant State's attorney at Chicago. Mr. Daniels will make a specialty of Interstate Commerce law.

FRAUDULENT TELEGRAPH SCHOOL.—M. A. Sweny, founder and manager of the "Pacific Railway and Telegraph Institute," at Seattle, Wash., has been sentenced to eight months in jail for using the mails in a scheme to defraud the pupils of his so-called school, by failure to furnish them with the instructions in telegraphy which he agreed to give them.

NIGHT LETTERGRAMS IN ENGLAND.—Night lettergram service was instituted in England April 1. The rate is six words for one penny (two cents). Night lettergrams are delivered by the first mail in the morning, with the idea of benefiting those who missed the last post at night.

Nine-Hundred-Pair Telephone Cable.

In his recent annual report Mr. Theo. N. Vail, president of the American Telephone and Telegraph Company, referred to a new type of cable, providing 900 pairs (1,800 wires) in the space formerly required for 600 pairs. The following data concerning the new cable will be of general interest:

Size of conductors—No. 22 B. & S. gauge.
Insulation—Paper.
Material of sheath—Lead.
Thickness of sheath—1/8 inch.
Diameter over all—2 5/8 inches.
Approximate weight per foot—9 1/2 pounds.

It is not expected that this type of cable will be used in all cases as a substitute for 600-pair cable, which has been up to this time the largest size. It will, however, be of considerable value at congested points.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

Edward B. Hurd, aged 35 years, an operator, and son of John B. Hurd, formerly and for many years identified with this office, died at Red Bank, N. J., March 26.

Mr. John Rathbone, one of the veterans of the office, who has been absent on account of illness for the past six months, is still confined to his home. His friends hope for his early recovery.

Miss Margaret Regan has been appointed assistant chief of the automatic department.

The baseball and athletic season having begun, Mr. R. J. Murphy, manager of sporting events, has full charge of the telegraphic arrangements.

Mr. James C. Young, manager of the Gold street office and captain of Company "A," Forty-seventh Regiment, was presented with a magnificent sabre by the officers and members of his regiment, April 5.

Mr. John S. Murray, of this department has resigned. He was married on March 20 to Miss Laura Bennett, and is now residing at Port Jervis, N. Y.

James McParlan, chief of the marine service, died of pneumonia on April 7, after a few days' illness. He entered the employ of the company at 145 Broadway, New York, in 1868. Four years later he was assigned to night work in the marine department, and the following year he took charge of that important branch of the service. It is here that centers for promulgation the announcement of the arrival and departure of every vessel coming under the observation of the reporters located in the Western Union look-out towers of Fire Island, Sandy Hook, New Jersey Highlands, Quarantine and City Island, which completely covers the approaches to the port of New York from all sides. Mr. McParlan was a man of sterling integrity and his sudden death was a great shock to his many friends.

ALBANY, N. Y., POSTAL.

The deep sympathy of the telegraph fraternity is extended to Mr. Quentin Andrews, assistant chief operator of this office, in the death of his wife on March 17 after giving birth to twins the day before. One of the twins, a girl, died on April 1. Mrs. Andrews was employed in this office for several years. She possessed excellent business qualities and was a valued member of our force. She endeared herself to her fellow workers and to the public by her affable and gracious manner. In her home circle she was a devoted wife and a true Christian and charitable. Her untimely death was a severe shock to her many friends, who were thrown into gloom by the sad ending of her short married life. The heartfelt sorrow of many friends goes out to Mr. Andrews and his motherless babe in the pathetic taking off of this beautiful young wife and mother.

"While summer days are long and lonely,
While autumn sunshine seems to weep,
While midnight hours are bleak, and only
The stars and clouds their vigils keep,
All things that live will moan thee.
All fond regrets forever wake;
For earth is happier having known thee,
And heaven is sweeter for thy sake!"

DALLAS, TEX., WESTERN UNION.

Mr. E. C. Davis, formerly all-night chief in this office, but recently from San Francisco, is with us again. He has charge of the Barclay printing system, nights.

Leroy Youmans, formerly of Columbia, S. C., but for several years located in the western territory, died on March 23.

At the Mackay Telegraph and Cable Company's office, Mr. Roy DeLay is chief operator, H. L. Johnson, night chief, and Mr. McKenzie, all-night chief.

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Telegraph and Telephone Age

No. 9 NEW YORK, MAY 1, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Perplexing Problems in Electricity.

We have been so long accustomed to hearing and reading in text books stereotyped explanations of certain electrical phenomena that, despite the fact that there is really no actual proof that the claims made are true, many of us swallow the assertions whole without question or doubt.

It does not seem to occur to us at the moment of reading that what is really meant is that so-and-so is true only in the sense that it acts "as if" there were no other explanation.

For example, many old text books make the unqualified assertion that in a circuit containing a battery and grounded at each terminal the current returns through the earth, the natural inference of which is that the current generated by the battery really travels back and seeks the other pole of the home battery regardless of distance or locality.

If the writers had qualified the assertion by stating that the action of the current in such conductors was such as would be the case if the earth were a conductor of negligible resistance, and had not tried to trace the route of the current any further, it would be less confusing to the student and more logical in every respect.

As it is, the student immediately runs up against the paradoxical statement that the material which composes the earth, viz.: soil, etc., is practically a non-conductor of electricity. In fact, he finds that he cannot pass a current of electricity through even the thinnest layer of earth intervening between two points in an electric circuit, yet he is told that original currents travel back through hundreds of miles of this same material and actually seek out the associated battery or distant line terminal!

Would it not be more logical and consistent to suggest that when current is caused to flow through a conductor grounded at each terminal we apparently obtain reciprocal action at those two points on part of the earth's vast reservior of electricity for whatever energy we impress upon and extract from the earth at opposite terminals of the line?

This theory at once eliminates the question of the earth's ohmic resistance and disposes of the necessity for a return circuit, as the balancing of the forces would be effected on the spot. In this case the line current, after traversing the conductor, would simply reunite with the main supply in mother earth.

This point of view seems to be well supported by the almost universal belief of scientists to-day that we do not manufacture electricity at all, but simply extract it, so as to speak, from the main body of ether by creating different levels of activity between two points, and then utilizing its kinetic energy resulting from its effort to reestablish an equilibrium.

Another subject that is not always explained as fully as it might be is that of magnetism. The conventional explanation that a bar of iron becomes a magnet when a current of electricity is caused to flow through a wire wrapped around it often misleads the student to infer that the magnetism acquired by the metal is put into the iron solely by what might be called a process of absorption from the electric current itself. This is not strictly correct. We cannot get manifestations of magnetic force in any metal if the molecules of which it is composed are not in themselves true little individual magnets.

The electric current which surrounds the metal simply arranges the molecules in a uniform direction with the result that their combined magneto-force possesses a definite value. The stronger the current the truer the alignment up to a certain point.

An electric current flowing in a like manner around a bar of brass, nickel, zinc, or in fact almost any other metal than iron, will not create a magnet of the metal, although we know that alterations in the positions of the molecules thereof take place just the same.

It seems that iron is about the only metal in which magnetism can be developed to a sufficient degree to be of practical use.

In soft iron the temporary alignment is broken up the moment the energizing current is withdrawn.

In hard steel the alignment remains, hence we call it a permanent magnet.

A good reason for believing that magnetism in iron is self-contained is that a permanent magnet capable of lifting, say, a one pound weight is able to magnetize other steel bars to such a degree that each will in turn be able separately to lift nearly as much, without any apparent loss of magnetic strength in the original magnet.

Ether is another term used in connection with electricity of which there is no absolute proof that it exists. But as it is necessary that some highly elastic fluid should actually exist and fill all space in order to complete the theory advanced, it is assumed that something of the kind does pervade all space, and the name given to it is ether.

By vibrating this ether different manifestations result. Transverse waves of certain rapidity, for instance, are supposed to produce the phenomenon known as heat; other waves produce light, etc. Magnetism is supposed to be due to whirlpools of ether, while an electric current may be due to differences in ether pressures at two separate points in space connnected by a wire.

It will thus be seen that the nature and source of electricity are still a great mystery. We know how to develop it, measure it and control it, but aside from this no one has as yet lifted the veil that conceals its actual nature.

Telegraph and Telephone Patents.

ISSUED APRIL 8.

1,058,120. Telephone Muffler. To M. Weil, New York.

1,058,533. Automatic Resistance Regulator for Telegraph Lines and the Like. To E. Belin, Paris, France.

1,058,541. Telegraphic Relay. To S. G. Brown, London, England.

1,058,555. Receiving Transformer for Wireless Telegraph Systems. To E. L. Colby, Auburn, N. Y.

1,058,598. Telegrapher's Key-Button Cushion. To H. A. Helty, New Castle, Pa.

1,058,631. Telephone Attachment. To A. Schlosser, Dodge, Neb.

ISSUED APRIL 15.

1,058,903. Telephone-Exchange System. To J. N. Reynolds, Greenwich, Conn.

1,059,073. Antiseptic Telephone Mouthpiece. To I. S. Rosenbalt, San Francisco, Cal.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange April 26:

American Telephone and Telegraph Co.	129¼
Mackay Companies	83
Mackay Companies, preferred	68½
Western Union Telegraph Co.	65⅝

Subscribe for the paper of your profession, $2.00 per year.

PERSONAL.

Mr. S. M. English, president and general manager of the Postal Telegraph-Cable Company of Texas, Dallas, Tex., was a recent New York visitor.

Mr. J. J. Ghegan, president, and Chas. E. Graham, treasurer, of J. H. Bunnell & Company, Inc., New York, have returned from a trip to Florida and Cuba.

Mr. E. H. Lockwood, a well-known press telegrapher in Washington D. C., has entered the government service and has been assigned to naval department work.

Mr. C. H. Bristol, formerly general superintendent of construction, Western Union Telegraph Company, New York, now retired and living at Tampa, Fla., was a recent New York visitor. He returned to Florida April 26, accompanied by his daughter, Mrs. J. H. Drakeford.

Col. W. B. Wilson.—April 17 was a day of special significance to Col. William Bender Wilson, of Holmesburg, Philadelphia, president of the Society of United States Military Telegraph Corps. Fifty-two years ago, on that day, he opened the military telegraph office in Governor Curtin's office at Harrisburg, Pa. Col. Wilson is the sole survivor of those who surrounded the Governor at that time.

OBITUARY.

E. Raphael, aged 66 years, a former telegrapher and an operator in the Confederate service during the Civil War, died at Houston, Tex., April 16.

E. M. Nance, a well-known operator in the South, died at Pineora, Ga., April 20. Deceased was formerly with the Western Union in Savannah, Ga., and the Associated Press in Jacksonville, Fla., and retired in 1908.

John Gaul, aged 49 years, manager of the Santa Fe general telegraph office, San Francisco, Cal., died April 17 from the effects of an operation. Mr. Gaul devoted twenty years to commercial telegraphy, and during that time occupied official positions at Buffalo, was manager at Butler, Pa., and chief operator for the same interests at Pittsburgh. On account of his health he went West in 1905.

Condemning Right of Way for Telegraph Lines.—The Supreme Court of Alabama has rendered an opinion in two cases of the Western Union Telegraph Company vs. the Louisville and Nashville Railroad Company, involving the right of a telegraph company to condemn a railroad right of way, holding that the statutes of the state authorize such a condemnation by a telegraph company. The Western Union Company won on all law points submitted to the court.

Telephone Supplies Wanted for Tasmania.—The postmaster-general at Hobart, Tasmania, will receive tenders until June 9 for furnishing the following materials: Insulators, telephone distribution switchboards, telephone wire (iron, steel, cooper, and bronze), insulated wire, telephone instruments and accessories, battery material and lead armored telephone cables.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. C. P. BRUCH, third vice-president of this company, on April 23 addressed "The Town Criers," a Providence, R. I., organization, at their meeting and luncheon in the Crown Hotel in that city.

MR. WARREN S. HALLETT, superintendent of supplies of this company, New York, was married on April 19 to Miss A. Schneider, of Brooklyn, N. Y. Mr. Hallett returned to his office April 28, after a trip to Old Point Comfort, Va.

MR. H. A. TUTTLE, president and general manager of the North American Telegraph Company, Minneapolis, Minn., was a recent New York business visitor.

THE LOWELL, MASS., office of this company has been recently moved into new and modern quarters in the *Sun* Building. Mr. William Morris is manager.

Care of Motors and Generators.

Following are the rules of the Postal Telegraph-Cable Company for the care of motors and generators:

Keep clean every part of the machines and room in which the machines are installed.

Keep all of the insulation free from metallic or carbon dust or gritty substance.

Keep all bearings of machines well oiled.

The bearings, when running, should be examined at least once a week. When it is necessary to renew the oil draw the oil from the reservoir through the opening in the side of the pedestal.

From time to time, or whenever the bearings show signs of heating, the plug at the bottom of the bearings should be removed and the oil drawn off and replaced by new.

Keep brushes properly set and see to it that they are trimmed frequently so that full contact is obtained between commutator and brushes, and that there are no stray parts bridging across on to the other bars.

Keep the brushes clean, and if there is any cutting of the commutator wipe the latter occasionally with a canvas cloth slightly coated with vaseline. If the brushes are graphite no vaseline will be needed.

If a commutator begins to give trouble by roughness, with attendant sparking and excessive heating, it is necessary to immediately take measures to smooth the surface. Any delay will aggravate the trouble and eventually cause high temperatures, throwing of solder and possibly displacement of the segments. No. 0 sandpaper fitted to a segment of wood, with a radius equal to that of the commutator, if applied in time to the surface when running at full speed (and, if possible, with brushes raised) and kept moving laterally back and forth on the commutator, will usually remedy the fault. If this does not suffice it will then be necessary to tighten the segments and turn them off true. A machine tool will not leave the surface smooth enough to give perfectly satisfactory results. It is always necessary before putting on the load after the commutator has been turned to carefully smooth the surface with the finest sandpaper, thus removing all traces of the tool point, and treat with a small amount of pure vaseline until commutator is brought to a hard, smooth surface.

See that all connections of wires beween machines and starting boxes, and on the machines themselves, make good contact.

The best grade of dynamo oil should be used in the bearings, and this should be changed occasionally so that bearings will continue to run at normal temperature.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

MR. BELVIDERE BROOKS, vice-president, has returned from a short business trip to Florida.

MR. A. C. KAUFMAN, manager of the Commercial News Department, New York, and Mr. H. W. Dealy, of the office of the general superintendent of the same department, were in Baltimore April 18, inspecting the ticker system in that city.

MR. L. K. WHITCOMB, district traffic superintendent, Dallas, Tex., has been appointed district commercial superintendent at the same point, vice O. L. Turner, assigned to special duties.

MR. P. J. SULLIVAN, manager of the 255 Church street office, New York, has been appointed to fill the newly created office of district commercial manager, with headquarters at the same address.

MR. J. W. MCMAHON, assistant manager of the New Orleans office, has accepted a position in the commercial department of the New York Telephone Company, under general commercial superintendent J. S. McCulloh, with headquarters in New York.

MR. H. P. BOND, night chief of the Dallas, Tex., office, has been appointed chief operator at Galveston. Before leaving for his new post, he was presented with a gold watch and chain by the employes of the Dallas office, as a token of the high esteem in which he was held by them. Mr. J. L. Laney made the presentation speech.

MR. HARRY L. GIEM, who has been branch office manager in Spokane, Wash., for the past three years, has been promoted to be manager of the Klamath Falls, Ore., office.

THE OFFICES OF Mr. Edward Everett, manager of the time service department, and Mr. A. O. Wallis, superintendent of buildings, New York, have been removed to the Riker building, 191 Broadway.

THE DISTRICT SUPERINTENDENTS of the Eastern Division and their chief clerks will meet in conference in Philadelphia on May 15.

THE REGULAR MONTHLY MEETINGS of groups Nos. 2 and 3 of commercial managers in New York were held April 23 and 25. Addresses were made by Messrs. A. G. Saylor, general manager, J. F. Nathan, district commercial superintendent, A. C. Kaufman, manager Commercial News Department, and J. Simmonds, division cable manager.

THE CABLE.

Mr. J. W. Lawton, superintendent Commercial Cable Company of Cuba, Havana, Cuba, is in New York, where he will spend a vacation of a month.

J. C. Van Cura, aged 52 years, manager of the Anglo-American Cable office at 8 Broad street, New York, died suddenly on April 20. The funeral took place April 23. Mr. Van Cura was an excellent operator and a musician of high ability, and was highly esteemed by his co-workers and friends.

Mr. H. Sutton, of the Commercial Cable Company's main office, New York, a few days ago sent cablegrams direct to Waterville, Ireland, by means of the latest model Horace G. Martin vibroplex. The operator at Waterville reported that the signals came to him firm and distinct. This long distance perfect transmission was made possible by the invention of Mr. John Gott, which has been described in these columns several times.

Increase in English Cable Business.—Postmaster-general Samuel, of England, in presenting the annual post-office budget in the House of Commons April 24, referred to the increase in oversea cable business as a result of the reduction in rates, and said no development was more remarkable. A new "loaded" telephone cable, the longest of its sort in the world, is being laid from England to Belgium, he said. The post-office was communicating with the German post-office with a view to the establishment of telephonic communication between them. Mr. Samuel proposed the introduction of a system of synchronizing clocks, whereby everybody could have timepieces set to Greenwich time daily for $10 yearly.

New Cable for Central and South American Telegraph Company.

The Central and South American Telegraph Company recently contracted with the Norddeutsche Seekabelwerke, Nordenham, Germany, for the manufacture and laying of 771 knots of cable, to be laid between Panama, Republic of Panama and Santa Elena, Ecuador.

The Norddeutsche Company's cable steamer "Stephan," with the cable on board, sailed from Nordenham April 7, and is expected to arrive at Panama about May 20.

The laying of this direct cable from Panama to Santa Elena will materially expedite the telegraph traffic to and from Peru, Chile and Argentine, and is a preliminary step in providing additional facilities for the anticipated extension of the Central and South American Telegraph Company's lines from Argentine to Santos and Rio de Janeiro, Brazil, which extensions, it is expected, will be completed within a year. This will provide an all-American cable route to Brazil, which Mr. James A. Scrymser, president of the Central and South American Telegraph Company, has endeavored for many years to accomplish.

On her homeward trip the "Stephan," it is expected, will take soundings between Buenos Aires and Santos and Rio de Janeiro, covering the route on which the proposed cables are to be laid.

The average time of transmission between New York and Buenos Aires "via Colon" is now about sixteen minutes, and it is expected, on the completion of these Brazil extensions, that the average time between New York and Rio de Janeiro will not exceed twenty minutes.

THE TELEPHONE.

Mr. W. T. Gentry, president of the Southern Telephone and Telegraph Company, Atlanta, Ga., and Mr. E. D. Nims, vice-president and treasurer of the Missouri and Kansas Telephone Company, St. Louis, Mo., were in New York last week on business.

Mr. J. E. Farnsworth, vice-president of the Southern Telegraph and Telephone Company, Dallas, Tex., has been appointed a member from Texas of a national committee which will soon proceed to Europe to study the application of the co-operative system to agricultural production, distribution and finances in European countries, with a view to the adoption of similar methods in this country.

Telephone in Argentine.—The Compañia General de Teléfonos, of the Argentine Republic, made a profit of $40,000 in 1912 and declared a dividend of 15 per cent on ordinary shares and 21½ per cent on preference shares. The number of subscribers is 1,001.

Composite Telephone Cable.—The New England Telephone and Telegraph Company is laying a new composite duplex cable between Boston and Gloucester, Mass., to provide facilities for the handling of the telephone traffic between the cities mentioned and intermediate points.

The Missouri, Kansas and Texas Railroad telegraph office at Dallas, Tex., was recently removed into the new building on Commerce street, the general headquarters of the company. The telegraph office is equipped with modern apparatus. A force of six operators are employed to transact the business of the department. Mr. C. F. Beck is manager of the office.

Earnings for Two Months.—The American Telephone & Telegraph Company and associated holding and operating companies in the United States, not including connected independent or sublicensee companies, report for the two months ended February 28 as follows: Gross earnings, $34,425,-557; operating expenses, taxes and depreciation, $24,623,295; net earnings, $9,802,262.

Southwestern Telegraph and Telephone Company.—During the past twelve months 44,212,-668 telephone calls were handled through the Houston, Tex., exchange of the Southwestern Telegraph and Telephone Company. In Dallas, Houston, San Antonio, Fort Worth and Austin, Tex., the total number of calls was 200,527,667, and in all Texas the company handled 437,134,154 local and long distance calls.

Boston Plant Chapter.—The sixteenth regular meeting of the Boston Plant Chapter of the Telephone and Telegraph Society was held at the American House, Boston, April 29. The contents of the "Question Box" received special attention. After the meeting refreshments were served, accompanied by music. Mr. Gordon S. Wallace, Boston, is secretary of this chapter.

RADIO-TELEGRAPHY.

Mr. S. F. Barager, formerly with the United Fruit Company's wireless telegraph department at Bocas-del-Toro, R. P., Port Limon, C. R., and Bluefields, Nicaragua, and later assistant treasurer and assistant manager of the Bluefields Steamship Company, at Bluefields, Nicaragua, is now manager of the Latin-American department of the Whitney Central National Bank, New Orleans, La. Mr. Barager spends much of his time traveling in Central and South America.

Wireless Operated by Wind Power.—The wireless system between the Dutch West India Islands is operated by wind power, and is proving a great success and convenience.

Radio Without Masts.—An Italian engineer named Galetti has, it is stated, invented a means of dispensing with high masts in radio communication. He has set up two posts, 26 feet high, near Chambery, France, to support the antenna, and expects to communicate direct with New York.

Violation of the Wireless Law.—A student at the Massachusetts Institute of Technology, Boston, was arrested recently, charged with interfering with wireless messages sent out by naval and commercial stations. This will be made a test case in order to determine what constitutes an infringement of the new wireless law.

Price Paid for United Wireless.—Mr. Godfrey Isaacs, managing director of the Marconi Wireless Telegraph Company, London, in his testimony before the Parliamentary wireless investigating committee on April 17, stated that the assets of the United Wireless Telegraph Company (of America) had been bought by the British Marconi Company for $750,000 and sold to the American Marconi Company for $1,400,000 in shares.

Americans Telegraph; English Send Post Card.—In the course of his testimony before the Parliamentary Marconi Inquiry Committee in London on April 10, Mr. Godfrey Isaacs, managing director of the English Marconi Company, in referring to the readiness with which Americans use rapid means of communication said: "An American sends a telegram, no matter in what part of the world, with little hesitation; whereas, we in this country send a half-penny post card."

New Wireless Publication.—*The Wireless World* is the title of a new magazine published in London, England, by the Marconi Press Agency, Limited. This publication has absorbed the *Marconigraph* (English edition), and the first number appears in the form of a good size magazine. It contains a few interesting stories and a good deal of technical and descriptive matter, and is, besides, well illustrated. It keeps in close touch with wireless development. Mr. Arthur Cohen is the editor.

Radio Station Without Ground Connection.—The new wireless-telegraph station at Freemantle, Australia, is operated without the usual ground connection. On account of the resulting extreme dryness of the climate a satisfactory ground connection for the station could not be established readily. Accordingly, an insulated counterpoise is employed instead, constituting the lower element of the electrically vibrating circuit, of which the antenna is the upper. The counterpoise consists of about 100 insulated wires radiating out from the antenna tower and joined and supported by three concentric circles of wire. Communication has been established between the Freemantle station and Sydney, a distance of 200 miles overland.

Detecting Thunder Storms by Wireless.—The principles of radio-telegraphy have been adapted to means for detecting thunder storms. A small aerial wire, similar to that used for radio-telegraphy, collects the electricity from the atmosphere and transmits it to a coherer, or detecting device, connected to the earth. When an atmospheric discharge takes place the electricity produced passes from the aerial wire, through the coherer, to earth, and closes a delicate electric circuit, when a needle is moved. This needle traces a line on a piece of paper attached to a revolving cylinder. Each jerk of the needle caused by a discharge of atmospheric electricity produces a V-shaped deviation in the line traced. In order to measure the actual strength of electrical disturbances in the atmosphere a special apparatus has been designed. A delicate detector is connected with a sensitive meter, a pointer on the dial of which registers the strength of the discharges. The aerial wire collects the electricity from the atmosphere and discharges it through the detector. The pointer of the meter then indicates the amount collected.

Telegraph Facilities at President Wilson's Summer Home.—Mr. E. W. Smithers, chief operator of the White House telegraph staff at Washington, D. C., has been in Windsor, Vt., recently, making arrangements to extend the telegraph and telephone facilities at that place in anticipation of the rush of business consequent upon the establishment of President Wilson's summer home at Cornish, N. H., across the Connecticut River. An all-night office will be opened at Windsor as soon as the President takes up his residence at Cornish.

Corporation Income Tax.—The United States Supreme Court recently decided that a corporation leasing its property to another corporation is not liable for the corporation income tax. This decision will affect many railroad and telegraph companies.

A Busy Man.—Mr. Herman A. Miller, operator at Essex Fells, N. J., fills seven other positions besides his telegraph berth. He is borough clerk, recorder, clerk of the board of education, clerk of the board of health, ticket, freight and express agent.

Duplex Operation and Calling Systems Operated Thereon.*

BY JOHN A. KICK.

So much has been written about the theory of the multiplex that it is not well timed for the writer to cover the subject, except to attempt to popularize the use of such equipment by calling attention to the erroneous impressions of the difficulty of maintenance and the apparent disregard of the advantage where a single-line circuit would, perhaps, carry the business. The use of duplex telegraph equipment in railway telegraph service is to be strongly recommended. Circuits can be operated on lower voltage, while the capacity of the circuit is more than doubled by reason of the duplexing possibilities in the circuit capacity, as well as increasing speed. There is little or no difficulty in maintaining duplex equipment, and it is my experience that any intelligent operator can quickly learn the few necessary rules governing polar duplex operation and maintenance.

The margin of operation on a polar duplex is greater than is ordinarily realized. Such equipments frequently operate quite satisfactorily where the single line Morse fails altogether, by reason of extreme weather conditions. A polar duplex will continue to operate double when well out of balance, so that it is now common practice to maintain duplex sets at points where none of the operating force could be called skilled attendants.

The "flying" or "working" balance is one which is based on the known average balance on the given circuit. It is changed to suit weather or other governing conditions with the circuit in full operation, and the fact that such methods are practical is an indication of the margin. While the balance to ground may be considered necessary in quadruplex alignment, few wire chiefs now follow that practice in duplex operation.

Many dispatching and message telephone circuits are simplexed for Morse, and on those circuits the voltage on the simplex circuit should be as low as possible. By using the duplex the minimum can be secured.

The polar relay used in duplex operation is one which operates very successfully on very low current. It can be so adjusted as to respond where single line relays would be inoperative. For long circuits the duplex repeater is successful. It represents practically no loss in efficiency, while the single line repeater, unless constantly watched, represents serious loss and operating difficulties.

One of the greater gains in "efficiency" is "direct calling" or, more correctly, "instantaneous calling," and this is a very important factor in handling rush business or making "wire" calls at night.

When the duplexed wire is idle a buzzer or bell is switched into the local circuit. This calling system is used to great advantage on several railroad systems. It furnishes the means for all important offices to call the others at night, when the operating forces are small and no time can be spared to call other busy offices.

* Telephony.

For operation the system depends upon the simple idea of leaving all multiplex sets stand on open key with all of the receiving sounder circuits switched to bells or buzzers. To call, the key is held closed. This, in turn, causes the polar relay at the distant station to close its local circuit and the bell or buzzer to be actuated. The operator called goes in on the set switches from the buzzer or bell to the sounder and answers or gives the busy signal. This one feature alone is sufficient to warrant the duplex, as it means prompt service on important business or wire calls.

Where it is not possible to secure more than one pole of battery, or the business is very light and at irregular intervals, the same calling scheme can be used on the open circuit plan used in English telegraph service.

Another scheme could be used on side branch lines, where the business to the terminal office could be handled on a simplex or busy relay offices secured promptly by bell calling. Its operation depends upon a normal ground at the terminal and battery being applied to the line when the key is depressed, thus closing the line relays and ringing the bell or buzzer on the distant terminal. Open circuit operation depends upon a battery at each terminal sufficient to energize both terminal equipments, but simplexed dispatching and message circuits can be so low in resistance as to accomplish this operation on a very low voltage.

The polar duplex is the ideal telegraph equipment where Morse operators are employed. Regardless of whether required to double or not, the efficiency of the operator is much greater by reason of the ease of operation, as compared with single line circuits. The bell or buzzer calling device once used will be so highly appreciated that nothing less than universal application will satisfy the operating director.

Interconnecting Several Lines in One Office.

A correspondent writes: "We have a telegraph line, with an office at each end, A and B (30 miles), which is supplied with current from a forty-volt storage battery at B, permanently grounded at the positive end, which ground for certain reasons cannot be changed. We now wish to extend the circuit over three other lines, radiating from B to C (18 miles), B to D (25 miles), and B to E (20 miles). What circuit and repeater arrangement could be used?

Answer: It will require three sets of repeaters at B, placed in series; and the entire apparatus at B should be connected up as follows:

(1) The storage battery permanently grounded at the positive end; (2) from the negative terminal run a line through the local set, thence through one side of all three repeaters to C, where the line is grounded; (3) run another line from the negative terminal of the storage battery direct to the other sides of all three repeaters, but not including the local set at B; (4) tap the line to A (30 miles) to one repeater; (5) tap the E line (20 miles) to the second repeater, and (6) connect the D line (25 miles) to the third repeater.

CANADIAN NOTES.

Mr. C. E. Davies, supervisor of equipment, Great North Western Telegraph Company, Ottawa, Ont., was a recent New York business visitor.

Edward Flannery, an operator for the Canadian Pacific Railway's telegraph in Toronto, Ont., died in that city April 4.

Mr. F. D. Boomer, formerly chief operator at Ottawa of the Great North Western Telegraph Company, has been promoted to the managership at Quebec, vice C. E. Lillie, resigned to enter other business. Mr. Boomer entered the telegraph service in the Great North Western Company's office at Adams, N. Y., in April, 1902. In January, 1903, he took charge of the Postal Telegraph-Cable Company's office at Alexandria Bay, N. Y., and remained there until the following September, when he was transferred to the office at Ogdensburg, N. Y., where he served one year. In September, 1904, he was advanced to the position of all-night manager at Watertown, N. Y., remaining there until May, 1906, when he was engaged by the Great North Western Company at Toronto. In October, 1910, he was appointed traffic inspector of that company, and was appointed chief operator at Ottawa in June, 1911.

Great North Western Conference.—A conference of chief operators and wire chiefs of the Great Northwestern Telegraph Company was held at Toronto, Ont., last month for discussion looking to the betterment of the service, for the advancement of new ideas, and for the purpose of getting acquainted. Those present were: Chief operator Rogers and wire chief Clarke, of Toronto; chief operator Sallawan and wire chief Baker of Montreal; chief operator Lafayette, of Quebec; chief operators Boomer of Ottawa, Menger of Hamilton, Foster of London, and Kane of Kingston; W. J. Duckworth, superintendent of construction, Toronto, and C. E. Davies, supervisor of equipment, Ottawa.

Direct Circuit from London to Vancouver.

Mr. W. J. Camp, assistant manager, Canadian Pacific Railway Company's Telegraph, Montreal, Que., informs us that on Sunday, April 13, a number of experiments were carried on over the telegraph lines of the Canadian Pacific Railway Company and the Commercial Cable Company by means of the Morse repeater of Mr. John Gott, engineer for the Commercial Cable Company, described in Telegraph and Telephone Age of April 16. Conversation was carried on and messages were exchanged between Montreal and London, England, as easily as though the circuit were only a few hundred miles in extent. The circuit was then extended to Toronto through a repeater and messages exchanged direct between that city and London. After that both were connected with the British-Pacific Cable's press leased wires, between Montreal and Bamfield, B. C. On this circuit the ordinary Morse repeaters were used at Montreal, but at Fort William, Calgary and Vancouver the Wheatstone repeater was utilized. After some conversation Bamfield inserted the Wheatstone transmitter to ascertain the speed which could be obtained. Up to 130 letters per minute London reported that the signals were accurately received without a flaw. Later, the regular Canadian Pacific Railway message wire between Montreal, Vancouver and Victoria was switched in and messages exchanged between the two latter cities and London direct. In this case the repeaters were ordinary duplex sets at Vancouver, Moose Jaw, Fort William, Montreal and Canso. At the latter place the regular duplex set for the land line was connected with the Gott repeater. Afterward, Calgary, Alberta, Moose Jaw, Sask., and Winnipeg, Man., cut in and exchanged messages.

The international Morse code was used throughout, there being operators at the various cities who were somewhat familiar with it. The experiments demonstrated that the repeater was entirely satisfactory, and that, for instance, if there is sufficient traffic, the circuit can be worked regularly between any of the mentioned cities and London, at a speed equal to that obtained at any cross-continent circuit.

Z. A. Lash, President Great North Western Telegraph Company, Toronto, Ont.

Mr. Zebulun Aiton Lash, president of the Great North Western Telegraph Company in succession to the late H. P. Dwight, was born September 29, 1846, at St. Johns, N. F.

He was educated at the Dundas, Ont., Grammar School, and later took a course at the Toronto University.

In 1868 he was called to the bar of Ontario, and has since devoted his life to the legal profession.

Z. A. LASH, TORONTO, ONT.

In 1876 Mr. Lash was appointed deputy minister of justice of Canada, and resided in Ottawa till 1882, when he became a member of Blake, Lash & Cassels; this firm is now Blake, Lash, Anglin & Cassels, and Mr. Lash is a senior member. He is a director of the Canadian Northern Railway Company, and associate companies forming the Canadian Northern Railway system. He is a director of Mackenzie, Mann & Co., Ltd.; is vice-president of the Canadian Bank of Commerce and of the National Trust Company and of the Brazilian Traction Company, and is on the board of the Western Assurance Company, the Bell Telephone Company and other leading corporations of Canada.

Mr. Lash is a member of the York, the Toronto, the University and the Argonaut Clubs of Toronto, also of the Rideau Club of Ottawa and the Mount Royal Club of Montreal.

He was created Q. C. (now K. C.) in 1879, by the Governor General of Canada. He received the degree of LL.D. from the University of Toronto in 1910, and was appointed on the board of governors of the University by the Ontario Government in 1909. Mr. Lash is vice-president of the board of St. Andrew's College, Toronto.

Wireless Warnings of Storms.

The complete and comprehensive system of weather reporting by wireless, which has just been inaugurated by the United States Government, will enable the Weather Bureau at Washington to forecast the approach of storms, hurricanes, cyclones and tidal waves from the heretofore inaccessible regions of the ocean. Up to now, the only means the Government had to determine the approach of a hurricane was through certain disturbances of the atmosphere as they appeared to the weather observers on land, says *The Marconigraph*. Frequently, great storms have arisen of which no warning could be given only by use of data sent in by wireless from ships at sea.

But with the new system in operation every vessel that leaves an American port will know exactly what to expect in normal weather conditions on every point of its voyage. Not only that, but it will be warned while at sea of any menace to its safety. The United States is the first nation to adopt this advanced system of weather forecasting, and it marks an epoch in the marine history of the world.

The Government now has wireless instruments on thirty ships plying the Atlantic, the Gulf of Mexico, and the Carribean Sea. It is the intention of the Weather Bureau to employ the navigating officers of these vessels to report to the United States Weather Bureau at Washington by wireless twice a day, morning and evening, the same as though they were at the regular observing stations on land. These reports will include the exact position of the ship at sea at the time of observation. It will show the state of the barometer, whether rising or falling, the temperature, direction of the wind, and the force, and the state of the weather. In the hurricane season they will also report regarding the sea swells, which have a close connection with hurricanes some distance away.

This is the first real effort on the part of any service in the world to employ wireless as a direct aid in forecasting the weather. Up to the present it has been more or less at the will of the wireless operator on board the ship to report anything to the weather stations, but from now on the Government will pay the navigators on each vessel for this work. All of these vessels will act as scout ships for the Weather Bureau. As soon as anything is encountered in any part of the ocean, the observers at Washington will have immediate knowledge of it.

The first weather reports received by wireless exclusively came from a station established by the Weather Bureau in the summer of 1911 way up in the Aleutian Islands, at a little place called Dutch Harbor, in Unalaska. From this point the wireless report is flashed to Nome, about 1000 miles distant, and from there it comes overland to Sitka, by cable to Seattle, and from there overland to Washington. This station is the outpost established on the Pacific Ocean to give warning of the approach of storms crossing the North Pacific that are apt to reach the Western coast of the United States. This is the only station in the world that depends entirely upon wireless to get its weather reports through.

The Government has made arrangements with the United Fruit Company steamers, the Southern Pacific Line, the Clyde Line, and others running from New York to San Francisco, for daily reports by wireless at 7 o'clock in the morning and 7 o'clock in the evening. These reports will be picked up by the navy's wireless stations along the coast and transmitted direct to Washington, where they will be immediately made public. These steamers will also report the sighting of any wrecks or derelicts, icebergs or icefields and anything else that may be a menace to navigation. It is by this means that the Bureau will be able to report the very beginning of any hurricane at sea and give ample warning to other vessels and coast or inland cities which may lie in its path.

Effect of Moonlight on Wireless Signals.

It has been discovered by Mr. Austin M. Curtis, of Amazonas, Brazil, that the rise of the moon, as well as sunrise, causes a drop in the intensity of wireless signals from distant stations.

Mr. Curtis says: "In mid-winter in these parts long distance night signals will be strong and steady soon after sunset, and this gives the opportunity of observing the effect of moonrise while the moon is nearly full. The phenomenon is thus observable on the night after full moon and three more nights in each month. After this the effect disappears, as the moonlight gets much weaker.

"What happens is this: From five to fifteen minutes after apparent moonrise received signals suddenly decrease to one-thirtieth of original strength, gradually increase to almost their original strength, then suddenly drop again to the same minimum, and gradually increase again to a slightly lower strength than they were before moonrise. They then keep this strength until a few minutes after moonrise at the sending station (if it is to the west of the receiving station), and then recover to a value equal to or higher than the original. The time between the two successive drops is 9.5 minutes."

The phenomena has been observed at various stations in Brazil.

New Operating Equipment in St. Louis Fire-Alarm Office.*

The new fire-alarm operating switchboards and equipment recently installed and now in service in the St. Louis City Hall are different in design and operation from any fire-alarm switchboard in known use, and are unique among systems in vogue in other cities of large size in that the current which operates the system is drawn from one source of energy instead of a plurality of sources, as is the common practice.

The essential principles of the fire-alarm telegraph are the same the world over and in the St. Louis office, while not departing from standard methods of handling alarms, offers originality in the simplicity of design and cheapness of its equipment, which is startling to those used to common fire-alarm practice.

In the St. Louis office we have forty-four signal-box lines, seven joker-alarm lines and thirteen bell-striker lines. Up to the time of the installation of our new board the signal-box and joker-lines were supplied with current derived from the old-type gravity or blue-stone cell. Each of these signal and joker-lines, fifty-one in all, was fed from a separate battery unit consisting of from fourteen to thirty cells, approximately one thousand cells in all. Each line also required a local battery, for which Gonda or sal-ammoniac cells were used.

The first idea which entered the writer's mind upon taking charge of the office in July, 1911, was that of placing the entire service upon one source of power. To do this with the type of switchboard then in use would not have been possible. Ground troubles are eliminated in the new switchboards by the placing of two relays in each circuit, one on each side of the line. When two or more lines become grounded the relays offer sufficient resistance, 150 ohms each, on each side of each line, so that the current divides in the lines depending in quantity on the distance of the grounds from the office. Under such grounded conditions signals sent into the office from boxes located to the right side of the ground are received on the right relay, and signals sent in from boxes located to the left side of the ground operate the left relay.

Now in order to answer back from office to signal box it is necessary to break the circuit in the office on the same side of the ground as that from which it is received, or, in other words, the transmitter and receiver must manipulate the line upon the same side of the ground. In order to accomplish this, a double-pole double-throw switch is placed in each circuit, which reverses the polarity of the line and at the same time cuts the telegraph key on the office switchboard into the left side of the line instead of the right, where it normally is. Thus the operator in the office may, by throwing this switch, break either the right or left side of the line.

Each circuit is provided with a milliammeter, and each of the line relays lights up one-half of a bull's-eye on the switchboard. These lamps are inserted directly in the local circuit, current for this being taken from the common battery, passing through a sounder of large size from which the alarm is heard.

The negative side of a common battery is grounded through a small switch, whereupon the grounding of any line drops the relay on the negative side of that line, lighting the left half of the bull's-eye and attracting immediate attention.

It is obvious that by reversing the polarity of the lines by means of the switches before mentioned grounds showing on the positive side of lines may be made to show on the negative side. By this means the grounds on a number of lines may be all put on one side of the battery circuit, thus balancing the lines one to another. The result is shown on the milliammeters by the return of the needles to normal position, such position being designated by an indicator hand on the instrument.

The battery supplying current for the system consists of thirty cells of 200-ampere-hour capacity, in duplicate, the voltage being sixty, and one set charging while the other is in service.

The cost of the entire equipment was as follows: Terminal board, $417.00; switchboards, $2,736.59; cable, $569.61; nickel-plating, $182.50; 140 telegraph relays, $404.60; total for operating room, $4,310.30. Two new telephone switchboards, $1,-261.11; storage-battery equipment, $1,537.50; total, $2,798.61. Grand total, $7,108.91.

Thus it is seen that an entire new equipment, absolutely fireproof and up to date, including two telephone switchboards and complete equipment of storage battery, has been installed for less than one-half the cost of storage battery only for the old system.

The National Board of Fire Underwriters recommends that a fire-alarm office be equipped with a recording system by which all alarms are automatically registered on a tape as they are received. This means the introduction of a tape register into the local of each signal circuit. The requirement of the St. Louis office would therefore be forty-four, or, as is the usual practice, eleven registers each having four pens. The cost of this equipment is approximately $5,000 or almost the cost of the entire new office. Now, it is a fact that seldom if ever are more than three circuits operating at the same time. It is obvious, therefore, that forty-one pens, or ninety-three per cent. of this equipment are idle at all times. The writer conceived the idea of using one four-pen register and of introducing a selector between the forty-four signal circuits and this register so that each of the three circuits in possible operation at the same time would automatically take possession of the three pens on the register and record the alarm, the fourth pen registering the alarm as it is struck in the fire department on the joker-lines.

The writer designed and built such an apparatus which is now in operation. This selector cost in the neighborhood of $200.

This system fails when two alarms begin to come in at the same instant when, of course, both drops

* Extracts from a paper read by Mr. George McD. Johns before the St. Louis League of Electrical Interests, March 11.

fall upon the same rod; an unlikely condition, however, as the fraction of a second is sufficient to procure the selection of a pen.

When the register ceases running a contact is closed which operates a solenoid connected to resetting levers, the rods are replaced and the drop arms restored ready again for action.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What is residual magnetism?

What other name has been given to residual magnetism?

How must iron be treated in order that it will give up all trace of magnetism when the magnetizing current ceases?

What is the effect of making the cores of electromagnets as short as possible?

How is induction between two adjacent wires usually manifested?

When do the inductive effects appear?

Does induction appear in the coils of magnet wire, and what are its effects?

Why is the magnetization and demagnetization of a magnet core retarded?

Why does the presence of the iron core increase the normal induction?

Why should a magnet core be left black after it has been annealed?

What is the effect upon the iron of filing or touching it with a cutting tool?

Why is it objectionable to permit the armature to strike the cores of a magnet?

What is the average time required for a telegraph magnet to release its armature, (1) with maximum tension of the retractile spring, and (2) with minimum tension?

What is the best working adjustment?

Upon what two factors does the magnetism developed in a mass of iron depend?

Why does a high E.M.F. acting through a proportionately great resistance produce quicker magnetic action than where the E.M.F. and resistance are low, the value of current being the same in both cases?

If the armature is itself a permanent magnet upon what quality of the current does it depend for its action?

Study the actions of a polarized armature as described and illustrated in paragraph 201 of Pope's "The Electric Telegraph."

(To be Continued.)

Telephone Pioneers of America.

J. C. VAIL.

Mr. James Cummings Vail, until recently assistant treasurer of the American Telephone and Telegraph Company, New York, but now retired, entered the telephone service on June 1, 1880, as cashier for the Metropolitan Telephone and Telegraph Company, which company is now merged in the New York Telephone Company. Mr. Vail occupied the position of cashier for the Metropolitan Company for six years, and then became assistant treasurer of the American Telephone and Telegraph Company, which position he held until November 15, 1910, when he retired from active service.

J. C. VAIL (1880), RETIRED.

Mr. Vail is a native of Morristown, N. J., where he was born January 9, 1843. He is a son of Alfred Vail, who was intimately associated with Professor S. F. B. Morse in the development of the telegraph.

Reorganization of Uruguay Telegraph and Telephone System.—A reorganization of the national telegraph and telephone system of Uruguay is about to be undertaken by the Government. The Executive is authorized to contract a loan of 380,000 pesos ($392,920 U. S. currency) for this purpose. Among the contemplated extensions and improvements are the construction of a line between Salto and San Eugenio, on the border of Brazil, and placing underground the national telegraph wires in the Department of Montevideo. Iron or steel poles are to be employed, and the wires will be used for the simultaneous transmission of telegraphic and telephonic messages.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, MAY 1, 1913.

How to Study.

An interesting sentence, full of meaning, occurs in the address of Mr. M. M. Davis, made before the Postal Electrical Society in New York recently on the subject "How to Study" and printed on other pages of this issue. Mr. Davis outlines a method of study which has helped him and, no doubt, will help others who appply it with sincerity and determination. His rule is simple and yet scientific. "Begin at the place where you are sure your knowledge is accurate," he says, "and then follow the chain of reasoning, link by link, taking pains to get a good look at each link. If lack of information prevents you from fitting any link into its place, lay the subject aside and study something else until you find an opportunity to get the information you require."

This is a plain statement of fact, and, because it is so plain, its full meaning is likely to be overlooked by the average student. When, however, it is studied carefully in all lights it will be seen to be full of meaning, and a sensible form of procedure.

The keynote to the whole subject is accuracy of knowledge. It is much better to go slow and be sure of facts than to skim over the surface hastily. Knowledge obtained by the former process is deep-rooted, while by the latter it is only skin-deep, and often not that.

Those who are really in earnest in their desire to advance in their vocation would profit by a careful study of the advice given by Mr. Davis before undertaking the work of study.

Wireless in Railroading.

During the past year reference has been made in these columns to experiments with wireless telegraphy on an English railway with a view to its adaptation as an aid to the operation of trains. A serious attempt is now being made on the Lackawanna Railroad in this country with the same purpose in view, and those who have the experiments in charge seem to be very sanguine as to the results. It may be said in favor of the project that the problem is being approached in a scientific manner, and from the advanced state of the art it is fair to presume that the element of chance in the attainment of results will be largely reduced, if not eliminated.

The distance to be covered by the wireless in this instance is comparatively short, and if the system proves to be as successful as it is hoped it will be it will mean a great deal to the railroads of this country. The section of the road to be equipped is one which is frequently visited by storms, and wire communication suffers more or less in consequence. In order to be independent of such conditions, the railroad officials find hope for relief in the wireless, and if they succeed in accomplishing what they have started out to do they will have taken a great stride in the development of the science of railway-train movement.

The results of these experiments will certainly be awaited with deep interest by all the officials of the principal railroads of the country as well as by the telegraph interests in general.

New York to London Direct by Telegraph.

Whether or not the inter-operation of long submarine cables and land lines is of any practical utility at this time does not affect the fact that it is a successful accomplishment. The demonstration of its operation given at the dinner of the Magnetic Club, in New York, in the evening of April 19, was conclusive proof of its success and effectively removed from the minds of doubting Thomases any misgiving they may have entertained as to the possibility of such an achievement. On this occasion London and Waterville, Ireland, communicated directly with the banquet hall in New York, and felicitations were exchanged. The signals came through from these distant points with remarkable clearness and the flexibility of the system was clearly proved.

A noteworthy test of the system was made on April 13, when a Canadian Pacific Railway's overland wire was joined to the cable to Ireland and London, and communications were exchanged between Vancouver, B. C., and other Canadian cities directly with London, with entire success. It would seem now that there can be no insurmountable difficulty in the way of New York communicating direct with, say, Australia, or London with Peking or Tokio.

Of course, the successful operation of long land lines and long submarine cables is a common everyday affair, but the connecting of two such lines and operating them as one has not, until recently, been successfully carried out.

Now that the practical operation of such a combination has been demonstrated further developments will be awaited with much interest.

Over-Efficiency.

Efficiency is a word very frequently heard in business circles these days, and many persons believe that in some instances efficiency is carried too far. It should certainly be encouraged, but care should also be taken to avoid failing into the error of committing an injury to a business by the process of practicing efficiency.

Secretary Thorne, of the Young Men's Christian Association in New York, in a recent address, pointed out some of the effects of what may be called "over-efficiency." He stated that the Association employment bureau is finding more trouble this year in placing office men and salesmen than in all the previous sixty years of its existence.

"The fault," he says, " lies in the fact that too often the efficiency engineer, instead of devoting himself to promoting efficiency, concentrates on economy—usually false economy. In reorganizing the working force of a big office, store, or factory the efficiency system does not recognize sentiment. It makes no difference how long an employee has been with a concern, how hard he has worked to win profit for it, to help build it to the size where it can afford to go into efficiency reorganization, the tendency of certain efficiency engineers is to economize at the expense of the firm's loyalty to the employee that should repay the employee's loyalty to the firm.

"After all," said Mr. Thorne. "the efficiency engineer himself is an employee. That being the case, the employer should scan with a calmly analytical eye any suggestion he may make for the discharge of other employees—should insist on a reason more substantial than the sometimes specious one that they can be replaced with cheaper men. It often happens the cheaper man is far from cheap."

Encouraging Efficiency in Employes.*

Every effort is put forth in all large organizations to instill in each employee the necessity of cooperation and in generally looking upon the business as though it were his own. Heretofore large companies have been seriously handicapped by the indifference and lack of interest shown by many of the employees and, in this respect, I think, the officers of their companies have been largely to blame. The owner, or boss, in the smaller establishment is usually acquainted with the peculiarities of his workmen; he often knows their families and sometimes their troubles. Now knowledge and intimacy of this kind have certain undesirable features, but, taken as a whole, they are essential. Large companies have therefore recently endeavored in various ways to cultivate the spirit of fellowship found in smaller shops, through house publications, social clubs, benefit societies, and other forms of welfare work.

* Extracts from a paper read by C. H. Coar before the convention of Iowa Independent Telephone Association.

It has been found to be a fundamental fact that the man of superior ability cannot accumulate for himself without giving to his employees the opportunity to participate also. Thus we are led to believe that one of the secrets of success in business, and particularly in manufacturing, is a liberal division of profits among the employees who help to make them. It is self evident that brains, industry and ability can be encouraged and cultivated, but they will never be exercised to their fullest extent by dissatisfied or discouraged employees. It is generally recognized that the standard wage scale is unfair in many ways, for it places the inefficient on the same plane with the efficient. These differences are soon noticed by employees and are bound to cause more or less dissatisfaction. Good wages on a flat rate do not always accomplish desired results, for it is a failing of the human race to be more or less ungrateful, and there is apt to be some lagging because of the thought that the limit is reached. A system of wage that keeps the "voltage" up all the time is more to be desired, hence any bonus or merit scheme is worthy of serious consideration.

Sliding scales and piece work are direct methods of permitting the employee to participate in the results of increased efforts. They are used to a great extent by manufacturing concerns, but not suited to the needs of telephone organizations. Even in manufacturing concerns it has been found advantageous to modify these systems in such a way that the worker gets a certain stated salary regardless of output and an extra sum for any amount exceeding that set as a fair day's output; that is, a sliding arrangement with a minimum wage sufficient for a fair living. In the opinion of the writer this method is far more satisfactory, for under it the employee has an assurance of a certain sum which does away with some of the uncertainty which otherwise must exist.

This plan can be adopted by telephone companies under a number of different arrangements, depending on the duties of the employee concerned. That is to say, a different detailed arrangement would, of course, be necessary for the employees of the plant, commercial or traffic departments.

Proceedings of the Turin Telegraph Contest of 1911.—An official record of the international telegraphic contest which was held at Turin, Italy, in August, 1911, has been issued in large book form by the Italian Department of Posts and Telegraphs. The volume is quarto in size and is an elaborate piece of work. It is substantially bound and profusely illustrated with views of city and country, monuments, committee groups, portraits of the individual contestants, etc. Every little detail in connection with the affairs is dwelt upon at great length. The book is printed in French, Italian, and Spanish, with some English and German, and contains 336 pages. As an example of wealth of detail in description and illustration, it certainly stands in a class by itself.

Course of Instruction in the Elements of Technical Telegraphy—XXXVIII.

(Copyrighted.)

(Continued from page 239, April 16.)

[We began in our issue for October 16, 1911, the publication of a course of instruction in technical telegraphy. The course, which was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, is published for the benefit of those of our readers who desire to fit themselves for better positions in their vocation. It is elementary throughout and is divided into chapters, following one another in logical order.

The course has received the hearty commendation of telegraph officials and experts for its scope and accuracy and its sound practicability. In each chapter examples are presented in order to illustrate the application of the rules to practical cases, and each chapter is followed by a series of questions pertaining to the subject of the chapter, to be worked out by the student in order to review his progress. Back numbers containing these valuable articles can be obtained on application, at 10 cents per copy.]

Weston Instruments—The Milli-Ammeter.

Fig. 48 shows the exterior and Fig. 49 the interior mechanisms of the Weston milli-ammeter, an instrument which, owing to its many good features, is in general use by wire chiefs.

It consists of a permanent magnet having pole-pieces bored out so as to make a cylindrical opening. In the center of this opening a stationary soft iron cylinder is placed to increase the strength of the magnetic field in the same way as a soft iron core inserted in a solenoid increases the lines of force.

In the narrow gap left between the stationary cylinder and pole-pieces a rectangular coil of fine wire, wound on an aluminum or thin copper bobbin, swings. The bobbin is suspended vertically between

FIG. 48—MILLI-AMMETER.

two delicate jeweled bearings, and is controlled by the spiral springs shown at the top and bottom of the coil. A thin aluminum pointer, attached at right angles to the coil, moves over a scale and indicates the angle of deflection.

To account for the movement of the coil when a current is sent through it it will be remembered that a magnet, when brought near a conductor carrying a current of electricity, shows the presence of some force acting upon it by being deflected to a position at right angles to the wire. Here the force exerted by the conductor tends to produce motion in the magnet, but the magnet also exerts a force on the conductor, and the latter, when placed in a strong magnetic field, will tend to move in a definite direction and with a certain force, depending upon the

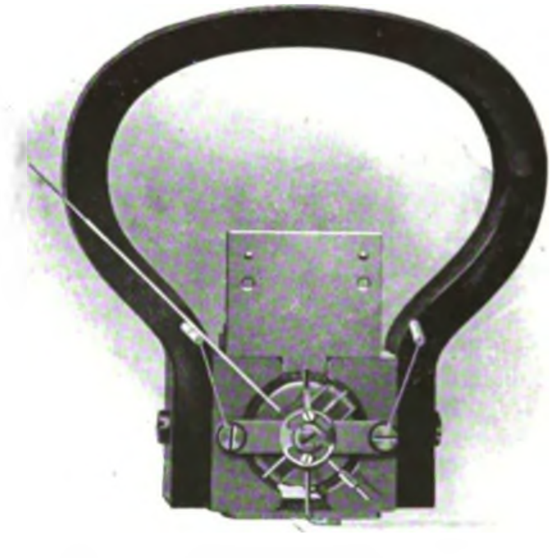


FIG. 49—INTERIOR MECHANISM OF MILLI-AMMETER.

strength of the current and upon the direction and density of the lines of force. The conductor in the milli-ammeter being in the form of a delicately suspended coil, there is, therefore, when a current is sent through it, a tendency for the coil to move through the magnetic field and place itself at right angles to the lines of force, until the moving force is balanced by the torsion of the spiral springs, when the coil will come to rest.

The magnetic field produced by the permanent magnet is practically uniform; that is, the lines of force are not more concentrated in one part of the field than in another, so that the angle to which the coil is deflected is closely proportional to the current flowing in the coil, and the scale divisions are consequently almost uniform.

The friction in the bearings is so slight that it has no effect on the swing of the coil, which, given an impetus, will swing too far over the scale; but a little consideration of the effect produced by the movements of the copper bobbin, upon which the coil is wound, will show how this is prevented.

We have seen that when a conductor is placed in a magnetic field the result of a current flowing through the wire is a movement of the conductor through the magnetic field in a certain direction. The converse is also true. If a conductor be moved in a certain direction (at right angles to the lines of force) through a magnetic field a current will be induced in the conductor. Now look at Fig. 49: the lines of force are passing from one pole-piece to the other, and the copper bobbin in its swing cuts these lines, or, in other words, moves across the magnetic field at right angles to the lines of force. A current is consequently induced in the bobbin as long as the coil continues to move. This induced current circulates in the opposite direction to the current in the coil, and therefore tends to check the overswing and bring the coil quickly to rest at the proper point.

An instrument whose moving system comes quickly to rest at the right place is called a "dead beat" instrument, and this dead beat quality enhances the value of the instrument for quick measurements very materially.

To obtain correct readings the needle must be looked at in line with the scale. To facilitate this a mirror is provided beneath the needle, so that by getting the needle directly over its reflection in the mirror false readings are avoided.

It is obvious that if the instrument is to show the value of the current in a circuit the resistance of the instrument itself must be so small that it will not materially add to the resistance of the circuit when included in it, since any increase of resistance will diminish the current strength. This is brought about by connecting the coil in parallel with a thick copper band, so that only a minute fraction of the current passes through the coil. The coil connected thus is said to be shunted, any branch of a derived circuit being a shunt when taken separately, since it shunts or diverts part of the current from the other branch or branches. The joint resistance of the coil and copper band is only a very small fraction of an ohm, and therefore meets the requirements of the case.

(To be Continued.)

The Balsera Rapid Telegraph System.

A description of a new rapid telegraph machine, which was invented by a Spanish engineer named Balsera, appears in a recent United States Government publication.

The Balsera telegraphic machine is similar to the Hughes, that is to say it is of micronetic movement. A keyboard serves as transmitter, and a wheel of types, which prints on ribbon paper, is the receiver. The synchronism between two machines is obtained independently. with automatic corrections, so that the operator does not intervene in the work once the machines are in operation. The transmitting machine preserves an exact copy of the dispatch, and no auxiliary lever is needed for the receipt of the message.

The machines, constructed and tried, have operated at the rate of 130 revolutions of the type wheel per minute, and in each revolution fourteen letters or signs may be transmitted or received against five in the Hughes.

A practical example of this is given in the word "hacemos" (we do, etc.). The Hughes machine would transmit H in the first revolution; A, in the second; C, the third; EM, fourth; O, fifth, and S in the sixth revolution; whereas the Balsera machine would transmit H in the first revolution and ACEMOS in the second. This shows that the same word is transmitted three times more quickly by the Balsera than by the Hughes, assuming that the two machines are operating at the same velocity.

Naturally this will not happen in all words, as only the letters that run in alphabetical order can be transmitted directly in one revolution, those which go out of this order necessitating one or more turns; but considering the number of letters that may be disposed of by a revolution it is easy to understand the enormous advantage that may be obtained through rapidity by the operator. In spite of the fact that the system is too young for its constant use to have produced the dexterity in the operator's hands necessary for its maximum yield, practically ninety-five per cent more service has been obtained by an operator scarcely familiar with the machine than is obtained on the Hughes.

The Hughes machine frequently loses its initial velocity when the five letters are transmitted in the same revolution, especially when the machine is not well looked after. The Balsera machine can not lose its initial velocity, even if the fourteen letters of which it is capable be transmitted in one revolution, as electrical and not mechanical energy is absorbed.

The types do not print immediately upon the arrival of the dispatch, but only when they are placed in front of the paper. The advantage of this is that, if due to variations in the line the time of transmission is altered, it is not noticed and the variations are practically avoided. It is possible to operate the system in duplex. The machines work with polarized relays.

During the entire month of December, 1912, the machines were operating between Madrid and Barcelona, a wire of three millimeters (0.118 inch) having been used, with no auxiliary transmitting relays between these two cities. The Director General of Communications and two technical boards have been present at these trials, and as a consequence of the approval of the results by the General Telegraph Company an order for several machines is to be made to cover the year's needs.

How President Lincoln Saved Captain T. T. Eckert from Losing His Position.—A story was recently told of how President Lincoln intervened and prevented the dismissal of the late General T. T. Eckert from his position in the government telegraph bureau during the civil war. The anecdote was related by General Eckert himself to the Rev. James Veit, as follows: "In 1862," he said, "when I was an officer in charge of the telegraph bureau with the rank of captain, Secretary of War Stanton called me to his office. He told me that he had received advice that I was not attending to my duties and that my dismissal had been written out. While I was standing speechless before him I felt a hand on my shoulder and some one said: 'I vouch for Captain Eckert. I have had occasion to go to his office several times, and I always found him there attending to his duties.' It was Abraham Lincoln. Stanton broke the silence. 'I apologize to *Major* Eckert,' he said."

A Way to Study.*

BY MINOR M. DAVIS, ELECTRICAL ENGINEER AND CHIEF ENGINEER OF TELEPHONES, POSTAL TELEGRAPH-CABLE COMPANY, NEW YORK.

Recently your president told me that the Postal Electrical Society had so far recovered from the effects of my last talk as to feel able to endure another, and he suggested the possibility of saying something upon the subject of "progress." Undoubtedly much might be said, but why say it when we are all of us engaged in making progress as part of our daily work? From conditions which a few years ago permitted delays in telegraphic communication during the lowering of operating efficiency that wet weather always brings we have passed to a state of affairs where traffic is moved promptly in spite of wet weather unless the lines are actually prostrated. Recent years have seen much improvement in telegraph equipment, and the wires are called upon to carry a heavy load of traffic day and night. The service from customer to customer has been expedited until satisfactory service over long distances under unfavorable circumstances is a matter of course. Each of us who faithfully performs the duties of the day is contributing to this satisfactory service and therefore is a living factor in the progress that is being made.

So much for "progress" as a topic; but I did not select "progress" as the subject of this evening's talk. Taken in the large it is a very big subject. It is better for our purposes to deal with details rather than with generalities, and the talk this evening will be about "A Way to Study."

Methods of working have much to do with the progress of the individual and with the progress of any art upon which an individual is engaged. From my own experience and from observation of young men and women in whom I have been interested I have learned that it is very difficult for even the most earnest student to properly carry on his studies undirected. Few individuals have the gift of taking studious steps consecutively without missing any steps.

It is related of Alexander Hamilton that after the War of the Revolution he studied law. He took the law course in very much less time than students usually give it, and while he was taking the course he made notes for his own guidance. These notes were subsequently used to make a text-book upon law, and this text-book has since taught many law students. The reason why Hamilton, while himself a student, could prepare a text-book for the use of other students is that he knew how to work. There are very few Hamiltons, but some of us can teach ourselves even if we never succeed in teaching others.

One difficulty encountered by a great many young men is that neither the point of beginning nor the path of study is plain to them. The operating room of the Postal Telegraph in New York City contains equipment upon which years of study may be spent and the libraries contain tons of books upon electrical subjects, to which access is easy. But with equipment and books both at hand it is difficult for a student to make a start and to keep going.

Let me try to briefly outline a way to study that has helped me. It is very simple. Begin at the place where you are sure your knowledge is accurate and then follow the chain of reasoning link by link, taking pains to get a good look at each link. If lack of information prevents you from fitting any link into its place lay the subject aside and study something else until you find an opportunity to get the information you require.

To illustrate: Almost everyone begins the study of the telegraph by trying to understand the battery, key and relay circuits used by Morse. Imagine yourself an operator at New York transmitting telegrams upon a simple Morse circuit to an operator at Hartford. You notice that when you open the key your relay and sounder open, and that when you close the key your relay and sounder close. You know that your instruments are joined to the instruments at Hartford by a wire, and that electricity passes through your instrument and through the instruments at Hartford when your key is closed. But this knowledge does not prepare you to understand the quadruplex. You must learn that your wire is connected with the earth at New York. That the current in the relay and in the sounder comes from a battery or from a dynamo machine. That the circuit is from the earth at New York, through the battery or dynamo machine, through the main line relay at New York, along the wire to Hartford, through the relay at Hartford, through a battery or dynamo machine at Hartford and then to the earth at Hartford. This makes a complete circuit. I shall not here attempt to explain why the earth completes the circuit: the student may get this information from the books. Now where shall you begin? It seems natural to ask: "Why does the relay armature move when the key is opened and closed?" Any chief operator will tell you that the relay magnet is made of soft iron. That a wire is wound around the soft iron. That the soft iron becomes magnetic when a current of electricity passes through the winding and that the soft iron loses its magnetism when the current ceases to flow. You can notice for yourself that there is a spring which draws the armature away from the relay whenever the magnet is not pulling. The next question might be, "Where does the electricity come from that magnetizes the relay?" You will be told that it comes from a dynamo machine. You ask "How does a dynamo machine make electricity?" Now this question can be answered directly, but perhaps it will help you to first learn something about chemical batteries which were used to generate current before dynamo machines were invented.

We all know there is such a thing as a battery, but few of us know just how it generates electricity. Most of us would not find it worth while to take the pains to study the electrochemical reactions that we must understand to become thoroughly ac-

* Address before the Postal Electrical Society, New York, April 15.

quainted with the actions inside a cell of battery, but each of us might profitably have a little rough knowledge about it. Mr. F. E. d'Humy wrote a brief article not long ago for the *Postal Telegraph* in which he gave a popular description of the phenomena. Let me read it to you.

"We have all been brought up on batteries, and so used to them have we become from the very beginning of our telegraph career that many of us have not stopped long enough to attempt to determine their mode of operation.

"Theories of how batteries work are to be found in many text-books, but they mostly bear upon the electrochemical changes that occur as the battery generates electric current. Beyond these theories a stumbling block is encountered as formidable as 'What is electricity?'

"It may interest some of us who are not already acquainted with the inner workings of chemical batteries to know the following phenomena incidental to the generation of electric current by batteries. Metals possess a peculiar property of becoming electrified when brought into sudden contact with metals of the same or other kinds, or when dipped into saline or acidulated solutions. All metals have this property, but some to a greater extent than others. Of two kinds of metals, the one that acquires the highest degree of electrification at the moment the two are brought into collision is known to be positive to the one acquiring the lesser electrification. Correlatively the latter is negative to the former.

"The two metals used in Callaud cells, commonly known as gravity batteries, are zinc and copper. Zinc is electropositive to copper and copper electronegative to zinc.

"We have all learned that a current of electricity will not flow unless a complete conducting path (circuit) is provided. Therefore a closed circuit or loop must be formed before an electric current will flow when two different metals are brought into sudden contact. For instance, if a piece of zinc be connected by means of a wire of convenient length to a piece of copper and the two metals are then brought together with a bang, an electric current will flow at the instant of collision from zinc to copper, thence through the connecting wire from copper to zinc. Without the connecting wire no current will flow. The flow of current occurs at the instant of contact only, not before, nor after. Rapping the two metals together rapidly will cause successive flows of current, each of an infinitely small duration of time, and coincident with the rapping.

"Immersing the two metals in a saline or acidulated solution produces the same phenomena as bringing them into collision. The liquid serves as the medium of contact or collision without actually bringing the two metals together. If the circuit be closed by a connecting wire from zinc to copper a current will flow in the same direction as before; this time continuously. The continuous current is sustained by the following action: Upon the first collision, which in this case is chemical instead of mechanical, a film of gas instantly forms on the surface of the copper. This gas is a non-conductor of electricity, and separates the two metals electrically. The gas then frees itself from the copper in little bubbles, and as it does so the solution comes again in contact with the copper plate, making another collision followed by a surge or flow of current. This action takes place irregularly all over the surface of the immersed copper, and is subdivided into myriads of infinitely small bubbles forming and breaking away all independently and at irregular intervals. The freeing of each bubble, no matter how microscopic, from the copper permits contact and causes an impulse of current. In this way we get the effect of a continuous flow of current, while in reality there is an infinite number of currents of short duration, overlapping each other in such density that they really form a continuous flow.

"This action is true of all chemical batteries, including those known as dry batteries, no matter what elements (metals, or carbons, or chemicals) are used."

Keeping in mind that this quotation is here used to illustrate a way to study let us try to answer the question "How does a dynamo machine make electricity?" It is known that electricity will be generated in a closed loop of wire if the loop is quickly moved in front of the pole pieces of a magnet. The mind of Faraday applied to this and correlative knowledge produced the principle of the dynamo machine. Loops of copper wire are so wound upon the rotating part of the machine that they pass near the pole pieces of a big magnet. The mechanism is so arranged that after each loop has passed the pole pieces it is disconnected from the generating circuit and another loop takes its place. Rapid replacement of the loops makes the current impulses from the machine practically continuous. If we were studying dynamo machines we would go on to find out why copper wire is used, how the dynamo magnet gets its magnetism, how the current impulses get out of the machine, etc., but we are now studying a simple telegraph circuit.

Having a little knowledge of the way in which current is generated, let us answer more questions about the New York-Hartford circuit. The dynamo machine at New York may be so connected that it sends positive current to the line. The machine at Hartford will then be connected so that it sends negative current to the line. The student should find out why this relation of polarities is necessary. There is electrical current upon this circuit when all the connections are closed, because the part of the circuit which is wound upon the armatures of the dynamo machines is rotating rapidly near the poles of electromagnets. This current of electricity magnetizes the relays because it passes through the coils of wire that are wound upon the soft iron cores of the relays. The relay armatures are attracted to the front contact stops, because the magnets overcome the pull of the retractile springs. When the relays close the local contacts the sounders at New York and Hartford close because wire wound upon the iron cores of these sounders, connected with sources of electrical energy not here described, magnetizes the cores of the sounders. So long as the circuit remains complete and the armatures of the dynamo machines continue to revolve, the relays and sounders will remain closed. Upon opening the key at New York or the key at Hartford the armatures of the relays and sounders will move, because the circuit has been broken and current no longer flows in the main line. The relays lose their magnetism because their iron cores demagnetize when the current stops. The springs upon the relay armatures pull the armatures back and open the local contacts of the relays and this causes the sounders to lose their magnetism, and the levers are pulled back by the springs.

Referring to the sketch which shows the main elements of a Morse single circuit in the simplest possible picture you may imagine that if the loops of wire were rotated by hand electrical impulses would

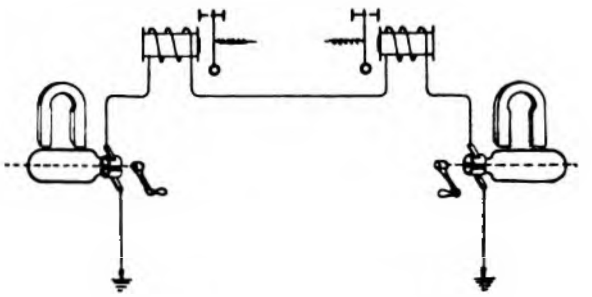


DIAGRAM SHOWING ELEMENTS OF A MORSE SINGLE CIRCUIT.

pass over the line. So they would if the loops were in the right relation to the magnets, but the circuit as shown would not be operative, no matter how rapidly the cranks were turned. You will probably see the reason. If you do not understand the reason it will help you in your studies if you find it out.

Now all this talk has taught you nothing about electrical circuits that you did not know, but if I have made my meaning clear it has illustrated a way to study. Beginning with the knowledge that zinc and copper will generate an electrical impulse if brought into contact we go on to learn that repetition of contact may be chemically simulated. We learn that soft iron becomes magnetic when placed within a loop of wire carrying electrical current; that soft iron loses its magnetism when the current ceases to flow, and that a magnet will generate electricity in a coil of wire moved across its poles. We learn that practically continuous currents of electricity can be produced by rapidly rotating loops of wire close to the poles of a magnet. We learn that by connecting rotating loops of wire with loops of wire that are wound around soft iron we can make the dynamo machine generate current that will magnetize the soft iron. We learn that these currents will follow a wire from city to city, and that the earth will serve to complete the circuit.

The simplest electrical circuit, whether energized by a battery or by a dynamo machine, includes a series of electrical and mechanical actions that must be carefully studied and fully understood before the student is prepared to learn about more complicated systems of telegraphy. It will not do for the student to treat a simple electrical circuit as trivial. Before he can learn how the quadruplex works he must follow the whole chain of events which make a simple electrical circuit operate, and he will find himself asking questions about this simple circuit which have not been answered in this talk. If a student with a thorough knowledge of simple electrical circuits wishes to understand the switchboard connections, the duplex, the quadruplex, the printers, the pneumatic tubes or any part of the equipment of a telegraph office he will not find the road particularly difficult if he will stick to the simple methods outlined in this talk. He must find out how much he really knows, and then go forward step by step. Do not be afraid of any sort of equipment or of any blueprint because it looks difficult to understand. Mechanical and electrical complexities of all kinds yield their secrets to the patient plodder who sticks to the track.

The Telephone in the Flood.

The telephone has become to such an extent an integral part of business and social life that we sometimes lose sight of the fact that it is also the greatest aid in times of emergency. Attention was forcibly called to this fact during the recent disastrous floods in the Ohio Valley. That there were not more lives lost was due to the fact that the telephone messages of warning were swifter than the onrushing waters. With the vast network of telephone wires connecting practically every outlying district and farm of the Ohio and tributary valleys, warning messages were sent in time to enable the people to escape to the hills.

The Bell telephone system bore the brunt of the work of keeping the lines of communication open during this emergency. Upon the very first intimation from the weather bureau of impending floods its repair men, of which there is an army, were gathered together at the strategic telephone centres ready to respond to any calls that might come in.

At the distributing houses and pole yards of the Western Electric Company are immense stocks of supplies, comprising poles, cross-arms, cable and wire, which are constantly kept in readiness for just such crises. The test of an organization comes in such an emergency. The rise and overflow of the Ohio River made it impossible to draw to any great extent on the stocks held in reserve at Cincinnati; but the other warehouses and store yards responded to the call, and shipments were started forward toward the center of the stricken districts. Two hundred and fifty thousand pounds of telephone cable were shipped from New York City by express. A whole trainload of poles was shipped from the company's yards in Michigan. The large stock at the central warehouse at Hawthorne, Ill., was drawn on for an enormous amount of cable and other material. Shipments being made by express, practically every train carried its quota of telephone material. The factories of the company were put on a twenty-four hour schedule, and the vast army of employes worked with a willing spirit to replenish the stocks that had been reduced by the emergency calls.

INDUSTRIAL.

Mine Telephones.

The accompanying illustrations show the modern "protected" mine telephone as manufactured by the Western Electric Company. All the apparatus is enclosed in a substantial cast-iron case, heavily japanned inside and outside and equipped with two doors. This combination makes the set fire-proof, rust-proof and moisture-proof when closed. The line wires may be brought in either at the top or bottom of the case. When brought in at the top, the wires run in through a curved inlet which acts as a drip loop to prevent water from getting into the set.

The outer door protects the transmitter mouthpiece, receiver and generator crank, while the second or inner door protects all the apparatus within

TWO VIEWS OF MINE TELEPHONES.

the case. Electrically, the set is the same as an ordinary magneto instrument containing practically the same apparatus, but the mechanical features are entirely different. Besides being encased in a cast-iron box, every piece of apparatus is individually and thoroughly treated with asphaltum paint or waterproof compound to protect it against the inroads of moisture and corrosive mine water and gases.

To avoid battery trouble the cardboard cartons are thoroughly impregnated with water-proofing compound to prevent the absorption of moisture which would otherwise short circuit adjacent shells, and they are properly spaced by special means to prevent contact. All wiring is fastened with insulating tape and treated with asphaltum paint. Every exposed iron part is triple electro-galvanized.

GUATEMALA SCHOOL OF TELEGRAPHY.—The National School of Telegraphy in the city of Guatemala, Guatemala, is conducted under the management of Señor Julio Amiel. The school is modern in all respects, and turns out first-class operators.

Restoring Telegraph, Telephone and Electric Light Service in the Storm and Flood Districts.

The recent storms in Omaha, Chicago and other centers throughout the West and the floods in Ohio, Indiana and elsewhere created an extraordinary and immediate demand for telegraph and telephone line material. The Western Electric Company was called upon for 8,000 poles, 25,000 cross-arms, 100,000 pins and 32,000 feet of telephone cable, ranging in size from twenty-five to 400 pair, and all of this material went forward on the day the order was placed. The Western Union Company called for 235,000 pounds of emergency cable for the Chicago district, and this order was filled at once from New York by express.

There was a great demand for material from the flood-stricken districts and many of the company's distributing houses through the country responded promptly to the great demand suddenly put upon them.

In order to replenish the depleted stocks the company immediately ordered 50,000 cross-arms from Washington and requisitions were placed upon the sources of supply to increase the stock of copper wire to upward of over 500,000 pounds, for drawing several hundred thousand pounds of copper wire, and the furnishing of from 5,000,000 to 10,000,000 feet of rubber covered wire and outside distributing wire.

There was also a heavy demand for reserve telephone exchange equipment and for electric light, street railway and railroad material, which the company promptly met.

VOLTA RELICS.—A cupboard full of Volta relics, in the form of apparatus, books and papers, was discovered recently in a small Italian town. The articles will probably be purchased and presented to the Royal Institution, London, to be placed alongside Faraday's original apparatus.

NEW BOOKS.

American Telegraph Practice.

"American Telegraph Practice," is the title of a new and important book just issued, the author being Mr. Donald McNicol of the engineering staff of the Postal Telegraph-Cable Company, New York.

This book will take a leading place among telegraph literature, and will no doubt become a standard work of reference and study. It is not a cheap, popular work, skimming over the surface of things and giving disconnected facts, but is a serious and complete exposition of the art and practice of telegraphy. It covers the subjects with which it deals in a very complete and systematic manner, and is, besides, authoritative. The subject-matter and illustrations were obtained from official sources, and the entire field is treated in a masterly way.

The book constitutes a complete technical course in modern telegraphy, including simultaneous telegraphy and telephony, and contains 498 pages, exclusive of the index. There are twenty-four chapters, as follows: I. Electricity and Magnetism; II. Primary batteries; III. Dynamos, motors, motor-generators, dynamotors, voltage and current regulators; IV. Storage batteries, current rectifiers, mercury arc and electrolytic; V. Power-board wiring, battery switching systems and accessories; VI. Circuits and conductors; VII. Single Morse circuits; VIII. Lightning and lightning arresters; IX. Terminal and intermediate switchboards; X. Measuring instruments, testing; XI. Speed of signaling; XII. Single line repeaters (29 pages); XIII. Duplex telegraphy; XIV. Quadruplex telegraphy; XV. Balancing duplexes and quadruplexes; XVI. Duplex and quadruplex "local" circuits, leg-board and loop board connections (12 pages); XVII. Branch office annunciators; signaling systems, selectors; XVIII. Half-set repeaters (20 pages); XIX. The Phantoplex; XX. High-speed automatic telegraphy (22 pages); XXI. Telegraph and telephone circuits as affected by alternating-current lines, transposition of wires; XXII. Telephony, simultaneous telegraphy and telephony; XXIII. Wire specifications; XXIV. Electrolysis.

Four appendices give much other valuable information, including tables, constants, etc.

The illustrations, of which there are 418, are very clearly drawn, and there is no difficulty whatever in any instance in being able to trace the circuits and arrive at an understanding of the operation and construction of the apparatus.

The text of the work is based to a large extent upon a series of lectures given in the evening technical schools in connection with Columbia University, New York, and as the students, all of whom were telegraph and telephone workers, experienced no trouble in understanding the simple mathematics employed, the problems are included in this work and should not offer any difficulty to the average student of telegraphy.

This work is the "last word" on telegraphy; and a copy should be in the possession of every telegrapher who wishes to prepare himself for advancement. It is truly a complete telegraph education in itself.

The price of this book is $4.00 per copy, postage prepaid, and copies may be obtained of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

ELECTRICAL INSTRUMENTS AND TESTING.—The fourth edition of "Electrical Instruments and Testing," by Norman H. Schneider, has just been issued and is now ready for delivery. This edition has been greatly enlarged and brought up to date, and it will be found acceptable and reliable in every respect. Much important new text and many illustrations and tables have been added. In the section relating to testing much fresh material will be found, including several pages on testing in telephone exchanges. New information is also given on the use of the voltmeter in testing resistances.

The book has 256 pages and 133 illustrations, and the contents by chapters are:

Laws of Electricity; Galvanometers; Rheostats; Voltmeters; Wheatstone Bridge; Testing Sets; Current and E. M. F. in a circuit; Potentiometer; Charge and Discharge of Condenser; Telephone and Telegraph Cable Testing; Testing with Voltmeter; Testing Telephone Lines with the Voltmeter; Early Morning Tests; Location of Grounds and Crosses.

The work is designed for the practical man, and is devoid of higher mathematics. It is a clear, straightforward presentation of all the matters covered.

Mr. Jesse Hargrave, superintendent Mackay Telegraph and Cable Company, Dallas, Tex., and an electrical engineer of ability and high standing, is the author of the chapters on testing telegraph wires and cables and locating faults.

The price of the book is $1.15, postpaid to any part of the world, and orders will be filled by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, on receipt of price.

Maver's Encyclopedia of the Telegraph.

"The book received. I am pleased to find it even exceeds my expectations," writes Mr. C. O. Overbey, of Amarillo, Tex., in regard to "Maver's American Telegraphy and Encyclopedia of the Telegraph." In his statement Mr. Overbey expresses the general experience of the purchasers of this standard work on telegraph engineering in this country. Telegraph engineers of high repute here gratefully say it was their only alma mater, and that any student may become an all round telegraph engineer by the study of this work. The edition of 1912 contains the last word on duplex, quadruplex and printing telegraphy, and describes in full detail the essentials of line and wire testing, etc.

The price of this book is $5.00 per copy, and copies may be obtained of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Wireless Telephony in Mines.

A system of wireless telephony is in regular and successful operation in the Carolinengluck coal mine, Germany.

The equipment required is very simple, and the necessary primary currents can be obtained from small batteries, so that the capital outlay and working expenses are low. High-pressure high-frequency secondary currents are supplied to ropes, pipes and rails in appropriate positions in the mine, and the electromagnetic radiations from these conductors are received in suitable local circuits.

Wireless telephonic communication can be established between the engine house and the shaft cages by (1) connecting a loop conductor in the shaft lining to batteries and a microphone in the machine house; (2) connecting a telephone and battery between the extremities of the over and under-winding ropes at each cage. These ropes and the winding pulleys form a closed circuit in which the current can be varied (by speaking into the cage transmitters), and thus corresponding variations can be electromagnetically induced in the engine-house receiving circuit.

The various strata of the soil play an important part in wireless telephony in mines. Electrically, the surface of the soil acts as a vast condenser, capable of absorbing any quantity of electricity. The lower strata act as an insulator with regard to static charges. The rails and pipes form a conducting system, sufficiently insulated by the surrounding layers of soil to be used as such—even for weak static charges.

A 12-volt battery in the surface sending station passes about 0.5 ampere through a microphone and the primary of an induction coil, which raises the pressure of the speech currents to several thousand volts. The secondary of the transmitting transformer is connected between earth and a pipe line transversing the mine shaft and galleries. The feeble high-pressure speech-currents flowing through the pipe line, or other conductors in the mine, emit electromagnetic waves, and the linear conductor may be interrupted at various points without disturbing the propagation of the waves. To collect some of these radiations and translate them into sound, one of three different arrangements may be employed. The simplest receiving circuit comprises a high-pressure winding connected between the pipe and the rails and a secondary low-pressure circuit containing a battery and the telephone receiver. In the middle gallery, the high-pressure winding of the receiving transformer is simply bridged across from 15 to 35 feet of the pipe according to the distance from the sending station. A third arrangement requires no direct connection between the pipe line and the receiving circuit; the high-pressure winding of the receiving transformer is connected to a loop of wire mounted parallel to the pipe line and constituting a receiving antenna.

For calling a note of definite pitch is emitted by an "electrical trumpet" in the sending station, and the electromagnetic waves radiated from the pipe system in the mine impinge on a receiving antenna connected to an electromagnet mounted beneath a membrane in the receiving station. This membrane is set in vibration by stimulating oscillations of predetermined frequency, and then makes and breaks the contact between itself and a style on a balanced arm the adjustment of which is independent of temperature. By tuning the membranes at various stations to different frequencies, and by providing a number of electric trumpets emitting corresponding notes at the pit-head station it is possible to call selectively the stations in the mine.

The Wonders of the Telephone.

BY HERBERT N. CASSON.

The telephone business is not like any other business on the face of the earth. It is the most remarkable combination of science and mystery, of human and mechanical, of wire and wits, of highly skilled specialists and the general public.

Any little child can be the engineer of a telephone talk-train. Any little baby can send its coo-ings hundreds of miles along the wire to its father at the other end. And yet, at the mystery end of the telephone, not even John J. Carty, master of telephone science, can explain, or even comprehend, some of the phenomena of a telephone exchange.

I once asked Alexander Graham Bell if he really understood the workings of a telephone receiver, and he replied: "Why, of course not. Nobody does." I also asked Mr. Emile Berliner if he could explain exactly what happened in a telephone transmitter, and he replied, "No, I can't. It is as great a mystery to-day as it was thirty years ago."

Think of the marvel of it! Here is an intricate network of wires and disks and electric currents and electric lights and keys and jacks and bells and cords and cables. This mechanism is so delicate that it is actually operated by the slightest sound. It is not set in motion by steam or gasoline, but by *breath*. The slight vibration of the vocal cords is actually the power that puts the vast telephone mechanism in operation.

A telephone system is an immense and widespread mechanism of voice machinery. There is nothing else like it. It stands by itself as a marvelous thing which anyone can use, and which nobody can understand.

So, the telephone business is fascinating because there is no end to it. The job is always bigger than the worker. There is always more to learn. No matter how wise we are, we can never be quite wise enough. And no matter how hard we think, the thing will always be a little bigger than the thought.

The telephone business branches out into the great new field of electrical science. It branches out into the field of voice study and elocution. It links itself to the metal trades and the rubber business. It is half indoor and half outdoor. It goes everywhere. It concerns everybody. Like the rain, it benefits alike the just and the unjust. And it has become so necessary that any family to-day without a telephone is in the dumb animal class and behind the times.

Twenty-Fifth Anniversary of the Magnetic Club.

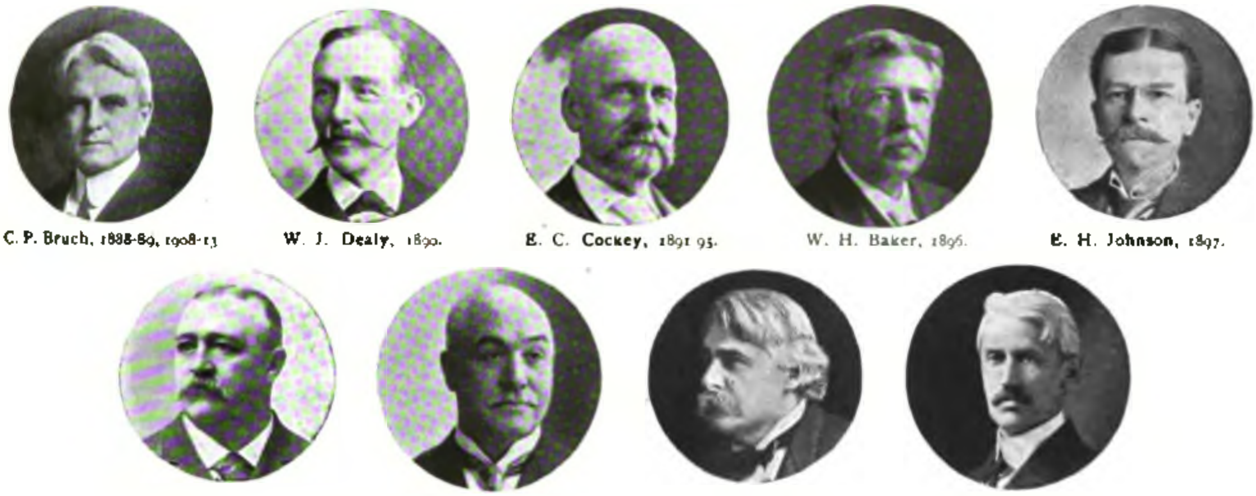
The Magnetic Club, of New York, on April 19 celebrated the twenty-fifth anniversary of its organization at the Broadway Central Hotel in a manner befitting the occasion. The officers had planned to give the members an enjoyable time and the results were exceedingly gratifying. The event of special interest was the conversation and exchange of greetings by telegraph with London direct from the banquet hall.

Prior to the dinner some time was spent in examining an exhibition of old telegraph apparatus and other relics of the early telegraph days, collected by Mr. J. F. Skirrow at the suggestion of Mr. E. J. Nally, and much interest was shown in them.

When the party assembled for dinner the exercises were begun by the singing of "America," after which connection was made with London by direct wire and greetings were exchanged. Sounders were scattered thoughout the room so that all could hear the international greetings. The signals from London and Waterville, Ireland, came with remarkable distinctness and were warmly applauded. Those present were deeply impressed with the thought that the impulses that caused the ticking of the instruments originated three thousand miles away, with the broad Atlantic between the sending and receiving ends. Mr. S. F. Austin, superintendent of the Commercial Cable Company, operated the New York end of the circuit, using a silver key that had been the property of Professor S. F. B. Morse, and a relay that had been used when the first message was sent around the world, via the Commercial Pacific Cables. The London end was in charge of Frederick Ward, manager in England, and E. J. Phillips, superintendent, and R. J. Hughes, superintendent at Waterville, Ireland, also sent greetings and in American Morse at a rapid speed.

Half past five o'clock was the time appointed for the dinner, and 214 members and guests sat down to the tables in the happiest frame of mind. The early hour was set in order to give ample time for the carrying out of the interesting programme in its entirety and enable the members to get home at a reasonable hour.

At the conclusion of the dinner, President Bruch gave a brief history of the Club's work during the twenty-five years of its existence. The club was organized April 19, 1888, Mr. T. C. Martin naming it "Magnetic," also designing the emblem. Forty-eight names were signed to the charter roll. The object of the club, he stated, was to promote good-fellowship. One reception, fifty-six dinners and seventeen outings had been held—"73" dinners and outings—and this was the seventy-fifth social meeting. He briefly reviewed the features of the various meetings and outings, and read a long list of names of distinguished gentlemen who had been guests of the club during its career up to the present. Many of these persons have since closed their earthly activities and gone to their rest.



C. P. Bruch, 1888-89, 1908-13. W. J. Dealy, 1890. E. C. Cockey, 1891-95. W. H. Baker, 1896. E. H. Johnson, 1897. R. J. Hutchinson, 1898-99. F. W. Jones, 1900-04. A. B. Chandler, 1905-06. G. H. Usher, 1907.

PRESIDENT AND PAST PRESIDENTS OF THE MAGNETIC CLUB, NEW YORK.

He referred to the unselfish and faithful work of the officers and the various committees during the club's activities in their efforts to provide entertainment for the members, and closed his remarks with complimentary references to the entertainment talent among the members—oratory, singing, etc. "We have had good times, and we are having them now," he said, "and the Magnetic Club is going to keep on having them; that is what it is for—to have good times, to keep up old friendships, to help form new ones, to make us 'love our fellow-men,' so that we may always answer 'yes' to the question 'Are you happy?'"

Mr. Bruch then introduced Mr. W. J. Dealy, the second president of the Magnetic Club. Mr. Dealy spoke on "Fraternity and Mutual Aid in the Telegraph Service."

The next speaker, Mr. W. H. Baker, the fourth president of the club, was introduced, and spoke on the "Value of Sociability Among Telegraphers."

"The Development of Electrical Enterprises by Telegraph Men" was the subject of the next address, Mr. E. H. Johnson, the fifth president of the club, being the speaker.

Messrs. Francis W. Jones and George H. Usher, seventh and ninth presidents, respectively, were down on the programme for addresses, but were unable to be present and sent letters of regret which were read by toastmaster Bruch.

Colonel Albert B. Chandler was the next and last speaker, taking as his subject "Telegraphers in the Civil War." The entire company rose when he was introduced and greeted him with cheers. His remarks were listened to with keen interest.

The Harmony Orchestra, composed of members of the Western Union engineering staff, was then introduced and rendered some excellent musical selections, which were warmly applauded. In presenting them, Mr. Bruch said that "Telegraphers are versatile. They can do many things besides running messages, pounding keys, climbing poles and drawing large salaries."

After the singing of "Auld Lang Syne" a short intermission for social intercourse was taken and this was followed by an excellent and varied musical programme, which concluded the evening's festivities.

A handsome watch fob of unique design in metal, was given to each one present as a souvenir of the occasion. The pendant contained the club's well-known emblem—a horse shoe magnet, with the symbol "73"—and was suitably inscribed on the back. This souvenir was much appreciated by the members.

Among those present were:

Albany, N. Y.—N. C. Pangburn, H. S. Mason.

Bridgeport, Conn.—W. P. Phillips, H. B. Ray, E. F. Sause.

Boston, Mass.—W. Ryan, C. A. Richardson, F. B. Travis.

Buffalo, N. Y.—J. F. Harrington, H. D. Reynolds, L. H. Bangert.

Dallas, Tex.—S. M. English.

Harrisburgh, Pa.—C. E. Diehl.

Jersey City, N. J.—A. C. Ackerman, Fred. Ackerman, F. W. Potts.

Havana, Cuba.—J. W. Lawson.

Norfolk, Va.—H. A. Lanier.

Philadelphia, Pa.—S. S. Garwood, C. E. Bagley, A. E. Zintl, J. A. McNichol, J. H. Wilson, R. C. Mecredy.

Chicago, Ill.—H. R. Davis.

New York, N. Y.—J. F. Ahearn, J. J. Astegher, C. C. Adams, H. Angel, S. F. Austin, T. M. Acken, W. H. Baker, C. F. Bandel, C. P. Bruch, W. A. Boyd, B. Beardsley, T. M. Brennan, Col. E. B. Bruch, J. R. Beard, J. J. Cardona, M. R. Cockey, Frank Cohen, Samuel Cohen, T. L. Cuyler, Jr., Walter Cleverdon, Fred. Cleverdon, R. N. Cleverdon, J. F. Cleverdon, R. Cardona, L. J. Cardona, M. D., J. F. Connolly, J. W. Connolly, A. Clokey, T. J. Cusack, Col. A. B. Chandler, J. Costelloe, J. K. Calvert, T. F. Clark, W. H. Davis, M. M. Davis, Mark L. Dunn, W. J. Deegan, L. Dresdner, A. J. Driver, W. B. Dunn, W. J. Dealy, H. W. Dealy, F. N. Dealy, T. J. Donovan, J. S. Ellis, J. W. English, A. J. Eaves, J. Ellis, V. F. Fiore, J. H. Flood, E. Fiske, J. J. Fredricks, Wm. Finley, E. F. Fisher, C. A. Fisher, T. E. Fleming, D. Fuchs, W. E. Fleming, R. Gould, W. G. Gray, D. H. Gage, Jr., J. J. Ghegan, A. Goul, Jr., T. J. Howlett, W. E. Huntington, T. E. Heffren, W. A. Hayes, P. A. Hickey, T. E. Hammond, Wm. Heron, J. F. Harrington, R. J. Hall, W. G. Harkness, J. F. Howell, J E. Hoey, H. F. Hawkins, F. E. d'Humy, M. O. Hoffman, E. F. Howell, W. A. Houghtaling, Dr. L. R. Hallock, G. W. Hickey, H. W. Hetzel, E. H. Johnson, C. Jacobson, F. J. Kernan, F. G. Kernan, H. L. Krum, E. Kimmey, A. F. Kavanaugh, M. H. Kerner, M. Kitt, A. C. Kaufman, James Kempster, C. F. Leonard, C. A. Lane, G. H. Leader, Robert Lundell, H. S. Latimer, C. Lyle, L. Lemon, D. J. McQuade, T. Murray, C. E. Merritt, W. Miller, J. A. Manning, R. L. McCann, D. McNichol, J. J. McCormick, F. E. McKiernan, D. F. Mallen, J. J. McCauley, U. H. Michener, H. J. McNamee, L. MacConnach, J. J. McDermott, W. J. Morrison, W. J. Morrison, Jr., H. C. Morrison, A. V. Morrison, F. A. Morrison, J. A. Morrison, J. McNeill, John T. Mulhall, H. W. Moorehouse, P. T. McNamara, H. R. Monahan, C. E. Muerling, R. H. Miller, W. H. Mathews, E. J. Nally, C. E. Orr, J. P. O'Donohue, G. J. O'Brien, M. J. O'Leary, F. G. Payne, E. B. Pillsbury, W. O. Powers, C. Ruffer, Major S. Reber, U. S. A., H. J. Reinhardt, D. F. Regan, L. O. Rogers, S. Reyonlds, C. Rimpo, Edwin J. Rankan, W. H. Rost, Wm. Restmeyer, J. Santulli, F. J. Scherrer, G. Sievewright, Wm. V. Stahl, D. Shortall, W. Scarborough, T. G. Singleton, J. F. Skirrow, W. A. Scrivens, C. Shirley, D. Skelton, P. Q. Skirrow, J. F. Shugrue, H. C. Sanford, W. M. Sheehan, C. A. Tinker, E. P. Tully, J. H. Twyford, J. B. Taltavall, J. T. Tynan, G. G. Volkmor, D. C. Van Orden, E. M. Underhill, Albert Walsh, R. S. Wishart, J. P. Williams, H. P. Wasserboche, J. J. Whalen.

Philadelphia, Pa.—S. S. Garwood.

Pittsburgh, Pa.—Geo. Weider, W. A. McCombs.

Syracuse, N. Y.—J. W. Weed.

Woods Hole, Mass.—H. G. Haddon.

Washington, D. C.—G. M. Foote, W. E. H. Krechting, M D.

Minneapolis, Minn.—H. A. Tuttle.

Mr. A. W. Orton, of Rome, N. Y., a military telegrapher during the civil war and a well-known old-timer, in renewing his subscription for another year, writes: "Although for many years out of the telegraph service, I enjoy perusing TELEGRAPH AND TELEPHONE AGE. I always find items of interest in its columns. The paper keeps me in touch with the new developments, and I take pleasure in recommending it to the telegraph and telephone fraternity. Although personally out of line in these professions my interest in its progress and development does not abate."

MR. G. O. PERKINS, superintendent of telegraph of the Chicago Great Western Railroad Company, Chicago, Ill., writes: "I assure you that I will never miss an opportunity to induce our employes to subscribe for your excellent publication."

Edison - BSCO Type 404 Cell – 400 A. H. Capacity

EDISON BSCO

PRIMARY BATTERY

The Standard Closed Circuit Cell

No matter how well a telephone system is constructed, distinct transmission is out of the question unless the transmitter is supplied with current by a battery of low internal resistance and capable of maintaining uniform voltage.

No better example is needed of the results possible with a proper battery than are furnished by any well-maintained common battery telephone system.

It therefore behooves every telephone man who feels that high-grade service is imperative, to adopt the most suitable talking circuit battery that the market affords.

No othe primary battery compares with the Edison in either of the important features mentioned. Of the other cells commonly used for telephone work, a dry battery does not maintain uniform voltage and is of much higher internal resistance. A gravity cell is of high internal resistance, requires considerable attention to keep at maximum efficiency, and the work of renewal is unusually disagreeable.

Service and laboratory tests of all cells show that the **EDISON**-BSCO maintains the most uniform voltage under discharge, and has the lowest internal resistance of any primary cell. The task of renewing has been made extremely simple with this new type, none of the parts that have been in solution are handled, and the cell can be recharged without soiling the hands.

Catalog on request.

The Cheapest Form of Battery

THOMAS A. EDISON, Inc.

247 Lakeside Avenue, Orange, N. J.

Complete Edison-BSCO Renewal. Each Edison-BSCO complete Renewal consists of Zinc-Oxide assembled, can Caustic Soda, and bottle of Oil.

THE RAILROAD.

Miss Margaret S. Walstrum, daughter of Mr. W. C. Walstrum, superintendent of telegraph, Norfolk and Western Railway, Roanoke, Va., was married to Mr. A. G. Kindred on April 14. The bride is very popular in her home town.

Wireless on the Lackawanna Railroad.

In our March 16 issue reference was made to the proposed installation of a wireless telegraph service on the Lackawanna Railroad between Scranton, Pa., and Binghamton, N. Y. Mr. L. B. Foley, superintendent of telegraph of that road, states in this connection that 2-kw. 500-cycle Marconi stations will be established at Scranton and Binghamton, and 1-kw. outfits on the passenger trains. The antenna tower at Scranton will be 225 feet high and that at Binghamton 200 feet.

The installation of the wireless is largely experimental in this instance, but the railroad officials are sanguine as to the results. One of the principal reasons for the proposed use of wireless is to insure communication on the section of the road between Scranton and Binghamton, the maintenance of wire lines along which is difficult in stormy weather.

The St. Louis Convention of Railway Telegraph Superintendents.

Secretary P. W. Drew, of the Association of Railway Telegraph Superintendents, has issued a circular letter of information regarding hotel rates, etc., in connection with the thirty-second annual convention of the Association, which is to be held at the Planters Hotel, St. Louis, Mo., May 20 to 23.

Rates at the hotel are as follows:

Single room, without bath, $1.50 and $2.00 per day; with bath, $2.50 per day and up.

Double room, without bath, $1.00 per day per person and up; with bath, $1.50 per day per person and up.

Table d'hote meals at the following rates: Breakfast, 75 cents; luncheon, 60 cents; Dinner, $1.00. Also a la carte.

As there is to be another convention in St. Louis the same week members are advised to apply promptly to Mr. Lyman T. Hay, general manager of the Planters Hotel, for accommodations.

The usual arrangements for transportation to and from St. Louis and for sleeping car accommodations will be observed.

An informal get-together assembly will be held at 8.30 p. m., Monday, May 19, in a parlor in the hotel, and the first business session will be called to order at 10 a. m., Tuesday, May 20.

Following is a list of the papers to be read at the convention:

"General Principles Underlying Telephone Transmission," by Messrs. Elem Miller and C. A. Robinson.

"Use of Telephone by Railroads for Dispatching Trains, Handling Messages, etc.," by Mr. J. C. Johnson.

"Inductive Disturbances as Affecting Telegraph and Telephone Circuits," by Mr. P. J. Howe.

"Protection Against Lightning and High-Tension Currents for Telegraph and Telephone Equipment," by Mr. M. H. Clapp.

"Main Line Power for Selective Circuits, Including Transmission and Signaling," by Mr. R. F. Spamer.

"Full Use of Wires," by Mr. H. D. Teed.

"Organization for Maintenance of Lines," by Mr. M. C. Allen.

"Organization for Wire Chiefs and Telephone Inspectors," Mr. J. B. Sheldon.

Advance copies of the papers will be forwarded to the members, who are requested to bring them to the meetings and be prepared to discuss the various subjects.

At the recent meeting in Chicago of the Eastern and Western Divisions it was decided by the supply men not to make any organized collective exhibit of apparatus at this convention, leaving the individual concerns free to make displays in their rooms if they see fit.

Mr. P. W. Drew, 112 West Adams street, Chicago, Ill., is the secretary of the Association, and he will be pleased to give any further information relating to the meeting.

B. A. Worthington, President Chicago and Alton Railroad, a Former Telegrapher.

The fact that so many former telegraphers occupy posts of prominence and responsibility in other lines of activity is evidence of the educational value of a telegraphic career. The presidents of some of the leading railways in this country were telegraphers early in life, who looked beyond the present and

B. A. WORTHINGTON, CHICAGO, ILL.

took every opportunity their positions afforded to fit themselves for advancement and greater responsibilities.

Mr. B. A. Worthington, president of the Chicago and Alton Railroad Company, Chicago, Ill., is a notable example of what an operator possessed of ambition and energy can accomplish. He was born in Sacramento, Cal., November 20, 1861, and began his telegraphic career at the age of thirteen years as a messenger for the Central Pacific Railway Company in his native city, later becoming an operator. He worked in the Western Union San Francisco, Cal., office, and after considerable commercial experience he returned to the railroad service. Being of an ambitious nature he, by studying shorthand, soon afterward became secretary to the superintendent of motive power of the Southern Pacific Company at the Sacramento locomotive shops. He was later appointed chief clerk to the general manager, and afterward to the assistant to the president.

During these years he was an eager student of the construction and operation of locomotives, and he soon became superintendent of the Tucson division of the Southern Pacific. His progress was rapid, and he afterward occupied positions of prominence with various railways, finally reaching the presidency of the Chicago and Alton.

Mr. Worthington is a thoroughly practical railroad man, and is held in the highest esteem by his contemporaries and subordinates. His telegraphic experience proved to be an enduring foundation for his later career, and that he has used his talents well is evident from his success in life.

A. T. Hardin, Vice-President New York Central Lines, East, a Former Telegrapher.

Mr. A. T. Hardin, whose appointment as vice-president of the New York Central Lines, East, was recorded in our issue dated April 16, is a native of South Carolina, in which state he was born in 1868. He entered the railway service in 1882 as telegraph operator on the Richmond and Danville Railroad, and afterward became agent and later stenographer for the same interests. He served in the latter capacity until 1890, when he entered the University of South Carolina, taking the civil engineering course. In 1894 he graduated from college and entered the maintenance of way department of the Southern Railway. From 1898 to September, 1899, he was supervisor and division engineer of the New York Central and Hudson River Railroad Company, and from the latter date until February, 1903, was engineer of track for the same road.

Later positions occupied by Mr. Hardin on the New York Central were: Engineer of maintenance of way from February, 1903, to July, 1905; assistant to the general manager, July, 1905, to June 14, 1906; assistant general manager, June 14, 1906, to April 15, 1912; assistant vice-president, April 15, 1912, to April 1, 1913, and on April 1 of this year, he was elevated to the position of vice-president, with headquarters at New York, as noted.

Western Electric Company's Telephone, Supply and Foreign Business.

For a period extending over thirty-five years the growth of the telephone industry has been so closely identified with the Western Electric Company that it is generally thought that the activities of the company do not extend beyond the manufacture of telephones. In a recent issue of the *Western Electric News* Mr. Gerard Swope, vice-president, has reviewed the commercial activities of the company since 1884, showing in detail how the company's field of operation has broadened until now it has spread into every branch of the electrical industry.

The growth of the business since 1884 has been markedly upward, with but one appreciable set-back during 1907 and 1908. In 1906 the business of the company grew from approximately $44,000,000 to $69,000,000, or over fifty per cent. After 1908 it again grew at quite a rapid rate until for the year just completed the sales amounted to approximately $72,000,000, making 1912 the largest year in the history of the company. This business was secured from almost 40,000 customers all over the world. Among the nations which have most recently entered this list are China, where the first common battery telephone exchange was installed a few years ago at Peking, and Turkey, where, just before the outbreak of the war, the contract for the first common battery telephone system was secured. Within the last month, the company has been awarded another large switchboard contract in China.

The larger part of the company's telephone business is done with the American Telephone and Telegraph and Associate companies, manufacturing and furnishing telephone apparatus, switchboards and cable, and buying for them a large variety of merchandise made by other concerns. In addition to the companies of the Bell system, sales have been made to 9000 different telephone companies in the United States.

Some of the salient points of the 1912 business have been the furnishing of enough telephone switchboards and telephones to give service to over 1,000,000 new subscribers, and the manufacture in the Hawthorne and foreign shops of cable containing 10,000,000,000 conductor-feet of wire, or enough to girdle the earth eighty times.

Another side of the company's activities, the electric light supply business, while not as large as that of the telephone, runs into millions every year.

The company's customers range from the smallest household to the largest corporation. Great railroads, in addition to purchasing lamps, motors, line material, etc., have installed Western Electric telephones on their lines to increase the efficiency and safety of operation, while, in order to make work in mines less hazardous, telephones have been introduced in most of those in the United States.

IMPORTANCE OF GOOD GROUND CONNECTION.—Fully 75 per cent of lightning-arrester troubles are directly traceable to inadequate ground connections. Copper sheets, with at least four square feet of surface, should be used for the ground connections, and should be thick enough to prevent wasting away. The depth to which the plates should be buried depends, to a large extent, upon the nature of the earth about the station. It can be said that the plate should be buried in powdered coke to a depth at which the soil is always damp.

T. M. B. A. Assessment.—Assessment No. 551 has been levied by the Telegraphers' Mutual Benefit Association to meet the claims arising from the deaths of E. G. McMinn, at Chicago, Ill.; R. Gibbs, at Medford, Wis.; F. W. Ganger, at Bedford City, Va.; G. W. Jackson, at Rochester, N. Y.; W. Ettenger, at Elizabeth, N. J., and J. D. Cruise, at Osawatomie, Kan.

Lectures on Interesting Subjects.—Mr. Samuel Wein, 51 East Ninety-eighth street, New York, has made a special study of the transmission of photographs by telegraph, and selenium submarine cable relays, and would be pleased to address any telegraphic society on these interesting subjects. His lectures are illustrated by lantern slides and experiments. Mr. Wein is willing to give his lectures without compensation.

Wire Tappers Trapped.—Three "wire tappers" were brought to grief in New York a few days ago by a Southerner whom they had intended to victimize, and who apparently fell into their trap, but, in reality, led them into the arms of the police. The usual process, involving delayed racing returns, betting on the alleged known winners, dummy telephones, etc., was followed by the sharpers.

Production of Platinum.—During the year 1912 the platinum production in the Ural region, in Russia, was only 12,177 pounds (avoirdupois) as compared with 12,727 pounds in 1911.

For Sale.—Bound volumes of Telegraph and Telephone Age for 1912. Price $3.50. Sent by express, charges collect. This price covers the bare cost of binding and handling in addition to the regular subscription price of the paper. The binding is of substantial black cloth, with neat gilt lettering. The index is even more complete than usual, comprising, in addition to the regular alphabetical classification: The Cable, Obituary, Postal, Radio-Telegraph, Railroad, Western Union, Authors, Biographical, Book Reviews, Canadian Notes, Editorial, Legal, Municipal Electricians, Some Points on Electricity, The Telephone, Telephone Pioneers. In addition to the index for 1912, a complete index for the year 1911 has been added, thus greatly increasing the reference value of the work. This complete record of events of the year and the latest developments in telegraph, telephone, cable and wireless science should be in the library of every progressive member of these professions.

MUNICIPAL ELECTRICIANS.

Mr. W. E. Wolgamott, city electrician, Peoria, Ill., has been elected president of the Peoria Electrical Club.

Records of Efficiency.—The Gamewell Fire-Alarm Telegraph Company, New York, has just issued a neatly gotten up pamphlet, entitled "Records of Efficiency, Relay Systems." It contains a description of the Gamewell interior fire-alarm service and endorsement by fire insurance underwriters and many mercantile and other large business establishments and public institutions all over the country.

The Watertown Convention.

The announcement of the general programme of the convention of the International Association of Muncipal Electricians, to be held at Watertown, N. Y., August 19 to 22, published in our issue for April 16, has stimulated interest in the meeting, and there is now every reason to believe that there will be a large attendance.

The programme is an attractive one, both from business and social standpoints, and while the entertainment feature is of generous proportions, President J. W. Kelly, Jr., has wisely subordinated it to the business of the convention as far as the members are concerned. He looks upon the gathering in a business light, the entertainment being secondary. The men, however, will be allowed plenty of enjoyment; their time will be fully taken up between business and pleasure during their stay in Watertown, and the two features will be nicely balanced.

Papers of interest and practical importance will be presented at the convention for consideration, and the discussion should be free and ample. Frequently discussions bring to the surface many facts that would not come to light through the medium of a technical communication, and the municipal electricians have a commendable reputation for investigation and asking questions at their meetings for their own information and that of their fellow members.

Among the important subjects to be presented for consideration at the meeting will be, in addition to fire-alarm and police signaling, electrical inspection, municipal lighting, the joint use of poles, permissible voltages on overhead wires in cities, standardization of specifications for cables for municipal purposes and municipal ownership.

The modern municipal electrician must take cognizance of all these subjects and be familiar with them. Much responsibility rests upon these officials and the Watertown meeting will afford an excellent opportunity to gain wider knowledge upon these matters, which are pressing upon them for attention.

A new constitution and by-laws for the Association will be taken up for consideration and passed upon. The original constitution will probably be made more flexible, in order to meet the changed conditions in municipal engineering.

Mr. J. W. Kelly, jr., president of the association, is giving much personal attention to the arrangements for the convention, which fact is an assurance that the meeting will be a great success. Mr. Kelly, whose address is Camden, N. J., will be glad to give the members any further information on the subject.

The Detroit Convention of Old Timers.

The citizens of Detroit, Mich., are making active preparations to give a rousing reception to the old-time telegraphers on August 26, 27 and 28, and the members and their families are assured a very enjoyable time. President H. J. Kinnucan, who resides in that city, will leave nothing undone that will in any manner contribute to the general enjoyment.

The members themselves are looking upon this reunion of the Old-Time Telegraphers and Historical Association and the Society of United States Military Telegraph Corps with much pleasure, and many of them have signified their intention of being present. That there will be a large gathering is certain, and preparations are being made accordingly.

Mr. F. J. Scherrer, secretary of the old timers, and Mr. David Homer Bates, secretary of the military telegraph corps, report unusual interest in the coming reunion, and they are kept busy making the necessary arrangements. There is every indication, they say, that the Detroit meeting will surpass all former reunions.

A subscription to Telegraph and Telephone Age yields splendid returns on the investment.

New Western Union Main Switchboard.

Following are the specifications of the new type of main switchboard developed and adopted by the Western Union Telegraph Company:

For the efficient operation of a system of telegraph circuits it is necessary that the wires used in such circuits be so arranged that they may be readily interchanged with one another and connected with any desired set of apparatus at each important station along the route. It is also necessary that those stations be provided with means for testing and locating faults in the wires or apparatus, in order that the system may be efficiently maintained.

The new main switchboards of the Western Union Telegraph Company meet these requirements by providing the group of pin-jacks for each wire and suitable testing sets terminating in plugs which may be inserted in the proper jack for testing any circuit. The groups of pin-jacks are so arranged as to connect each wire with either terminal ap-

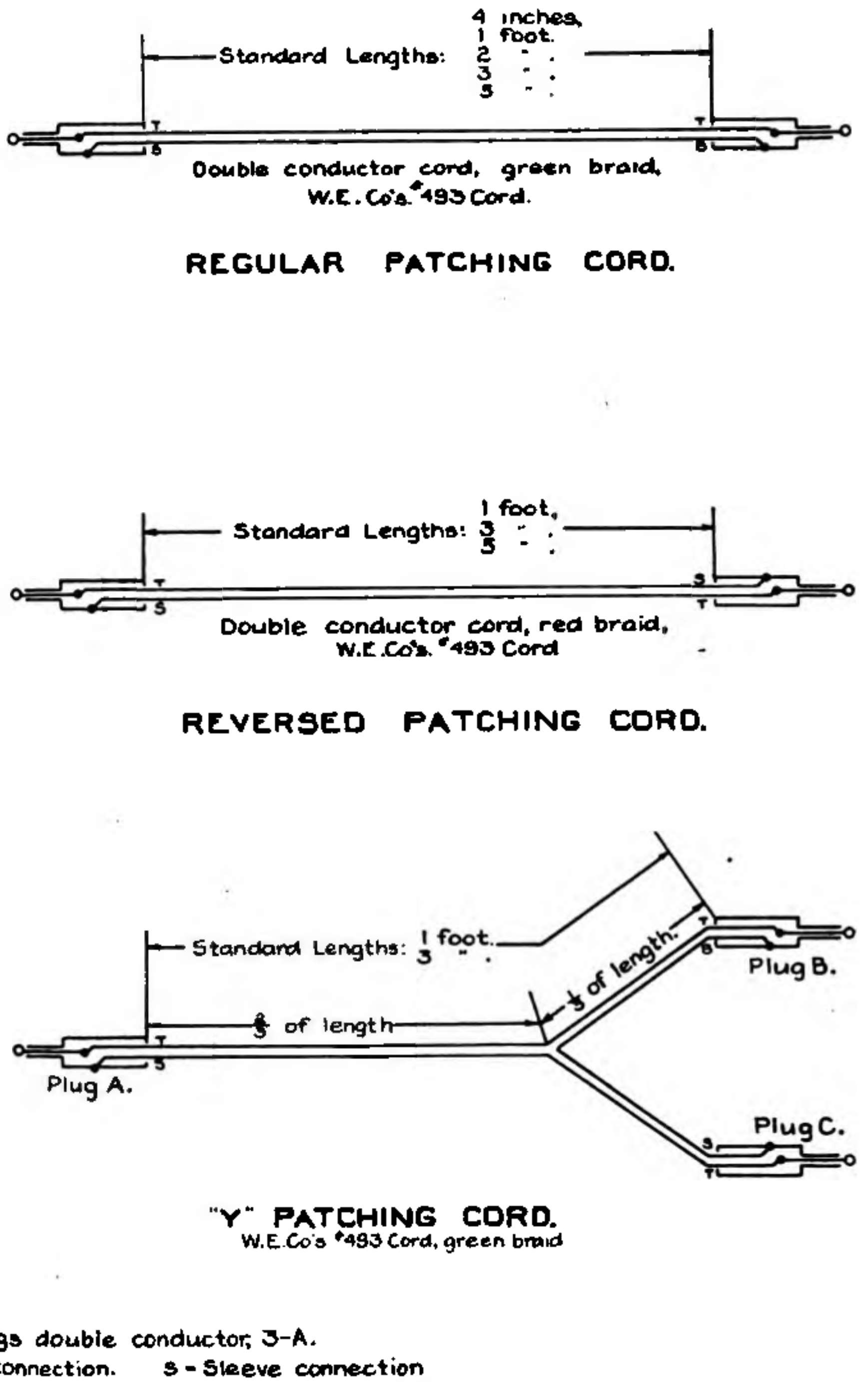
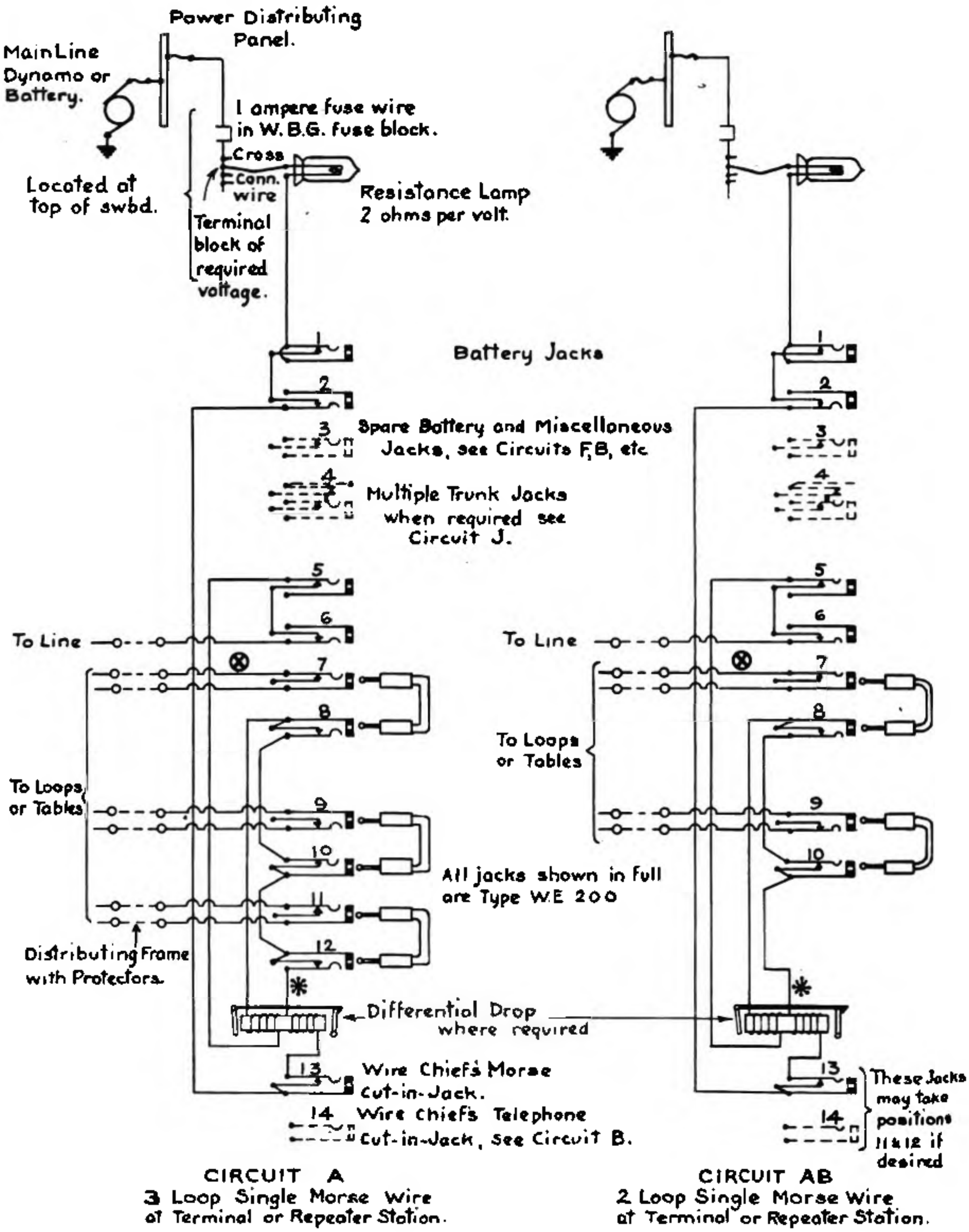


FIG. 1—PATCHING CORDS.



NOTES:

✱ – In specially authorized cases, additional jacks or permanent connections to a table or a time repeating circuit may be installed at this point.

⊗ – See Circuits AC & AD, for modifications covering Multiplex and Through Morse Wires.

FIG. 2—SWITCHBOARD CIRCUITS A AND AB.

paratus or another wire for through working. The necessary loops or apparatus are connected to terminating or through circuits by means of short patching cords which are run from jacks in these main groups to adjacent jacks on which the loops or apparatus are terminated. Longer patching cords may be used, however, for connecting irregular and temporary assignments such as the application of a battery tap of different voltage or polarity from that normally used, the insertion of a loop or set not ordinarily associated with the circuit, or the transposition of one wire with another.

OPERATION.

Patching Cords. As all circuits, except the testing sets, appear in one or more pin-jacks on the face of the boards, connections between any of these circuits are made with double-conductor patching cords. Fig. 1 shows the three types of patching cords used, which are termed "regular," "reversed" and "Y" cords. The conductors of the regular patching cord are straight connected, that is, one conductor connects the tip of one plug with the tip of the other, while the second conductor connects together the sleeves of the two plugs; this type of cord is used for probably ninety-five per cent of all connections made at the main switchboard. The reversed patching cord is not used at the main switchboard. The Y cord consists of three double conductor plugs connected together in series; it is used to connect two loops or sets into one looping jack, or to transfer a group of loops, etc., from one circuit to another.

Circuits. The circuits used in main switchboards are designated by the letters A to N inclusive, and are shown in Figs. 2, 3, 4, 5, 6 and 7. The following descriptions outline the general operation and handling of these circuits:

"A"—Three Loop Single Morse Wire. This circuit (Fig. 2) will be generally used at large terminal stations where the average switchboard section, not including city line boards, contains at least four Morse wires having more than two loops or sets each. Referring to the illustration, the various potential leads from the main battery or generators are terminated on a number of terminal blocks in the rear of the top of the switchboard. The proper voltage for the normal operation of each circuit is applied by means of a cross-connecting wire running from one of these terminal blocks to a resistance lamp located on the upper face of the switchboard. The other terminal of this lamp is wired to the battery jack (No. 1) of the circuit, all jacks of which are placed in a vertical row directly beneath the lamp. By tracing out the wiring diagram it will be seen that the circuit normally passes from jack 1 through a patching jack (No. 2), a wire chief's cut-in jack (No. 13), three looping jacks (Nos. 12, 10 and 8), a second patching jack (No. 5), and reaches the line through the line jack No. 6. Closely adjacent to the looping jacks are the loop jacks, Nos. 7, 9 and 11, on which are terminated the loops, table sets or similar apparatus; these are connected in circuit by means of four-inch patching cords running between jacks 7 and 8, 9 and 10, 11 and 12, as desired. The wire chief's cut-in jack (No. 13) is used for answering calls, supervising the working of the circuit, and rough testing, by inserting in it the double conductor plug of a Morse testing set (circuit L). This jack may also be used for looping in the volt-milammeter when that instrument is required for testing. Jacks 1, 2, 5 and 6 are used for patching. The change from a faulty wire to a good one is accomplished by running a regular patching cord from jack 5 of the defective circuit to jack 6 of the good circuit. This opens off the normal connection between jacks 5 and 6 of each circuit, and puts the loops and battery on the good wire; the faulty wire is then available for test at its line jack (No. 6), where the single conductor plug of a Morse testing set (circuit L) or the volt-milammeter plug may be inserted. If, for any reason, it becomes necessary to temporarily change the voltage or polarity of the battery applied to a circuit, a regular patching cord is run from jack No. 2 of that circuit to a spare battery tap, circuit F (jack No. 3), of the required potential. The battery tap normally used is opened off by the insertion of the patching plug in jack No. 2, and is therefore available for any other service, if wanted. Occasionally it is desirable to transfer the entire group of loops and other apparatus comprised in jacks 7 to 13 inclusive, from its regular assignment to some other part of the board. This may be done by putting the B and C plugs of a Y-patching cord (Fig. 1) in jacks 2 and 5; the A plug of the Y-cord may then be inserted in the desired looping jack or in the jack of a trunk (circuit H or J), which will extend the combination to the point at which it is required. It will be noticed that provision is made for a differential drop to be connected in circuit A where required. This drop is used on all Morse leased wires and like important circuits; under normal conditions the currents in the two windings of the drop are equal and neutralize each other's effects, but when a ground is tapped on the loop by the operator pressing a push button the current in one winding becomes larger than that in the other winding and the drop is operated. In responding the wire chief plugs his Morse testing set in jack 13, and at the same time manually restores the drop. To ground a circuit, a patching cord is run from a ground jack (circuit D) to the line jack No. 6. To open a circuit, one plug of a patching cord is inserted in any one of the jacks, and the other plug left hanging clear of any contact.

"AB"—Two-loop Single Morse Wire. This is a modification of circuit A, the only difference being that, as jacks Nos. 11 and 12 are omitted, the circuit provides for only two loops or sets instead of three. This circuit was designed for terminal offices, where very few of the Morse wires have more than two loops or sets, and its operation is identical with that of circuit A.

(To be Continued.)

Western Electric Company's Annual Report.

The annual report of the Western Electric Company for 1912 shows a five and a half million dollar increase in sales over 1911; an increase in the number of orders and their average value; additions to manufacturing plants both at home and abroad; the opening of new distributing houses, and an increase in the number of employes.

The sales, amounting to $71,729,329, were not made to the American Telephone and Telegraph Company and the associate companies alone, although some people still entertain the idea that sales to these companies is the extent of Western Electric activities. The fallacy of this opinion is apparent from a statement in the report that the company has 24,000 customers other than telephone companies. This signifies wide activities in fields other than the telephone industry. The Western Electric Company sells to railroads, electric power, central stations, street railways, electrical contractors and dealers, manufacturers, and now also, to a limited extent through its own retail stores, to individual consumers. The line of equipment handled embraces everything electrical, from the largest generating plant to the simplest of electrical household devices. The company's sales to customers other than companies of the Bell system have steadily increased during the past ten years, and are in great measure responsible for the addition to the American factory at Hawthorne, Ill., and the Antwerp and London factories abroad.

MANHATTAN ELECTRICAL SUPPLY COMPANY.—At a special meeting of the directors of the Manhattan Electrical Supply Company, New York, April 19, Mr. J. J. Gorman was elected president to fill the vacancy caused by the death of H. J. Johnson. Mr. B. H. Ellis, treasurer, was elected vice-president, and will fill the two positions. Messrs. E. Whitmore, F. M. Pierce and F. W. Manger will continue in the positions held by them for so long.

GLASS INSULATORS.—The Hemingray Glass Company, Covington, Ky., has issued a pamphlet containing some interesting information regarding the manufacture and annealing of glass insulators. It also gives the results of high voltage tests of glass insulators of various types, and illustrations show flashover discharges.

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

MR. J. E. JENKINS, assistant electrician in the operating department at 195 Broadway, has been appointed chief operator at Buffalo, N. Y.

PHILADELPHIA POSTAL.

Among recent visitors at this office were Messrs. E. B. Pillsbury, general superintendent, and H. W. Hetzel, auditor, New York, and C. F. Troeller, manager at Atlantic City, N. J.

Chief operator E. W. Miller is receiving the congratulations of his friends on the birth of a son at his home.

The thirteenth annual ball of the Electrical Aid Society of Philadelphia was held at Mercantile Hall, April 15. This being the twenty-fifth anniversary of the founding of the society was a signal for a reunion of all members and an unusually large number attended. The affair was pronounced a social success.

M. K. Smith, lineman for this company, at Clinton, N. J., died April 12. A delegation from Philadelphia attended the funeral.

WICHITA, KAN., WESTERN UNION.

MR. E. J. SULLIVAN, manager, is rapidly recovering after undergoing an operation for appendicitis. Chief clerk F. B. Fosnot is back at his desk, having recovered from a two weeks' illness. This is the first time in twenty years that he has been absent from the office for a week. Chas. A. Paxson, the veteran, who has been retired on a pension on account of old age, reports every morning at the office at 8 o'clock, probably through habit. Mr. M. F. Taylor, district equipment supervisor, has returned from a trip through the Eastern part of the State. Operators F. D. Hearl, C. M. Carlisle and R. C. Simpson have been added to the force on account of increase in business. Work has been started on the remodeling of the building in which our office is located, and after the work is completed we will have an office twice the size of the present quarters.

It is a valuable privilege to be eligible for membership in a sound and reliable life insurance association which cannot afterward cancel or alter the terms of the certificate issued. The payment of the sum called for in a benefit certificate blesses alike the recipient and the provider. The Telegraphers' Mutual Benefit Association, 195 Broadway, New York, now the oldest co-operative life insurance association, having been in successful operation for the past forty-six years, offers this privilege to all eligible employes of telegraph and telephone service. Write at once for application form and full particulars.

Supplement to
Telegraph and Telephone Age,
May 16, 1913.

EDWARD REYNOLDS, VICE-PRESIDENT AND GENERAL MANAGER,
POSTAL TELEGRAPH-CABLE COMPANY, NEW YORK.

Telegraph and Telephone Age

No. 10 NEW YORK, MAY 16, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Relay Windings.

Not long ago the writer was asked why 150 and four ohms were adopted as standard resistances for the windings of single-line Morse relays and local sounders, respectively, and if there was any particular reason for maintaining those values? Why not add, say, fifty, seventy-five and 100-ohm instruments to the list and thereby have separate apparatus suitable for the different groups of long, short and medium-length circuits, all supplied with current from one battery potential instead of from several, as is now the case? The question was also asked if it would not be advisable to rate instruments by watts instead of by ohms.

In reply to the first question we will say that we have been unable to find any information as to when and why the figures were adopted, but several good reasons for not adopting different ratings, as suggested, probably accounts for the standard windings.

For instance, if only one value of E.M.F. were to supply all wires regardless of their length, the volume of current in each would, of course, differ according to the resistance or length of the component wires of each group; the shorter wire taking a greater volume of current. As low-wound relays require more current to make them magnetically equal to the higher would instruments, placing the former in the short circuits and the latter in the long circuits would be feasible, theoretically, but not practicable.

In the first place there would be an unnecessary waste of electrical energy in all the short lines. Not only that, but the greater quantity of current flowing through the short wires, especially those in aerial and underground cables, would raise the temperature of the conductors to a prohibited degree, and cause greater inductive disturbances between parallel wires, due to the larger currents. Again, the accidental nearby grounding of a comparatively short wire, already overloaded, would obviously tend to burn out a cable or instrument located between the fault and a high-pressure battery. Then, just imagine the inconvenience a wire chief would be put to in a large office if he had to have four or five differently wound relays on his shelf in order to test the various groups of circuits.

In regard to the suggestion of rating instruments by watts instead of ohms we will state that the proposed change in marking would rather tend to confuse than help matters for the reason that the energy required to operate them is not of a fixed value, as is the case with electric lamps and various other electrical devices. For instance, a 40-watt, 110-volt lamp will always give out exactly the same quantity of light if a pressure of 110 volts is maintained across its terminals, because the filament in the lamp has a permanent or fixed value, hence it is immaterial whether the lamp is rated in watts or candle power.

With relays the case is different. Here, while the resistance of the winding of course remains constant, the ability of the magnet to operate the armature does not depend entirely upon the number of watts expended in the coil, because the degree of tension given the retractile spring and the width of magnetic air gap regulate the amount of energy required to actuate it. In other words, since all standard sounders and relays are practically identical in dimensions and construction, class for class, regardless of their windings, and the actual mechanical work to be done is identical in each class, viz.: the actuating of one uniform size lever for all sounders and another uniform size for relays, no two like instruments, dissimilarly adjusted, would work on the same watt energy supplied. Therefore a rating in watts would not only be inaccurate, but give no indication of resistance or current requirements—the two principal factors most important to know.

In summarizing, we will say that the standard winding values of instruments of the present day were adopted for the following reasons.

(1) 150-Ohm Relay—Because experience has demonstrated that in addition to being able to pick up and be operated by very feeble currents, 150 ohms inductive resistance is about as high as we can go per instrument for circuits where a great number of them are to be cut in in series, as is usually the

case. This value of winding permits the addition of the maximum number of relays without adding sufficient inductive resistance to be prohibitive. An equal number of higher wound relays in many such circuits would not only cause very slow action, but often necessitate increasing the E.M.F., which is always objectionable, since it in turn increases the escape. In other words, a 150-ohm relay seems to meet the severest wire conditions better than any other winding, and is equally efficient for all short circuits.

(2) 35-Ohm Relay—This winding was adopted because it provides a suitably low resistance per instrument to permit substitution for an equal number of high-wound relays on very long way circuits without increasing the battery power. In other words, the winding is as low as we can go, and yet have a practical instrument for this class of line service, and, as is the case with 150-ohm relays, 35-ohm instruments will fit a greater number of existing circuits that may need a reduction in ohmic resistance than they would if the winding was, say, fifty or seventy-five ohms.

(3) 300-Ohm Relay—This instrument is practical for long circuits in which a very feeble current may flow and where but one or two such relays are cut in. They are principally used at repeater stations where particularly strong-acting instruments are very helpful in passing the signals.

(4) Sounders—Four ohms was adopted for low voltages probably because the resistance of the coil necessary to operate the lever with one or two cells of gravity battery, as was formerly the case, measured about four ohms. In other words, it is as low as we can go for all-round service.

Fifty ohms is an arbitrary value for the winding of instruments to be operated in circuits where feebler currents are either unavoidable or preferred.

Telegraph and Telephone Patents.

ISSUED APRIL 22.

1,059,529. Telegraph Transmitter. To P. P. Dow, Montreal, Que.

1,059,690. Telephone Repeater. To D. H. Wilson, New York.

1,059,745. Telephone Metering System. To E. H. Martin, Webster City, Ia.

1,059,758. Telephone Time Signal. To W. Pothen, Murdock, Minn.

ISSUED APRIL 29.

1,059,988. Combined Automatic Sender and Telegraph Key. To D. I. Garretson, New York.

1,060,211. Desk Telephone. To A. C. Reid, Genoa, Ill.

1,060,212. Selective Signaling System. To C. S. Rhoads, Jr., Sandwich, Ill.

1,060,214. Signaling System. To H. O. Rugh, Sandwich, Ill.

1,060,308. Intercommunicating Telephone System. To L. D. Barrows, New York.

1,060,325. Telegraphy. To P. B. Delany, South Orange, N. J.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, May 12:

American Telephone and Telegraph Co.	127½
Mackay Companies	82½
Mackay Companies, preferred	66
Western Union Telegraph Co.	65¾

PERSONAL.

MR. PATRICK B. DELANY, the well-known telegraph engineer and inventor, of Nantucket, Mass., was a business visitor in New York last week.

MR. W. H. SAWYER, a well-known old-time telegrapher, who has been spending the winter at Pasadena, Cal., has returned to Providence, R. I., for the summer months.

MR. E. PAYSON PORTER, a forty-niner of the telegraph, who has been spending the winter months at Geneva, N. Y., returned to his home at Asbury Park, N. J.

MAJOR W. A. J. O'MEARA, engineering special commissioner, and former engineer-in-chief of the British postoffice, London, England, in addition to his many professional and official activities has qualified as a barrister.

MR. H. H. ATWATER, a member of the Society of the United States Military Telegraph Corps, and his wife, celebrated the fiftieth anniversary of their marriage in Brooklyn, N. Y., April 28. Mr. Atwater served under General T. T. Eckert during the civil war.

MR. FRANCIS W. JONES, the first president of the New York Electrical Society, was unanimously elected an honorary member at the 318th meeting of the society held on March 28. Mr. Jones, accompanied by Mrs. Jones, has returned from West Palm Beach, Fla., where they spent the winter, to Spring Valley, N. Y., in which place they will reside during the summer months.

MR. J. N. JOHNSON, an old-time telegrapher and inventor, for many years past a resident of Albuquerque, N. Mex., who has been in New York for the past two months on business, has returned to his New Mexico home. Among Mr. Johnson's inventions is one which is in use on the Santa Fe Railroad system. The invention consists of a machine which delivers train orders to a rapidly moving train. It has proved a great success, and its use is being extended. The device will probably be on exhibition at the Train Dispatchers' Convention at Los Angeles, Cal., in June and at the annual meeting of the Association of Railway Telegraph Superintendents at St. Louis, this month.

MR. RALPH D. BLUMENFELD, editor and chairman of the *Daily Express*, London, England, and a former telegrapher in the United States, was tendered a congratulatory dinner by the staff of the paper on April 26 to celebrate his assumption of supreme control of the *Express*. Mr. Blumenfeld represented *Telegraph Age* in Chicago in 1883, while he was employed by the Postal Telegraph Company.

He entered the newspaper field in London several years ago, and at one time managed the London and Paris editions of the *New York Herald*. He is one of the best of newspaper writers, and represented the United Press in London for some time. Mr. Blumenfeld is a native of Wisconsin, having been born in Watertown in that state. He inherits his literary tastes from his father, who was also a newspaper man. Mr. Blumenfeld has a beautiful home sixty miles out of London, and has become very influential in the English metropolis.

Mr. W. H. Allen, private secretary to former fourth assistant postmaster-general, P. V. DeGraw, Washington, D. C., was a recent New York visitor. Mr. Allen is a well-known member of the telegraph fraternity.

Mr. Stephen D. Field, the well-known electrical inventor, of Stockbridge, Mass., who has been confined to his home by sickness since January last, remains in the same condition. His numerous friends hope for his speedy recovery.

Mr. Hiram Draper Rogers, formerly of New York and well known among telegraph people, together with Mrs. Rogers, will celebrate the fiftieth anniversary of their wedding on May 26, at their residence, 1246 Commonwealth Avenue, Boston, where they now reside. Mr. Rogers was manager of the Gold and Stock Telegraph Company at Cincinnati in the sixties.

Mrs. M. C. Gates, of New York, a member of the Old Time Telegraphers' and Historical Association and an attendant at the annual reunions, has been appointed one of the delegates to represent her city at the World's Sunday School Convention at Zurich, Switzerland. Mrs. Gates was also a delegate to the World's Sunday School Convention in 1904 at Jerusalem.

THE CABLE.

Mr. George Gray Ward, vice-president and general manager of the Commercial Cable Company, New York, accompanied by Mrs. Ward, will sail for Europe on the steamer "Adriatic," May 22. Mr. John Goldhammer, assistant secretary of the company, will also sail on the same steamer.

Portuguese Cables.—The Portuguese Government has authorized a contract with the European and Azores Telegraph Company for the laying of two cables between the Azores and the United States, and one between the Azores and England. The Portuguese Government, it is stated, is negotiating with the Republic of Panama for a cable between Portugal and Panama.

Cable Dividend Cut.—At a shareholders' meeting of the Direct United States Cable Company held in London April 29, chairman Gunter announced the cutting of the usual dividend to four per cent on account of the expense caused by two breaks in the company's deep-sea cable. The repairs, Mr. Gunter stated, would cost $200,000. One of these breaks occurred last year and the other recently. A balance of $100,520 was carried to the reserve fund.

E. M. Underdown, aged 83 years, chairman of the Direct United States Cable Company, died in London, England, April, 11.

Edward Brailsford Bright, aged 82 years, brother of Sir Charles Tilson Bright, of Atlantic cable fame, died in England recently. He was associated with his brother, Charles, in the telegraph and cable work and, with his brother, produced many important inventions. In 1852 he became manager of the Magnetic Telegraph Company. A few years later the brothers invented a system of duplex telegraphy, which was worked successfully between London and Birmingham. Edward Bright was largely responsible for the establishment of telegraphic communication between the West Indian islands by some 5,000 miles of submarine cable. Among his inventions was a fire alarm system.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

Mr. E. J. Nally.—After a record of thirty-eight years continuously in the telegraph business, with absolutely not a break of a single day in all that time, Mr. Edward J. Nally has earned a vacation, and plans to sail on May 15 on the steamer "Baltic" of the White Star Line, for a six weeks' absence. Mr. Nally inherited a love for old books, prints and pictures, and even as a messenger boy began collecting them in a small way. This love has continued with him ever since, and he is now planning, as a fulfillment of his dream of years, a vacation in London and thereabouts, where he can leisurely browse about the old book and print shops. Upon his return, about July 1, Mr. Nally will assume the duties of the new position to which he has been promoted, that of vice-president and assistant to the president. Mr. Nally takes with him the good wishes of every employe of the Postal Telegraph-Cable Company, with whom he has been so long and intimately connected, and who will look forward to his return with pleasure.

Mr. George H. Usher, general superintendent of this company, Atlanta, Ga., accompanied by Mrs. Usher, will sail for Europe from New York on May 31 on a vacation.

Among Recent Executive Office visitors were: Messrs. James Kent and W. J. Camp, manager and assistant manager, respectively, Canadian Pacific Railway Company's Telegraphs, Montreal, Que.; Mr. F. W. Conger, formerly superintendent of this company at Chicago, also E. Y. Ouderkirk, manager of the Wheeling, W. Va., office. Mr. Ouderkirk called on many old friends. He was on his way to Saratoga, his home town, and will not return to Wheeling, until May 22.

Mr. H. Scrivens, superintendent at Pittsburgh, Pa., announces the following changes in his district: Mr. George E. Taylor has been appointed manager of the Warren, Pa., office, vice J. F. Mickel, transferred to Franklin, Pa., as manager. Mr. Taylor was manager at Warren for twelve years until two years ago, when he left the service to accept a position with the Floridin Company, but has decided to re-enter the telegraph field. Mr. C. R. Snyder, whom Mr. Mickel succeeds at Franklin, has been transferred to the general operating department at Pittsburgh.

Edward Reynolds, General Manager, Postal Telegraph-Cable Company, New York.

Mr. Edward Reynolds, whose appointment as general manager of the Postal Telegraph-Cable Company, New York, took effect May 1, has reached that high office through real merit. He has been tried in various subordinate positions, and has never been found lacking in the qualifications necessary to successfully fill them.

Mr. Reynolds is in the prime of life, having been born in Catskill, N. Y., November 11, 1866. At the age of eighteen years he began his telegraphic career as manager for the Baltimore and Ohio Telegraph Company at Saugerties, N. Y. His popularity in that place resulted in his being appointed postmaster, which post he filled for three years, and the experience he thus gained has been of inestimable value to him in his subsequent career.

He entered the service of the Postal Telegraph-Cable Company as an operator at New York on August 1, 1889, and through intelligence and fidelity to the company's interests he became chief clerk to superintendent E. G. Cochrane on April 1, 1891.

On February 1, 1897, he was appointed to a like position in the office of the general superintendent, and on July 1 of the same year was promoted to be chief clerk in the office of vice-president E. C. Bradley.

Having shown unusual ability he, on January 1, 1900, was advanced to the position of assistant auditor, becoming auditor on May 1 of the same year.

On May 1, 1912, Mr. Reynolds was appointed fifth vice-president of the company, and on January 1, 1913, he was made assistant to the president, and relieved of his duties as auditor in order to devote his entire time to his new position.

This position, together with that of vice-president, he occupied when he received the appointment as general manager.

Mr. Reynolds has the full confidence of the officials, and is very popular in the service. He has made many friends among the employes through his interest in their behalf, as expressed through the activities of the Mutual Investment Association, of New York, of which he is treasurer.

A full-page portrait of Mr. Reynolds is presented in this issue in the form of a supplement.

Dinner of the Atlanta Postal Telegraph Club.

The fourth annual dinner of the Postal Telegraph Club, of Atlanta, Ga., was held at the Cafe Durand on Saturday evening, May 3. Prior to sitting down to the elaborate menu, the election of officers for the ensuing term took place, resulting as follows:

Mr. G. H. Usher, president, succeeding Mr. W. C. Daviet, who had occupied that position since the Club's inception three years ago; Mr. G. W. Ribble, vice-president; secretaries, Messrs. H. W. Pearce and W. C. Daviet; treasurer, Mr. H. R. Waterbury; additional members of the executive committee, Messrs. J. F. Heard and D. C. DeLany.

The newly elected president presided at the dinner and after the gastronomic entertainment had been disposed of, awoke considerable enthusiasm by a talk which was full of appreciation of the loyalty and energy of the members as Postal employes, and of encouragement as to the future. Brief talks were made by Mr. J. F. Heard, Mr. C. H. Ashburn, Mr. W. C. Lloyd, Mr. G. W. Ribble and Mr. W. C. Daviet. The talks were interspersed with character songs by Mr. G. B. Adair, and the musical numbers furnished by Messrs. F. J. Poundstone and C. H. Ashburn, jr., two club members, contributed no small part to the enjoyment of the evening.

Manager Martin, of Nashville, Tenn.

Mr. A. P. Martin, manager at Nashville, Tenn., on May 1 closed his twentieth year of service with the company. He began as a messenger in May, 1893. Mr. Martin is very popular in the city, and is highly esteemed by the business community. A local newspaper in referring to Mr. Martin's celebration, says:

"Just to celebrate the beginning of his twenty-first year manager Martin declares it his intention that this month shall be the biggest in the history of the local offices.

"There are few better liked men in Nashville, if there are any at all, than A. P. Martin. Young and enthusiastic, filled with a desire always to do just a little better than he has ever done before, he has worked his way up the ladder of success until now he is one of the city's most valued business men. He takes an active interest in the affairs of Nashville and is in every way one of us. He and his family own a beautiful home in Waverly Place, and number their social acquaintances and friends by the hundreds."

Western Union Telegraph Company.

EXECUTIVE OFFICES.

Mr. Theo. N. Vail, president, returned to New York on May 9 from his cruise in the West Indies, in excellent health.

Messrs. Belvidere Brooks, vice-president; A. R. Brewer, treasurer; W. N. Fashbaugh, general superintendent of traffic and R. H. Chetwood, plant engineer, left New York May 13 on a business trip to St. Louis and other points. They will attend the convention of the Association of Railway Telegraph Superintendents while in St. Louis. The party, excepting Mr. Chetwood, will inspect the new office at Omaha, Neb.

Mr. A. G. Saylor, general manager, New York, recently visited Philadelphia, Baltimore and Washington, on company business.

Mr. E. M. Mulford, general manager of the Gulf Division, Dallas, Tex., was in New York May 12, on company business.

Mr. J. C. Willever, United States manager cable system, New York, spent two days in Ottawa, Ont., recently in connection with the Prince Edward Island lines.

Mr. G. M. Yorke, general superintendent of plant was in Lowell, Mass., last week, attending the funeral of his father, who died in that city May 1.

Mr. W. W. Ryder, manager railway department, New York, will attend the St. Louis convention of the Association of Railway Telegraph Superintendents May 20.

John T. Terry, aged 90 years, a director of the Western Union Telegraph Company from March 14, 1883, to December 8, 1909, and a member of the executive committee for about thirty years, died May 3.

Mr. C. H. Finley, chief operator at Chicago, has been appointed city traffic superintendent, and Mr. E. T. Jones formerly night chief has succeeded Mr. Finley as chief operator. Mr. C. H. Shell has been appointed night chief to succeed Mr. Jones.

Mr. J. B. Norcross, of Denver, Col., has been appointed chief clerk to superintendent C. B. Horton at Omaha, Neb., vice C. W. Allen, appointed acting district commercial agent.

Mr. R. Wells, formerly cashier of the Denver, Col., office, has been transferred to the position of chief clerk at that point under Mr. J. F. Reade, manager.

Telephone Switchboard at Worcester, Mass. —A new telephone switchboard has been installed in the Worcester, Mass., office, where over 800 messages are received daily over the telephone. Mr. H. B. Simons is manager of the office.

THE TELEPHONE.

Fred H. Gardiner, aged 61 years, formerly assistant superintendent, Providence Telephone Company, died at Lynn, Mass., April 22.

Mr. F. V. Bennis, formerly supervisor of distributing houses of the Western Electric Company, has been appointed assistant treasurer of the American Telephone and Telegraph Company, New York.

Mr. Francis A. Houston, vice-president and general manager of the New England Telephone and Telegraph Company, Boston, has been appointed treasurer of the company to succeed Mr. W. R. Driver, resigned.

George E. Betts, seventy-four years of age, manager of the Southern New England Telephone Company, and a member of the Telephone Pioneers of America, died at Bridgeport, Conn., May 6. Mr. Betts was the dean of the telephone managers. He entered the telephone service in 1878.

The Telephone in France and the U. S.—Jules Roche compares, in the *North American Review*, state ownership of telephones in France with private ownership in the United States. He points out that in the United States there is one telephone for about every twelve inhabitants, while in France there is one to every 171 inhabitants. "To whatever field of human activity one turns," he says, "the same thing is found to be true—superiority of individual initiative and liberty of work; inferiority of state action, always heavier, slower, more costly, less fecund."

RADIO-TELEGRAPHY.

Mr. William Marconi stated before the parliamentary Marconi inquiry committee in London on May 8, that he could produce evidence from Messrs. Thomas A. Edison, N. Tesla and other American experts to the effect that the Marconi Company had not held back wireless telegraphy for fifteen years, as had been charged. He reviewed the development of transatlantic wireless service.

Wireless in the Canadian Northwest.—It is proposed to establish a series of wireless stations from Athabasca Landing on the Mackenzie River to Herschel Island and from there to Rampart House in the Yukon.

Canadian Transatlantic Wireless Service.—A bill is before the Canadian Parliament authorizing the Government to contract with the Poulsen interests for the use of the Poulsen wireless system for transatlantic service.

Le Pas, Manitoba, Wireless Station.—The wireless station to be constructed at Le Pas, Manitoba, will be the second largest wireless station in Canada. The plant will cost about $100,000 and will include four 250-foot steel towers and a 230-horse-power engine.

Wireless and the Aurora.—It is stated that during the occurrence of strong auroræ borealis it is almost impossible for the wireless station at Spitzbergen to communicate with the station at Ingo, near Hammerfest. This fact seems to confirm the theory that the aurora is an electrical phenomenon.

A Youthful Wireless Amateur.—C. B. Belt, aged thirteen years, living in New York, was one of the 150 candidates who took the government examinations for licenses as amateur radio operators, at the Brooklyn Navy Yard, April 29. Young Belt successfully passed the examinations and received his license. He uses either Continental or Morse code.

Daylight Effect in Radio Telegraphy.

At the meeting of the Institute of Radio Engineers in New York, on May 8, Dr. A. E. Kennelly read an interesting paper on the "Daylight Effect in Radio Telegraphy," covering the general theory of radio transmission between earthed conductors, and the probable causes of attenuation and of the rapid variations in signal intensity which occur near times of sunrise and sunset.

The next meeting will be held at Columbia University at 8.15 p. m., June 4. Mr. John L. Hogan, jr., of the National Electric Signaling Company, will present a paper describing the new "Heterodyne" receiver as used in the Fessenden system during the recent trials of the Arlington radio station.

STATISTICAL INFORMATION REGARDING TELEPHONE TRAIN-DISPATCHING ON RAILROADS IN THE UNITED STATES AND CANADA.

NAME OF RAILROAD	Head of Telegraph and Telephone System	Total Mileage	No. of Miles on which Trains are Dispatched by Telephone	No. of Miles on which Trains are Dispatched by Telegraph
Algoma Central and Hudson Bay Railway	Chas. Fitzsimmons	332	282	0
Algoma Eastern Railway	Chas. Fitzsimmons	86	66	0
Atchison, Topeka and Santa Fe Railway	L. M. Jones	10,398	6,366	4,032
Atlantic Coast Line R.R.	W. P. Cline	4,194	786	3,280
Baltimore and Ohio R.R.	Chas. Selden	5,464	1,023	4,441
Bessemer and Lake Erie R.R.	F. W. Smith	206	206	0
Boston and Maine R.R.	S. A. D. Forristall	2,291	230	1,935
Canadian Northern Railway	W. E. Muir			
Canadian Pacific Railway	W. J. Camp	11,706	5,860	5,552
Central R.R. of New Jersey	F. G. Sherman	684	38	646
Central Vermont Railway	M. Magiff	536	250	286
Chesapeake and Ohio Railway	C. W. Bradley	2,315	1,333	642
Chicago and Alton R.R.	T. M. Haston	1,027	157	870
Chicago and North Western Railway	Wm. Bennett	7,945	1,922	6,023
Chicago, Burlington and Quincy	V. T. Kissinger	9,003	2,753	6,232
Chicago Great Western Railway	G. O. Perkins	1,496	339	1,157
Chicago, Indiana and Southern R.R.	W. L. Connelly	322	328	0
Chicago, Milwaukee and St. Paul Railway	E. A. Patterson	9,359	3,453	5,906
Chicago, Rock Island and Pacific Railway	C. H. Hubbell	8,445	2,132	5,474
Chicago, Terre Haute and South Eastern Railway	F. H. Van Etten	375	155	220
Chicago, St. Paul, Minn. and Omaha R.R.	Geo. Boyce	1,744	0	1,744
Cleveland, Cin., Chicago and St. Louis Railway	C. S. Rhoads	2,510	1,800	710
Cincinnati, Hamilton and Dayton Railway	C. A. Plumly	1,015	231	694
Colorado and Southern Railway	J. L. Henritzy			
Delaware, Lackawanna and Western Railway	L. B. Foley	978	978	0
Denver and Rio Grande R.R.	J. M. Walker	2,597	50	2,500
Denver, North Western and Pacific Railway	C. A. Parker	214	50	0
Erie R.R.	E. P. Griffith	2,227	439	1,788
Galveston, Harrisburg and San Antonio and Texas and New Orleans R.R.	Percy Hewitt	2,420		2,420
Georgia R.R.	W. S. Brand	303	249	303
Grand Trunk Railway	W. W. Ashald	4,765	1,150	3,615
Great Northern Railway	E. J. Little	7,421	4,768	2,651
Illinois Central R.R. (Northern Lines)	F. T. Wilbur	4,763	2,164	2,599
Illinois Central R.R. (Southern Lines)	B. Weeks			
Indiana Harbor Belt R.R.	W. L. Connelly	45	45	47
Intercolonial R.R.				
International and Great Northern R.R.	C. W. L. Mickley	1,106		1,106
Lake Shore and Michigan Southern Ry	F. F. Riefel	1,682	1,682	36
Lehigh Valley R.R.	J. F. Caskey	1,453	1,291	162
Long Island R.R.	L. S. Wells	388	66	322
Louisville and Nashville R.R.	R. R. Hobbs	4,723	2,539	2,184
Michigan Central R.R.	J. J. Ross	1,723	1,316	284
Minn., St. Paul and Sault Ste. Marie Railway	H. A. Tuttle			
Minn., St. Paul and Sault Ste. Marie Ry. (Chicago Div.)	P. W. Drew	1,000	185	815
Missouri, Kansas and Texas Ry. System	W. H. Hall	3,086	758	2,327
Missouri, Pacific Ry. System	E. A. Chenery	7,239	907	6,081
New York Central and Hudson River R.R.	A. B. Taylor	2,829	2,090	739
New York, Chicago and St. Louis R.R.	E. J. Parrish	523	523	0
New York, New Haven and Hartford R.R.	N. E. Smith	2,000	100	1,900
Norfolk and Western Railway	W. C. Walstrum	2,018	1,783	235
Northern Pacific Railway	M. H. Clapp	6,656	2,320	3,712
Oregon-Washington Railroad and Navigation Co.	E. A. Klippel	1,992	344	1,648
Oregon Short Line R.R.	B. F. Frobes	2,050	48	2,000
Pennsylvania R.R.	J. C. Johnson	4,700	2,500	2,200
Pere Marquette R.R.	W. M. Hayes			
Philadelphia and Reading Railway	C. M. Lewis	3,558		1,520
Pittsburgh and Lake Erie R.R.	L. A. Lee	221	160	0
Pittsburgh, Shawmut and Northern R.R.	C. L. Lathrop	272	117	144
Queen and Crescent Route	W. S. Melton	630	138	492
Richmond, Fredericksburg and Potomac	T. R. Gooch	112	112	0
Seaboard Air Line Railway	W. F. Williams	3,076	1,414	1,662
St. Louis and San Francisco R.R.	H. D. Teed	6,244	770	5,474
Southern Railway	W. H. Potter	7,033	281	6,752
Southern Pacific R.R.	F. S. Rawlins	6,323	806	5,517
Terminal Railroad Association of St. Louis	F. E. Bentley	9	9	9
Union Pacific R.R.	J. B. Sheldon	3,574	709	2,864
Virginian Railway	George Reith	475	475	
Wabash R.R.	J. P. Church	2,514	830	1,695
Wabash, Pittsburgh Terminal R.R.	C. O. Dambach	84	84	
Totals, June 1, 1913		186,479	63,960	117,647
Totals, June 1, 1911		190,054	40,160	159,894
Totals, June 1, 1910		217,782	24,831	189,939
Totals, June 1, 1909		213,552	11,632	200,049

Several railroads could not answer the questions satisfactorily to themselves or the interests we seek to serve, and requested that the matter be laid over for a year so far as it affected their respective roads. They hope that next year they will be in a better position to give publicity to their statistics and opinions.

Mr. L. M. Jones, superintendent of telegraph, Atchison, Topeka and Santa Fe Railway, Topeka, Kan., states that he prefers the telephone, and that additional telephone train-dispatching circuits are to be constructed this year, covering 864 miles of road.

Mr. William Bennett, superintendent of telegraph, Chicago and Northwestern Railway, Chicago, Ill., writes: "For train dispatching the telephone has proved its superiority. There is an additional 90 miles of railroad and 346 miles of telephone line under construction at the present time."

Mr. R. L. Logan, superintendent telegraph, Kansas City Southern Railroad, Kansas City, Mo., says: "The telephone for train-dispatching purposes is not in use at present on our system. It has been recommended, but no action has yet been taken.

Mr. E. A. Klippel, superintendent telegraph, Oregon-Washington Railroad and Navigation Company, Portland, Ore., says: "We consider the telephone train-dispatching circuits more beneficial than the telegraph. We are building an additional one hundred miles of telephone circuits now, and contemplate extending our telephone system, as soon as we can secure authority. In addition to this, we have a telephone message circuit with selective calling apparatus, 180 miles long from Portland to Seattle, which is simplexed. We are also contemplating simplexing some of our dispatching circuits with a view to increasing our telegraph facilities between division points. It is not our intention to abandon the telegraph entirely as we consider that modern railroading demands both telegraph and telephone service."

Mr. F. T. Wilbur, superintendent telegraph, Illinois Central Railroad, Chicago, Ill., writes: "One hundred and sixty-two additional miles single track nearly ready for telephone operation. We favor the telephone."

Mr. P. W. Drew, superintendent telegraph, Minneapolis, St. Paul and Sault Ste. Marie (Chicago Division), Chicago, Ill., writes: "The telephone is much preferable to the telegraph for train dispatching purposes and we contemplate extending the telephone system."

Mr. Chas. Fitzsimon, superintendent telephone construction, Algoma Central and Hudson Bay Railway and Algoma Eastern Railway, writes: "We dispensed with telegraph in 1902 and since then have used the telephone exclusively."

Mr. G. O. Perkins, superintendent of telegraph, Chicago Great Western Railroad, Chicago, Ill., states that his preference is for the telephone for train dispatching and that he contemplates extending the telephone train-dispatching circuits 313 miles. The work is to be done immediately, and further extensions are under consideration.

Mr. B. F. Frobes, superintendent telegraph. Oregon Short Line, Salt Lake, Utah, writes: "In congested traffic sections the telephone is better, and on branches and other light traffic sections the telegraph is better."

Mr. L. A. Lee, superintendent telegraph, of the Pittsburgh and Lake Erie Railroad, Pittsburgh, Pa., states that on August 1, 1912, his system changed entirely from telegraph to telephone for train-dispatching purposes with the most satisfactory results.

Mr. M. Magiff, superintendent telegraph, Central Vermont Railway, St. Albans, Vt., writes: "We expect to complete the installation of telephone train-dispatching apparatus on all divisions within a year."

Mr. C. W. Bradley, superintendent telegraph, Chesapeake and Ohio Railway, Richmond, Va., writes: "We are constructing 141 miles of telephone train-dispatching circuits now."

Mr. F. G. Sherman, superintendent telegraph, Central Railroad of New Jersey, Jersey City, N. J., writes: "Thirty-six miles of our four-track road now authorized. There will be two telephone train-dispatching circuits, one for emergency. The thirty-eight miles now in use are on the New York and Long Branch division. The two circuits authorized will be between Jersey City and Somerville, N. J."

Mr. Chas. Selden, superintendent telegraph, Baltimore and Ohio Railroad, Baltimore, Md., writes: "We are now working toward using the telephone on all our dispatching circuits."

Mr. J. J. Ross, superintendent telegraph, Michigan Central Railroad, Detroit, Mich., writes: "We propose to extend the telephone system for train dispatching, as well as for message work. We have fifty-five miles of telephone lines on branches, used for all purposes, in addition to the 820 miles recorded."

Mr. C. M. Lewis, superintendent telegraph, Philadelphia and Reading Railway, Reading, Pa., writes: "In reference to statistics relating to the development of the telephone for train-dispatching purposes I may say that this company has not placed such a system in operation."

Mr. E. J. Little, superintendent telegraph, Great Northern Railway, St. Paul, Minn., writes: "The entire main line now operated by telephone. New lines under construction all planned for telephone operation. Extension of telephone service to existing branch lines already equipped with telegraph not now contemplated, as benefits to be derived on feeder lines of limited business not at present sufficient to warrant expenditure involved."

Mr. E. P. Griffith, superintendent telegraph, Erie Railroad, Jersey City, N. J., writes: "Four hundred and forty-six miles more of the road are under equipment with train and message circuits.

The telephone installation on railroads up to the present time has not reached that magnitude which makes it as flexible as the telegraph in the joint service of the railroads. The telephone as a train-dispatching or message circuit locally over a division is reported as most beneficial to such local operation of the road. The telegraph, however, being more universally used by the railroads offers a flexibility in detouring in case of interruption and establishing communication, which the telephone at the present time does not offer. In the present state of the art both the telegraph and telephone are necessary to railroad operation."

Mr. C. H. Hubbell, superintendent telegraph, Chicago, Rock Island and Pacific Railway, Chicago, Ill., writes: "One hundred and forty-six additional miles of telephone circuits now under construction. The telephone is regarded as the most satisfactory to the road."

Mr. M. H. Clapp, superintendent telegraph, Northern Pacific Railroad, St. Paul, Minn., writes: "We expect to add 152 miles single-track telephone dispatching circuits soon."

Mr. George Boyce, superintendent telegraph, Chicago, St. Paul, Minneapolis and Omaha Railway, St. Paul, Minn., writes: "We have no telephone train-dispatching circuits, but are firm believers in its desirability for handling trains."

Mr. C. A. Parker, superintendent telegraph, Denver, Northwestern and Pacific Railway, Denver, Col., states: "The telephone is preferred. Our telephone system is not complete. In time when we have a first-class circuit, we expect to use the telephone much more."

Mr. H. D. Teed, superintendent telegraph, St. Louis and San Francisco Railroad, Springfield, Mo., states that he favors the telephone, and will increase its use, as fast as finances permit.

Mr. C. S. Rhoads, superintendent telegraph, Cleveland, Cincinnati, Chicago and St. Louis Railroad, Indianapolis, Ind., writes: "On our system the telegraph is considered away below the telephone from every standpoint. An additional 140 miles of telephone circuits are approved now."

Mr. J. M. Walker, superintendent telegraph, Denver and Rio Grande Railroad, Denver, Col., favors the telephone, and will extend its use probably 400 miles this year.

Mr. F. Tremble, superintendent telegraph, The Texas and Pacific Railway Company, Dallas, Tex., writes that his company has no train-dispatching telephone circuits, and does not contemplate the installation of this class of telephone circuits during the coming year.

Mr. G. A. Cellar, superintendent telegraph, Pennsylvania Lines west of Pittsburgh, Pittsburgh, Pa., says: "The telephone dispatching matter with us is just about as it was a year ago."

Mr. W. J. Camp, assistant manager of telegraphs, Canadian Pacific Railway Company's Telegraphs, Montreal, writes: "Most decidedly the telephone is superior to the telegraph for train-dispatching purposes."

Mr. J. T. Nolan, supervisor of telegraphs and telephones, The Washington Terminal Company, Washington, D. C., writes: "Since December 14, 1912, we have been operating the Webb magnaphone system of intercommunicating telephone system in our various towers, in lieu of the telegraphic system, in blocking trains. We have at present six receivers and six transmitters stationed in our various towers, as follows: One set at "VU" tower, located at Second and Virginia Ave., S. E., and which is a junction point for all trains enroute from the South to the Washington Terminal; one set at "F" tower, which is located at the east end leg of wye, and which is a junction point for all trains from the East, via the Baltimore and Ohio Railroad; one set located at "QN" tower, west end leg of wye, and which is a junction point for all trains from the West, via the Baltimore and Ohio Railroad. At "K" tower, train director's office Washington Terminal, one set; "C" tower assistant train director's office Washington Terminal one set; "A" tower assistant train director's office Washington Terminal, one set; this latter office located at north end of tunnel. One receiver located in the yard master's office, coach yard; one receiver located in the assistant yard master's office at north end of station, and one receiver located in the switchtender's box at the entrance to the coach yard. Our object in having these extra receivers located at the points named, is to enable all concerned to receive all the information possible when given out as to the running of all trains, and to keep in close touch with the movements. These lines are operated for a distance of about three miles."

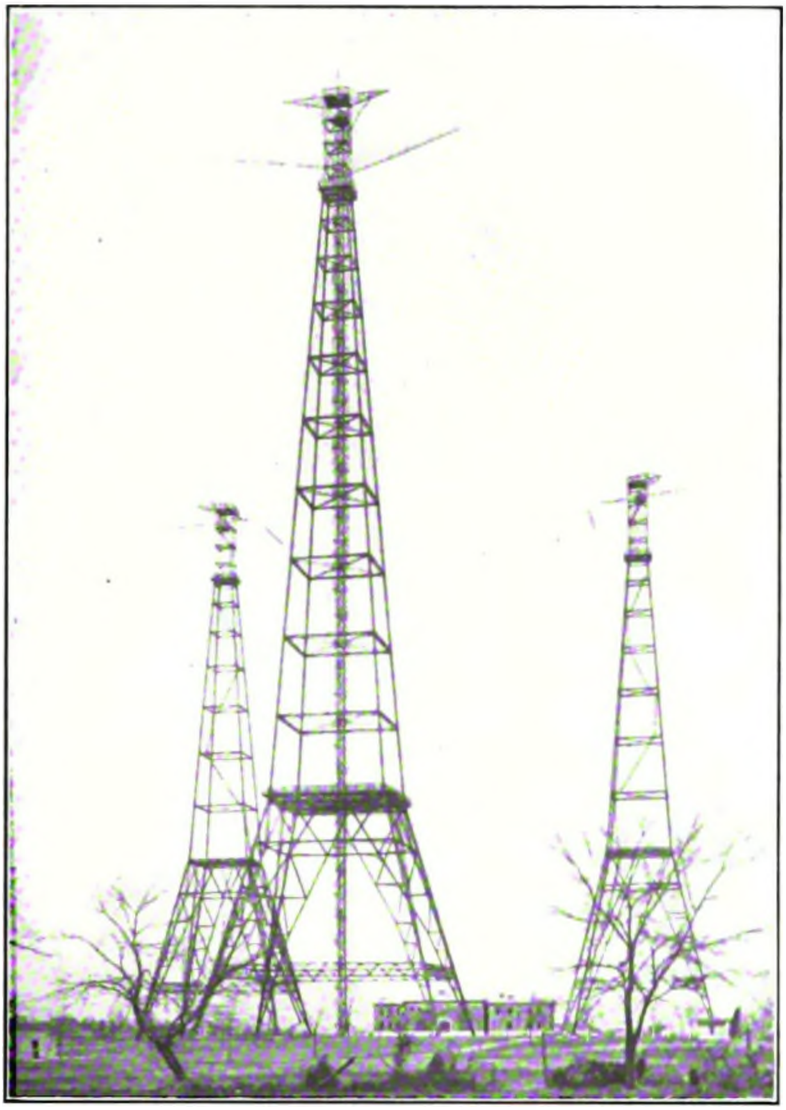
Mr. F. F. Riefel, superintendent telegraph, Lake Shore and Michigan Southern Railway, Cleveland, Ohio, writes: "The total mileage of the Lake Shore and Michigan Southern Railway, is 1,682. All of this is dispatched by telephone, excepting thirty-six miles on the G. & M. branch, from Goshen, Ind., to Findley, Mich., and the E. & W. branch, Elkhart to Mishawaka, Ind., twelve miles. Of the 1,634 miles dispatched by telephone, 994 miles are single track and the remainder double track or more. The telegraph is used for train-dispatching work on the G. & M. branch. There is no dispatching necessary on the E. & W. branch. The Dunkirk, Allegheny Valley and Pittsburgh Railroad, length ninety miles, is dispatched by telephone entirely. The Lake Erie and Western Railroad, 854 miles in length is dispatched by telephone on the main line from Sandusky, Ohio, to Peoria, Ill., and the Indianapolis and Michigan City Division from Indianapolis to Michigan City. The Fort Wayne, Cincinnati and Louisville Division, 123 miles, and the Northern Ohio Railway, Akron, Ohio, to Delphos, Ohio, 162 miles, are dispatched by Morse telegraph, but we expect to erect this year a new pair of copper wires on the former division for train dispatching. This is a single track road on all divisions. The Toledo and

(Continued on page 319.)

The Navy Radio Station at Arlington, Va.

Various references have been made in these columns during the past year to the radio station of the United States Navy at Arlington, Va., near Washington. In our issue dated September 16, 1912, we presented an illustration of the uncompleted towers, together with a brief description of the station and its equipment.

The *Electrical World* publishes an account of the service trials and operating features of the station, from which article we abstract some facts of interest, in addition to those we have already published, and show the towers complete and as they appear at the present time.



AERIAL TOWERS AT ARLINGTON STATION

Use is made of three towers located at the angles of an isosceles triangle, one side of which runs nearly north and south, and has at each of its extremes a 450-foot tower, while at the other angle a 600-foot tower is located. The distance between the two 450-foot towers is 350 feet, while that between the centers of the 450-foot towers and the 600-foot tower is 400 feet. These towers are carried on concrete columns and are provided with an insulating plate of marble. Each tower has four legs and four supporting columns.

The antenna consists of three horizontal antennas between the three towers, of a type and supported in a manner similar to that employed on the steamship installations, except that the spread of the wires and the number of wires are considerably greater. These three antennas are supplemented by an additional spread of wires which is secured by means of a cable supported between the two smaller towers and to which is attached, at intervals of ten feet, the antenna wires, which are carried up to a spreader supported by the 600-foot tower. All of these antennas are joined together and form in effect one enormous fan-shaped antenna, the upper corner of which is approximately 600 feet above ground, while the lower side is slightly less than

450 feet above ground. These antennas are all insulated by means of porcelain disks, arranged in series, ten being employed to provide the necessary insulation. The connection from this antenna to the station is made at the middle of the antenna, between the two smaller towers, by means of a grid of wire which leads directly down to a pole, on which is mounted a switch, by means of which the antenna can be connected to either the sending or the receiving room, or can be connected directly to ground in order to protect it from lightning discharges.

The operating house, shown in the illustration, was described in our issue of September 16, 1912.

The energy for the operation of the sending equipment is secured from the Potomac Light & Power Company and is delivered to the station in three-phase, 25-cycle alternating-current form. It is used to run a 200-hp. synchronous motor, which drives, in addition to a direct-current generator for exciting purposes, a 100-kw., 500-cycle, single-phase alternator. The E. M. F. from this alternator is stepped up by means of a transformer to approximately 25,000 volts, the energy being used to charge compressed-air condensers, which are, in turn, discharged by means of a synchronous rotary spark gap, through a high-frequency oscillating circuit, The latter, by means of an oscillation transformer, feeds the energy directly into the antenna circuit. The control of the current in sending is effected by means of a remote-control switch which interrupts the circuit between the generator and the transformer in the process of making dashes and dots for the Morse code. This control switch is operated by means of an ordinary telegraph key placed in the operating room, where the messages are received.

The character of radiation sent out by this equipment is very pure in its wave form, being practically seven times as good as that fixed as the legal limit set by legislation which became effective last summer. This purity of radiation is due, in a large measure, to the low resistance of the antenna, but, in order that best advantage may be taken of this condition very accurate tuning of the oscillation circuits in the sending apparatus is required. The low resistance of this antenna is, in a large measure, due to the large amount of copper employed in the antenna proper, together with the fact that an enormous wave-chute, consisting of a great network of buried copper wires, covering several acres, is employed as a means of making the ground connection.

The transmitting apparatus of this station employs a high spark frequency—that is, 1000 sparks per second. In its ability to transmit successfully through atmospheric disturbances it gives vastly superior results over those achieved by the old low spark frequency, which suffered such serious interruptions in the transmission of messages during certain periods of the year.

The constants of the antenna taken after adjustment for the recent test with the scout cruiser "Salem" were as follows: Capacity, 0.01 microfarad; inductance, 0.123 millihenry, and an equivalent resistance of two ohms. The power input was about seventy-two kw., and a wave-length of 3800 meters was used, experiments having shown this to be the best for sending to the ship. The oscillations are particularly persistent, the logarithmic decrement per complete period being only 0.031.

The arrangement of the sending set is very compact as a result of the employment of Fessenden compressed-air condensers, supplemented by an assembling of parts to the best advantage. The use of compressed-air condensers not only economizes in floor space, but also increases the operating efficiency very materially. A total capacity of 0.126 microfarad in compressed-air condensers is used.

The receiving equipment consists of condensers and inductances, together with a suitable oscillation transformer, all being provided with means of adjustment which permit the accurate tuning of each of these several elements so as to secure the best possible results. The detectors employed are the Fessenden liquid barretter and the Nescon crystal detector.

In addition to the receiving apparatus described the heterodyne receiver was employed at times during the tests when the signals were exceedingly faint, or when interference from other stations was likely to prevent accuracy.

Horizontal Antennae.

A German radio engineer named Kiebitz finds that wireless waves can be received with surprisingly good results by using an antenna made up of wires stretched along at a short distance from the ground, mounting the receiving devices at the center of the antenna. For instance, upon a large flat area near Belzig, Germany, he stretched several wires between pairs of posts at about three feet from the ground. However, a combination is made by stretching one antenna from north to south, then a second from east to west, so as to cross the first one at right angles, and in the middle. He also ran a third antenna across the middle point, and directed north-east and south-west, that is, at angles of forty-five degrees. This latter antenna was about 1,000 feet long, and lay in the direction of the Schönberg station (40 miles off) and also in the direction of the Eiffel Tower (500 miles away) and the German post of Swinemunde (140 miles). In this way he was able to pick up these two German posts, as well as the Norddeich post (250 miles distant). Signals could be heard very well from the Eiffel Tower, and Mr. Kiebitz concludes that an antenna of this length is equivalent to a vertical one of 40-foot height. Poldhu was also heard, and he could receive from Clifden and Glace Bay by using a 4,000-foot wire three feet from the ground. Brief reference to this work was made in our issue dated March 1.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, MAY 16, 1913.

The Convention of Railway Telegraph Superintendents.

The thirty-second annual convention of the Association of Railway Telegraph Superintendents will meet in St. Louis on the twentieth instant. It is fair to conclude that any association that has lived thirty-two years must be successful in its work, and in this particular instance there is no doubt on this point. The association truly stands for progress in all things that pertain to the movement of railway trains, and it is gratifying to know that the individual members measure up to the same standard.

The only way to judge the worth of an individual or an association of individuals is by the results accomplished, and in order to know whether this truth is applicable in the present case all that is necessary is to note the progress being made in the art of train dispatching and the excellence of the service. Improvement is the key-note to the whole situation and the superintendents are certainly an alert lot of men, judging from the high state of efficiency of train dispatching as practiced at the present time. At first the old Morse telegraph met all the requirements, but something better in the shape of the telephone came along and was adopted. Some of the staunchest advocates of the telephone system of dispatching were, a few years ago, rather skeptical of it, but the results attained by its introduction is another example of the danger of passing upon the worth of a thing before it is tried. Experience has proved that the telephone is superior to the telegraph in this line of work, and enables the railways to move their trains with greater safety and speed.

The next thing in the line of progress will probably be the use of wireless in railway work. This may seem to be a far look into the future, but as a matter of fact, preparations are now being made to test it on a prominent Eastern railroad. The results of this test will give the officials of other railways something to think about.

A successful wireless system would have an immense advantage over the present systems in that it would be independent of wires which are always liable to more or less trouble. The railway telegraph superintendents therefore have not yet by any means realized the ultimate possibilities of their calling, and there is much yet to be done.

The programme for the St. Louis convention is an excellent one as far as the character and number of papers is concerned, and the meeting will certainly be profitable to those who are in attendance.

Telephone Insanity.

Many sins and evils are charged against the telephone when no other scapegoat is handy. It used to be the fashion a few years ago to charge to electricity every fire whose origin was in any sense obscure. Now the telephone is charged with producing insanity.

Dr. Strauch, a commissioner in lunacy, in Berlin, Germany, gave it as his opinion at a trial that even phlegmatic men might have their mental balance upset by exasperation at getting no reply from "central" in answering calls. He mentioned a case of a well-known doctor who became insane through telephone exasperation.

What can one expect from such service as was described by another witness. He said that government telephone girls had been permitted to use one of the big exchanges for the reception of their fiancés.

If the girls are permitted to entertain their "beaux" during business hours, they cannot at the same time answer calls. They will naturally choose the more pleasant service of the two—they cannot serve two masters.

The German telephone service needs some serious attention if the testimony of these two witnesses is true. The officials should come to the United States and learn how to conduct the telephone business. There is no telephone exasperation here.

The Imperial Wireless Chain Investigation.

The report of the technical committee appointed by the Postmaster-general of England, to consider the various systems of long distance wireless telegraphy, with particular reference to the proposed imperial chain of stations, has been issued. It states that the Marconi system is at present the only system of which it can be said with any certainty that it is capable of fulfilling the requirements of the imperial chain. This does not imply, however, that the Marconi Company must necessarily be employed as contractors for all the work required for the imperial chain. Indeed, in some respects it might, the report states, be better for the government itself to undertake the construction and equipment of the necessary stations.

The committee considers wireless telegraphy to be in a condition of rapid development and thinks it undesirable that the post-office should be pledged to the continued use of any existing apparatus, or subject to any penalty by way of continued royalties.

The committee investigated the Telefunken, Poulsen, Goldschmidt and Gallette systems.

One of the post-office requirements is for continuous communication by day and night over land and water for distances ranging from 2,000 to 2,500 miles. "Except in the case of the Marconi system," the report continues, "we did not obtain any demonstration on a commercial scale, or any demonstration over a distance of even 1,000 miles."

The committee points out the fact, however, that it was apparently impossible for some companies to arrange a demonstration within the three months allowed for the purpose.

The Value of Your Capital.

BY EDW. B. FIELD, JR., VICE-PRESIDENT AND TREASURER, MOUNTAIN STATES TELEPHONE AND TELEGRAPH COMPANY, DENVER, COL.

What is the value of your capital? I don't mean to your employer, but to yourself. Most persons measure themselves by false standards. Nearly everyone thinks his or her assets in life is that vague thing called "opportunity" that is waiting just around the corner to give us a lift on the road of life. Opportunity is a wonderful thing—to dream of. If you rely on it entirely, however, or dream too long, you may not be ready when opportunity comes.

Suppose, just for an example, there was a place where thousands of men assembled, and, by drawing lots, there was given an opportunity for one in each thousand to take a seventy-five-pound weight, lift it from the ground with one hand, and raise it above his head. Let us suppose the prize was a fortune large enough to keep the person who could perform this feat in luxury ever after. This is a fair example of opportunity in business life, isn't it? There is a chance that you may be chosen to lift the heavy weight and win the coveted prize. And if you will tell me what suggestion this example conveys to you, I can tell you what the future holds for you.

There is only one suggestion this ought to convey to you—"be ready." Begin by picking up a ten-pound weight, and, when you can lift that, seize upon one weighing fifteen pounds, then twenty pounds, then twenty-five pounds, and when the great event comes if you are chosen you can lift all you are asked to and do it easily.

This illustration of opportunity I use is not so far-fetched as you may suppose. You can walk into the office of any large establishment in the country and find a man there lifting the heavy burden of the company's affairs who once was not able to pick up and carry one-tenth what he can to-day. But he tried himself out with the small tasks, lifting more each time, and when the day of opportunity came he was ready. His strength grew by the use he put it to. He picks up the heaviest weights every day now, and they seem lighter than the smaller ones did years ago. Every fibre in him is strengthened by the slow increase of responsibility.

How much weight can you lift to-day? What are you worth—as an asset? Let us see: Do you earn $50 a month? Do you realize what that represents as an investment at six per cent per annum? Just $10,000. That's your capital. You can increase it if you will. Every time you add five dollars a month to your earning power you are adding $1,000 to your capital, and you are worth that much more to yourself. When you earn $100 a month you will have a capital of $20,000. Perhaps you have been advised to "get into business for yourself." That is a very common bit of free advice and is worth about what is asked for it. Tell all anxious friends who offer you this suggestion in the future that you are in business for yourself; that you are adding to your capital every day, and the reserve of strength and ability and earning power you are laying up will not take wings as easily as do many money fortunes.

Opportunity is very common. It is everywhere. The world of business bristles with it. It is so plentiful that sometimes the person whose arm can only lift thirty pounds is seized upon by opportunity and asked to lift fifty pounds. Then we see failure. But the person who loses heart over one failure makes a big mistake. Failure merely means you were not prepared. The big, heavy weight is hard to lift. If at the first try you can't lift it—well, you simply can't, that's all. The difference between the strong and the weak is that the strong begin all over again, with a stout heart, to gain strength so at the next opportunity they win.

Some day the big chance is coming to you. When it does, and you lift the heavy burden easily and walk away with it, someone is sure to say, "How lucky that person is." But what do you care what they say. You will have other things to occupy you. Real friends will come in and take your hand and say, "I knew you could; I have seen you getting ready for it."

Perhaps you think that when the day of triumph comes you will sit a long time and think and dream pleasantly of the days when you hoped and planned that some time you would lift the heavy burdens, confident of your strength. Well, you won't sit and dream very long. They don't sit and dream in the places where you must measure strength with big tasks. New responsibilities come crowding in upon you and you put forth your strength, glorying in the possession of a power that is all your own.

Course of Instruction in the Elements of Technical Telegraphy—XXXIX.

(Copyrighted.)

(Continued from page 272, May 1.)

[We began in our issue for October 16, 1911, the publication of a course of instruction in technical telegraphy. The course, which was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, is published for the benefit of those of our readers who desire to fit themselves for better positions in their vocation. It is elementary throughout and is divided into chapters, following one another in logical order.

The course has received the hearty commendation of telegraph officials and experts for its scope and accuracy and its sound practicability. In each chapter examples are presented in order to illustrate the application of the rules to practical cases, and each chapter is followed by a series of questions pertaining to the subject of the chapter, to be worked out by the student in order to review his progress. Back numbers containing these valuable articles can be obtained on application, at 10 cents per copy.]

The Milli-Ammeter *(Continued)*.

The milli-ammeter, when inserted in a circuit, shows by the deflection of its needle the current value in milli-amperes. The term milli-ampere was introduced some years ago as a unit of current strength for telegraph signals, and is equal to the current generated in a circuit of 1,000 ohms resistance by a pressure of one volt. The ampere unit is equal, as before stated, to the current generated through a resistance of one ohm by one volt pressure, but the current strength in telegraph circuits is so low that, for testing purposes the milliampere has been generally adopted in preference to the larger unit, since by its use the value of the current is obtained in whole numbers instead of fractional parts of an ampere.

Ohm's law must now be modified to suit the smaller current unit, and for calculations of resistance and potential in connection with milli-ammeter readings we have the following:

(1.) $\dfrac{\text{Milli-volts}}{\text{Milli-amperes}} = \text{ohms.}$

(2.) $\dfrac{\text{Milli-volts}}{\text{Ohms}} = \text{milli-amperes.}$

(3.) Milli-amperes $\times$ ohms $=$ milli-volts.

Example: The resistance of a circuit is 5,000 ohms; the current received from the distant battery as shown by a milli-ammeter is 40 milli-amperes; find the E. M. F. of the distant battery.

Solution: Milli-amperes $\times$ ohms $=$ milli-volts.

$40 \times 5{,}000 = 200{,}000$ milli-volts.

To change milli-volts divide by 1,000, since one volt equals 1,000 milli-volts.

$\dfrac{200{,}000}{1{,}000} = 200$ volts. Ans.

Example: The fall of potential in a circuit is 200 volts, and the current strength by milli-ammeter 40 milli-amperes; find the circuit resistance.

Solution: $\dfrac{\text{Milli-volts}}{\text{Milli-amperes}} = \text{ohms.}$

$\dfrac{200 \times 1{,}000}{40} = 5{,}000$ ohms. Ans.

Example: The E. M. F. applied to a circuit is 200 volts; the circuit resistance is 5,000 ohms; what deflection should be obtained on the milli-ammeter?

Solution: $\dfrac{\text{Milli-volts}}{\text{Ohms}} = \text{milli-amperes.}$

$\dfrac{200 \times 1{,}000}{5{,}000} = 40$ milli-amperes.

It must be remembered that in accepting the milli-ammeter reading as the true value of the current from the distant battery we are assuming a condition of things that is seldom if ever attained in practice, viz.: a perfect state of line insulation. On this account it is hardly possible to obtain absolutely correct results, but by making suitable allowances from a knowledge of the probable condition of the line, etc., sufficiently accurate data for all practical purposes can be secured.

The milli-ammeter, besides giving the value of the current in a circuit, is very useful in picking out the bad spots along the line.

Suppose that the New York-Buffalo circuit shown in Fig. 30 is reported heavy and working badly, and that the E. M. F. of New York's battery is 200 volts. New York orders the wire opened at Buffalo and inserts the milli-ammeter between his battery and line.

The insulation resistance of a wire (the joint resistance of the leakage circuits) in ordinary weather should not be less than 50 megohms (50,000,000 ohms) per mile, so if a deflection of, say, ten milli-amperes is obtained on the meter the total insulation resistance of the line is

$\dfrac{200 \times 1{,}000}{10} = 20{,}000$ ohms.

To find the insulation resistance per mile multiply the total insulation resistance of the line by the number of miles contained in it. Calling the distance from New York to Buffalo 440 miles, the insulation resistance per mile is thus $20{,}000 \times 440 = 8{,}800{,}000$ ohms.

This is a drop from 50,000,000, and shows the presence of a bad leak somewhere, and by opening the wire at different points, and working out the insulation resistance of each section as above, the fault can be speedily located.

In the case of a ground some idea of the whereabouts of the fault can be obtained by using the milli-ammeter, provided the normal current strength in the circuit is known. It is not even necessary to request a station to open the wire, but simply to note carefully the altered deflection due to the ground fault. For instance, say the usual current strength on a circuit is fifty milli-amperes. A ground fault appears and the current from the battery is now owing to the shortening up of the circuit increased to, say, 100 milli-amperes. The current being doubled, the circuit resistance must be only half as much as before, so that, assuming the fault to be a dead ground, it must be at a point half way along the line of resistance, or very near the center of the circuit.

In case of a partial ground a deflection of twice the normal number of milli-amperes places the fault in the near half of the circuit. For example, a circuit has a resistance of 1,000 ohms and a battery of 100 volts, and the milli-ammeter consequently registers a current of fifty milli-amperes. A fault appears in the circuit, and the current is now increased to 100 milli-amperes. Assuming the partial ground fault to have a resistance of 100 ohms, then, the current having been doubled, the circuit resistance must be only 500 ohms, and the fault cannot therefore be at the center of the circuit, as in that case there would be 500 ohms to the fault, plus the joint resistance of the fault and the remainder of the line. It must be at a point considerably nearer the battery, where the line resistance to the fault, plus the joint resistance of the fault and line beyond, is equal to 500 ohms.

It can be easily determined whether the fault is dead or partial ground, by grounding the wire through the milli-ammeter, which will show no deflection from a dead ground, but will be affected more or less by the quantity of current flowing in the line branch of the parallel circuit formed by the fault.

(To be Continued.)

Edison and His Tiger.

At the Magnetic Club dinner at the Broadway-Central Hotel, New York, on April 19, a speech was made by a dignified gentleman, long a resident of England, but a true American for all that, whose visits to this country for several years past have been few and far between.

When Mr. Edison was about to bring out his electric light he invited me to come to New York and see it. The moment it was ready he notified me, and dropping my duties temporarily as manager of the Associated Press in Washington, I hastened to New York to find that very swell quarters in which the new incandescent lamps were in abundant evidence had been fitted up on Fifth Avenue. Edison had his office at the top of the house and, as I soon discovered, gaining access to him was by no means a simple matter. A man I had never seen before sat near the door much in the attitude that St. Peter is supposed to have occupied at the celestial gate, when, on a given occasion, as Byron pictured it, "the keys were rusty and the lock was broke."

I asked for Edison and was presented with a card on which to write my name, state the nature of my business, etc. I told the guardian at the gate that I had no business with Edison; that I was one of his personal friends, and if my visit was viewed in the light of an intrusion I wouldn't disturb the old boy for the world, and that I knew very well what a great man he was becoming, and all that. I was very proud of my friend Edison.

I was just preparing to depart when I heard a voice that waked the echoes shouting, "Come on up, Phillips, come on up." I looked up the spiral staircase, and on the upper landing Edison was stationed for the apparent purpose of steering his friends safely into his mighty presence.

I was fat and hated climbing, and as I halted at one landing after another to get my breath, I thought of the story of the spider and the fly that I used to read at school when a boy, and I wondered if it was going to be true in my case "that who goes up these winding stairs will ne'er come down again." Puffing like a porpoise. I finally reached the goal, and was soon shaking hands with Edison, listening to his enthusiastic reports as to how successful the light was going to be, the liberal manner in which the stock of the company was selling, etc.

Finally, when I could find my voice, I inquired who that tiger, the roustabout or bouncer down stairs who held me up, was. Edison roared and replied: "Don't you know *him?* Well, that is a good one on you, Walter, and I suppose he doesn't know *you.* Why, Phillips, that is Ed Johnson."

After the distinguished Mr. Edward H. Johnson, of London, had made his brief and graceful little talk to his Magnetic associates, I went over to his table and shook hands with him. I don't know what he was thinking about, but my mind wandered back some thirty odd years, and I recalled St. Peter Johnson as he appeared on the morning I was looking for Edison. As a bouncer, Mr. Johnson was a much more formidable figure than he was the other evening in correct evening clothes, the personification, in fact, of gentility and courtesy. He was not very gracious on the occasion of our first meeting, I assure you. The Edison light had been appropriated by two companies, which the courts, in due course, put out of business for barefaced infringement of the Edison patents; all sorts of fakers were abroad in the land, say nothing of the cranks, many of whom wanted to get Edison's ear without serious delay. Johnson was a watch-dog for fair, and those who tried to bluff him, as I learned from observation that very day, after my talk with Edison was over, and I stopped to tell Johnson who I was, were not brilliantly successful.

His method of dealing with intruders reminded me of that charming verse which Woodrow Wilson quoted apropos of Tammany Hall, during the progress of the recent campaign. The President's revived limerick runs thus:

"There was a young lady from Niger
Who rode out, with a smile, on a tiger;
They came back from their ride with the lady inside
And the smile on the face of the tiger."

W. P. P.

A VERSATILE MESSENGER.—Walter Arndt, a Western Union messenger in Duluth, Minn., has joined a theatrical circuit to appear in a monologue act. His specialties will be impersonations and imitations of noises, etc.

Wireless Messages Heard on Land Lines.

BY F. D. PRESSLER, WIRE CHIEF, BESSEMER AND LAKE ERIE RAILROAD COMPANY, GREENVILLE, PA.

We have been receiving wireless despatches in a novel way, and I give the details for the benefit of your readers, who, no doubt, will be interested in the matter.

The Bessemer & Lake Erie Railroad Company, which handles immense quantities of iron ore for the Steel Corporation from the docks on Lake Erie at Conneaut Harbor, Ohio, to the furnaces near Pittsburgh, has three up-to-date telephone train-dispatching circuits, a block telephone which is a grounded circuit, and several telegraph lines. On two or three occasions during the past year we have noticed high-tension induction on the block wire and on the dispatchers' telephone circuit, which extends from Greenville to North Bessemer, a distance of ninety miles (North Bessemer being only a few miles north of Pittsburgh), and the grounded telephone block wire was so noisy that it was impossible to hold the receiver to the ear. We watched this closely and discovered that every evening at the exact moment that the arc lights were turned on at the towns along the Allegheny River above Pittsburgh the induction became very pronounced on our telephone circuits, and we thought at times that we could distinguish wireless signals. The next question was "Where is it coming from?" since our wires are all high and dry and beyond the influence of the high-tension lines. We finally discovered that a Western Union wire from Pittsburgh, which occupies a place on our poles for some distance and which loops into the district where we had been watching the arc lights, was carrying induction to our lines. The Western Union people were notified to look over their wire and the induction and wireless signals disappeared until about ten days ago, when we noticed again high-tension induction on our telephone circuits, also wireless signals. Our operators and train dispatchers all being good Morse men it was only a short time until they could read part of the wireless conversation, and now they have become so expert that they can read everything that comes along—baseball scores, ocean news, cable dispatches and hear the wireless boys talking and joking. This induction comes in on our telephone circuits regularly each evening, being about three or four minutes later every day, and with it comes the wireless, which is as plain and distinct as any I have ever heard. There are four stations which we hear from every night, "SHP," "BOA," "LES" and "AOS." On a recent evening we heard bulletins regarding the Pope's condition, the White Star steamer "Laurentic," which was reported aground and later reported floated. One of the despatches to "AOS" from "BOA" read: 'I just came up Broadway in here to look the boys over; this is some club; you ought to come over some time."

We would like to know where these offices are and get better acquainted with our new friends. Our Morse call is "HF."

[In commenting on this communication, Mr. W. D. Terrell, radio inspector at New York, says:

"It is my opinion that the stations mentioned are either in the same town or near the line operated by the Bessemer and Lake Erie Railroad Company. It is hardly probable that the signals could have been received by inductance from New York. I have heard of cases where such signals were received, but only at comparatively short distances. For instance a friend of mine said he had used a telephone in one of the drug stores in New York and had heard the signals sent out by the Marconi station at Sea Gate. The call letters specified are unknown here, and the reports claimed to be received from New York are evidently without foundation, and, in any event, not accurate and possibly sent by experimenters nearby. For instance, there does not appear to be any record of the steamer "Laurentic," of the White Star Line, being aground at any time, according to the officials of the White Star Company in this city."

It may be stated in this connection that all ship radio stations on the Atlantic coast are assigned calls beginning with the letter "K," commercial coast stations calls beginning with the letter "W" and amateur stations calls beginning with the figure "2" followed by two letters of the alphabet, such as "2AB," "2AC," etc.

It is very probable that the calls referred to by Mr. Pressler are being used by experimenters who have not applied for licenses; and stations so operating are possibly violating the law. Experimenters using transmitting apparatus should have operators' licenses and also station licenses. Station licenses cannot be issued until the operators' licenses have been secured. The use of calls other than those officially assigned is unlawful.—EDITOR.]

Meetings of Associations, Societies, etc., During 1913 and 1914.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, at St. Louis, Mo., May 20. Secretary, P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION, New York, second Wednesday in March, 1914. Secretary, M. J. O'Leary.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS, at Watertown, N. Y., August 19-22. Secretary, Clarence R. George, city electrician, Houston, Tex.

OLD-TIME TELEGRAPHERS AND HISTORICAL ASSOCIATION AND SOCIETY OF THE UNITED STATES MILITARY TELEGRAPH CORPS, at Detroit, Mich., August 26, 27 and 28. Secretary of the Old-Timers, F. J. Scherrer, 30 Church street, New York; secretary of the Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

TELEPHONE PIONEERS OF AMERICA, at Chicago, Ill., October 16 and 17. Secretary, Henry W. Pope, 15 Dey street, New York.

Statistics of the Association of Railway Telegraph Superintendents.

The following table shows the dates and places of the annual conventions of the Association of Railway Telegraph Superintendents from the first meeting up to the present time; also the names of the president, vice-president and secretary-treasurer for each year throughout the entire period:

Date	Year	Place	President	Vice-President	Secretary-Treasurer
Nov. 20	1882	Chicago, Ill.	W. K. Morley	W. Kline	C. S. Jones
June 3	1883	Chicago, Ill.	W. K. Morley	C. Selden	P. W. Drew
Sept. 17	1884	Philadelphia, Pa.	C. Selden	E. C. Bradley	P. W. Drew
June 17	1885	Cleveland, Ohio	C. W. Hammond	G. L. Lang	P. W. Drew
June 16	1886	St. Paul, Minn.	A. R. Swift	G. L. Lang	P. W. Drew
July 13	1887	Boston, Mass.	G. L. Lang	G. C. Kinsman	P. W. Drew
July 11	1888	New York	G. C. Kinsman	C. A. Darlton	P. W. Drew
Oct. 16	1889	Washington, D. C.	C. A. Darlton	G. T. Williams	P. W. Drew
June 18	1890	Niagara Falls, N. Y.	G. T. Williams	G. M. Dugan	P. W. Drew
June 17	1891	Cincinnati, Ohio	C. S. Jones	L. H. Korty	P. W. Drew
June 15	1892	Denver, Col.	L. H. Korty	U. J. Fry	P. W. Drew
June 20	1893	Milwaukee, Wis.	U. J. Fry	O. C. Greene	P. W. Drew
June 13	1894	Detroit, Mich.	O. C. Greene	E. R. Adams	P. W. Drew
June 12	1895	Montreal, Can.	M. B. Leonard	J. W. Fortune	P. W. Drew
June 17	1896	Old Point Comfort, Va.	G. M. Dugan	J. W. Lattig	P. W. Drew
June 16	1897	Niagara Falls, N. Y.	J. W. Lattig	W. W. Ryder	P. W. Drew
June 15	1898	Omaha, Neb.	W. W. Ryder	L. B. Foley	P. W. Drew
May 17	1899	Wilmington, N. C.	L. B. Foley	W. F. Williams	P. W. Drew
June 20	1900	Detroit, Mich.	W. F. Williams	C. F. Annett	P. W. Drew
June 19	1901	Buffalo, N. Y.	C. F. Annett	F. P. Valentine	P. W. Drew
June 18	1902	Chicago, Ill.	J. H. Jacoby	W. J. Holton	P. W. Drew
May 13	1903	New Orleans, La.	C. S. Rhoads	C. P. Adams	P. W. Drew
June 15	1904	Indianapolis, Ind.	H. C. Hope	E. E. Torrey	P. W. Drew
May 17	1905	Chattanooga, Tenn.	E. E. Torrey	E. A. Chenery	P. W. Drew
June 20	1906	Denver, Col.	E. A. Chenery	E. P. Griffith	P. W. Drew
June 19	1907	Atlantic City, N. J.	E. P. Griffith	W. J. Camp	P. W. Drew
June 24	1908	Montreal, Can.	W. J. Camp	G. W. Dailey	P. W. Drew
June 23	1909	Detroit, Mich.	J. L. Davis	I. T. Dyer	P. W. Drew
June 20	1910	Los Angeles, Cal.	I. T. Dyer	J. B. Sheldon	P. W. Drew
June 26	1911	Boston, Mass.	G. A. Cellar	W. Bennett	P. W. Drew
June 4	1912	New York	J. B. Sheldon	W. Bennett	P. W. Drew

Electrical Dictionary.

Every student of electricity and every reader of articles on electrical subjects frequently finds the need of a dictionary that will explain technical terms used in books on electricity. Such a dictionary enables one to get an understanding of the technical terms used, and thus get a fuller grasp of the subject he is reading about, and unless one knows the meaning of these terms it is a waste of time trying to make intelligent progress.

The "Handy Electrical Dictionary" compiled and edited by W. L. Webber, M. E., is a practical handbook of reference, containing definitions of electrical terms and phrases. It is vest-pocket size and indexed for easy and quick reference.

With a copy of this little book at hand the student will be able to make much greater and more satisfactory progress in his studies, and feel that he is receiving proper guidance.

This little work is really a key to electrical knowledge, as it throws light on terms used in electrical books that would be unintelligible without it.

At the back of the book are standard diagrams representing the various electrical devices. This will be found a valuable feature to electrical students and others, as it shows how to make intelligible sketches of apparatus.

The book has 224 pages and can be easily carried in the vest pocket. It comes in two styles of binding—cloth and leather, the price being 25 cents and 50 cents per copy, respectively. Copies may be obtained of Telegraph and Telephone Age, 253 Broadway, New York.

More Wireless Long Distance Tests.

According to reports to the Navy Department regarding the experiments conducted on the recent voyage of the scout cruiser "Salem" to Gibraltar to test the Arlington naval radio plant, it has been demonstrated that between the two types of radiation, the spark apparatus and the electric arc, or "undamped" oscillations, the latter is less modified by absorption as each progresses over the surface of the earth. The spark waves have proved to be less energetic up to a distance of several hundred miles. In the experiments with the "Salem" both types of transmission were used, and up to 900 miles distance it was found that there was little if any appreciable difference in their respective energies.

It was possible in the daytime to communicate with the "Salem" from Arlington with both types equally up to 2,100 miles, and at night communication with the "Salem" was easily maintained at Gibraltar. But beyond the distance of 2,000 miles it was discovered that the waves produced from the electric arc showed an increasing efficiency and possessed an energy four times as great as those from the spark apparatus.


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Selective Signaling Circuits.*

BY JOHN A. KICK.

The operation of a selector is based upon a number of impulses sent out from the master station at a predetermined speed through a given current which is distributed among the selectors by means of adjustable, variable resistances in the selectors. By means of these resistances the current in the selectors at all stations is the same.

The operation is accomplished by controlling the local circuit of a main line operating relay that is included in the master signaling equipment at the dispatcher's station. The controlling key or keys are placed in a case on the dispatcher's table. They control the closing and opening of the circuit of the main signaling relay by the rotation of a toothed wheel or other means which cause to contact a pair of points closing the circuit of the signaling relay.

While there is a predetermined speed at the rate of so many impulses per second there is a considerable operating margin, so that the controlling key or keys may be operated at a slower or faster speed. In other words, the time interval of "closed to line" is controlled by reason of the key closing the local of the main line operating relay in the master selecting equipment for a long or short period, as is determined by the time constant of the controlling key or keys. The impulses are of a length depending upon the predetermined speed of the controlling key in the dispatcher's key cabinet and are influenced not only by the speed of this key but by the adjustment of the main line relay in the master signaling equipment, the travel of its armature, and the tension of its springs.

In addition to the controlling keys in the dispatcher's signaling key case there is usually a strap key, which fills the office of allowing a ring, the length of which is determined by the wishes of the dispatcher, and is accomplished by his closing this key upon the start of the answer back tone. As long as this key is depressed the battery continues to remain to line, the selector remaining in the operated position, and the bells continue to ring. The operation of the way-station selector is as indicated in this explanation of the series of impulses.

When the selector at the station which it is desired to ring receives the proper impulses the contact is made; the controlling key in the selector key case at the dispatcher's station automatically holds the battery to line for a definite period, causing the selectors to remain in the operated position and the bell to ring until the key has finished its travel, when the selector is automatically released.

Having explained the cycle of operations, the proper adjustments and maintenance of the equipment will be briefly discussed.

In the main line on the line side of the signal sending relay it is advisable to place the milliammeter in the circuit, close the signaling contact points, and to read the current, which should be a total of the equivalent to, say, four milliamperes per selector. Upon the keys being operated, the mean between the minimum and maximum oscillations of the indicating needle of the meter should be approximately fifty to fifty-five per cent of the total current. When these adjustments have been properly arranged the current passes over the line at the predetermined cycle of constants.

If the adjustable resistances in the way-station selectors are correctly set the proper current values will be secured at each way-station in the main line signaling bridge. The usual small retardation coils placed in the selector and at the bottom of the selector terminal that connects to the line serve a double purpose, inasmuch as they act as impedance to a loss of transmission and choke back lightning discharges.

In the local circuits of the way-station selector it is well and, in fact, quite advisable to include this meter test. After the meter has been wired in the circuit close the contact points of the main line operating relay and read the current through those circuits. Then have the master station send a series of signals and go through the same course of reading the average current as was done at the master station. In this case the mean of the oscillations should be fifty to fifty-five per cent, the same as at the main station.

It is quite noticeable that from the master station an observer can check the adjustment of the bell by listening to the tone of the answer back, as may be done by listening in at the station where the test is being made. The indications are more clear by listening in the telephone circuit than they are by watching the operation of the bell with the naked eye.

If the answer back signals are apparently sticky and continuous the bell needs pulling up. If it is found that the signal is very light and irregular the bell should be lowered in its tension.

By being very careful in making this test with the meter in the local circuit of the seleotor the party making the test will notice that, if the closed current reading is, say, 220 milliamperes and the current indicated during the time of signaling is on an approximate average of seventy-five to eighty milliamperes, it will be found the main line relay tension is too high, and this should be lowered until the mean between the minimum and maximum indications, as the needle oscillates, is approximately 110 to 115 milliamperes, or say fifty to fifty-five per cent. If the mean current reading is higher than 110 or 115 milliamperes, say perhaps 150 milliamperes, the relay is on too low an adjustment and is in a sticky condition, producing an interval of too long a closed contact. As a result, the selector will be found to operate it properly.

While a rough hand test can be made and a fairly good operation secured by adjusting from observations made with the eye, it is found that a greater working margin will be secured by the use of the milliammeter method. The greater the care in checking the operating intervals and current values, the greater the margin of operation. Statements to the contrary are merely argumentative and not consistent with good operating principles.

It may be alleged that this or that equipment does not require such high-class attention, but the

* From Telephony.

statement needs qualification. It is clear that an equipment having a large operating margin is not at its highest working efficiency until all of its members are at the maximum operating points, or, in other words, until the large operating margin is taken full advantage of by proper timing and securing true values.

By adjusting the equipment of a line in a scientific manner the installation cost may be slightly increased, but the maintenance saving will more than counterbalance it.

Telephone Pioneers of America.

B. A. KAISER.

Mr. Barney A. Kaiser of the railway department of the American Telephone and Telegraph Company, New York, was born in Callicoon, N. Y., July 12, 1869, and entered the telephone service in Birmingham (now Derby), Conn., October 17, 1885, as night operator and "trouble-shooter," remaining in that position until May, 1892.

In 1886 he installed telephones for the dispatching of trains between New Haven and Ansonia, Conn., on the New Haven and Derby Railroad. In that year he removed some of the first copper wire put

B. A. KAISER, NEW YORK. (1885)

up for experimental purposes by Mr. Thomas B. Doolittle, at Ansonia.

On February 28, 1894, he entered the service of the the New York, New Haven and Hartford Railroad as wireman under the then chief train dispatcher, Mr. N. E. Smith, now superintendent of telegraph for the same road.

Mr. Kaiser was on July 13, 1901, advanced to be superintendent of telephone of the New Haven road and held that position until February 1, 1904, when he entered the employ of the American Telephone and Telegraph Company at New York as special agent of the railway department.

During his connection with the New York, New Haven and Hartford Railroad, Mr. Kaiser advanced the use of the telephone for train movement and made other experiments in telephony. Much of his time has been spent among the railroads and in the territory of the Associated Bell Companies in developing the use of the telephone in railroad service throughout the United States and Canada, and is now in charge of the railroad work under Mr. H. S. Brooks, general commercial superintendent.

Mr. Kaiser is a regular attendant at the conventions of the Association of Railway Telegraph Superintendents, and is very popular among railroad men. He is an associate member of the association, and keeps in close touch with railroad telephone affairs.

The Pupin Inductor.

Dr. Michael I. Pupin, professor of electro-mechanics at Columbia University, New York, described his new invention, which he will probably call the "Pupin inductor," before the American Philosophical Society at its recent meeting. Dr. Elihu Thomson, who introduced Dr. Pupin, stated that the invention would make it possible to send a wireless message around the world.

Dr. Pupin said: "The great difficulty with wireless communication has been that the electric waves weaken so that it is impossible to send messages many thousands of miles. Atmospheric conditions and other causes have limited wireless signaling to about 3,000 miles. By using balloons Marconi sent messages 3,000 miles. Between land stations 2,000 miles has been about the maximum distance.

"I have invented a device by which the electric current is put in inductive relation with a rotating armature of a motor. When a signal is received it acts at once on the rotating armature, and the rotating feature serves to increase vastly the strength of the current and the magnetic power, thereby assuring greatly extended communication.

"The rotator serves another purpose almost as important. It suppresses confusing signals. Take, for instance, a ship in the English Channel, a waterway where there is much interference in wireless communication brought about by the great number of ships and land stations using wireless systems. By the use of my invention a ship in the channel could receive uninterruptedly and clearly and send with the same absence of confusion although 100 ships and stations were signaling at the same time. My invention is an entirely new form of transmitting and receiving circuit.

"My inductor can be applied to any form of electric communication, and I believe that it will be as successful with wire communication as with wireless signaling."

ANSWER, DEAD OR ALIVE.—A woman of Columbus, Ind., had a relative in another town, which was affected by the recent floods in that region, and in her anxiety to learn of the condition of the relative she sent a telegram inquiring, "Are you dead? Answer."

New Western Union Main Switchboard.

(Continued from page 289, May 1.)

"AC"—Wire normally multiplexed. This circuit (Fig. 3) may be used for wires usually operated with multiplex sets, but occasionally required to be available for single Morse working. A short patching cord normally connects jacks 6 and 7, putting the multiplex set directly on the line wire. When this cord is removed, the circuit becomes similar to circuits A and AB, except that but one looping jack is provided; into this jack any desired loop or set may be connected by a regular patching cord. If, while the wire is being operated multiplex, it is desired to loop in a milammeter to measure the main-line current, the patching cord connection is changed from jacks 6 and 7 to 2 and 7, and the milammeter plug inserted in the cut-in jack (No. 13).

"AD"—Morse Wire, normally cut through. This circuit (Fig. 3) is for use at stations having a considerable number of both terminating and through Morse wires. The arrangement resembles that of circuit AB, but the normal contact of jack 2 is wired to that of jack 7 instead of to the battery jack (No. 1). The spring of jack 7 is cross-connected, at the distributing frame, to the spring of jack 7 of another circuit of the same type, thus cutting through the two wires assigned to these circuits. In addition to the wire chief's cut-in jack (No. 13) one looping jack (No. 10) and one loop jack (No. 9) are provided in each circuit; this arrangement will permit the insertion of a loop or set on the through wire, at either or both of the switchboard sections through which the wire passes. When it is desired to terminate the wire, or to cut in battery for test, a short patching cord is run from jack 2 to jack 1, thus opening off the normal connection to the other section of the through wire and connecting the wire to the battery tap. The wire chief may then cut in his Morse testing set at jack 13, or connect a loop, a set or a repeater to jack 10. If the through wire is used for multiplex service, or if it is considered advisable to eliminate any chance of interference due to possible misplugging by wire chiefs, a short patching cord may be run between jacks 6 and 7, thus removing from the circuit all exposed live parts on the face of the board.

"AE"—Single Morse Wires on City Line Switchboards. To reduce the amount of space required for city line switchboards in the larger offices this simplified circuit (Fig. 4), permitting eighty Morse wires to be handled in one section, is provided. This necessitates the use of two rows of lamp panels at the top of the section. Only one patching jack is provided for each wire, No. 1 for the upper circuit, No. 8 for the lower circuit. It is used for battery patching and its normal contact is wired to a battery tap, arranged as described under the head of circuit A. From the patching jack the circuit passes through a looping jack (No. 3 or No. 11) and then through the wire chief's cut-in jack (No. 4 or No. 12) to the line. One loop-jack is provided for the upper circuit, and either one or two for the lower circuit. Regular or Y patching cords are used to connect the loops into the looping jacks, as in other circuits. To change the voltage or polarity of the battery applied to this type of circuit a patching cord is run from the patching jack (No. 1 or No. 8) to a spare battery tap of the desired potential (circuit F, jack 6); as the discarded battery tap is thus opened off at the normal contact of jack 1 or jack 6, it cannot be used while such a patch is in service. Testing on city line circuits will usually be done by looping in the Morse testing set (circuit L) or the volt-milammeter at the wire chief's cut-in jack (No. 4 or No. 12). This puts the testing set between the loops and the line, instead of between the loops and the battery, as in the case of the cut-in jacks of circuits A, AB, etc. If it is desired to loop the testing set between the loops and battery one single-conductor plug of the set may be placed in the patching jack (No. 1 or No. 8) and the other single-conductor plug in a spare battery tap (circuit F, jack 6). For leased wires and other cases where it is desirable for operators to signal the wire chief provision is made for a single-wound drop to be looped in any of the lower circuits. This drop may be adjusted so that it will not respond to the regular working current of about sixty milliamperes, but will operate on, say, ninety or 100 milliamperes, the current being increased to the latter amount by the operator pressing a push button, which short-circuits a fairly high resistance at his set. The differential drop used in circuits A, AB, etc., is not applicable to city line circuits, as many of the latter are grounded at the branch office and where the signals originate. In large offices, where the number of city wires is excessive, it may be desirable to still further concentrate them. This may be done by adding another row of jack panels above the top row shown in Fig. 5, and wiring the jacks in these panels the same as jacks 1 to 4 of circuit AE. Each section will thus provide for 120 wires. In cases of this kind the resistance lamps for spare battery taps (circuit F) will be located behind the board.

"AF"—Through Morse Wire Without Loops. This circuit is used at offices having a large number of through wires which are seldom connected at that point to loops, sets, or battery. A patching jack (No. 5), a wire chief's cut-in jack (No. 7) and a line jack (No. 6) are provided at each of the two sections through which the wire passes; the functions of these jacks are the same as those described for similar jacks in circuit AD. At some stations, where through wires predominate, but a considerable number of terminating wires are also handled, it is often advantageous to use circuit AF for all wires, and supplement it with circuit AJ for the terminating Morse wires. This results in a uniform panel layout.

"AG"—Multiplex Circuit. This circuit (Fig. 4), which is wired the same as circuit AF, is economical and satisfactory for switchboard sections having a considerable number of wires operating with multiplex sets and seldom reverting to single Morse working. The line wire enters at the spring of jack 6, the normal contact of which is wired to the normal contact of jack 5. This circuit differs from circuit AF by having its looping jack normally

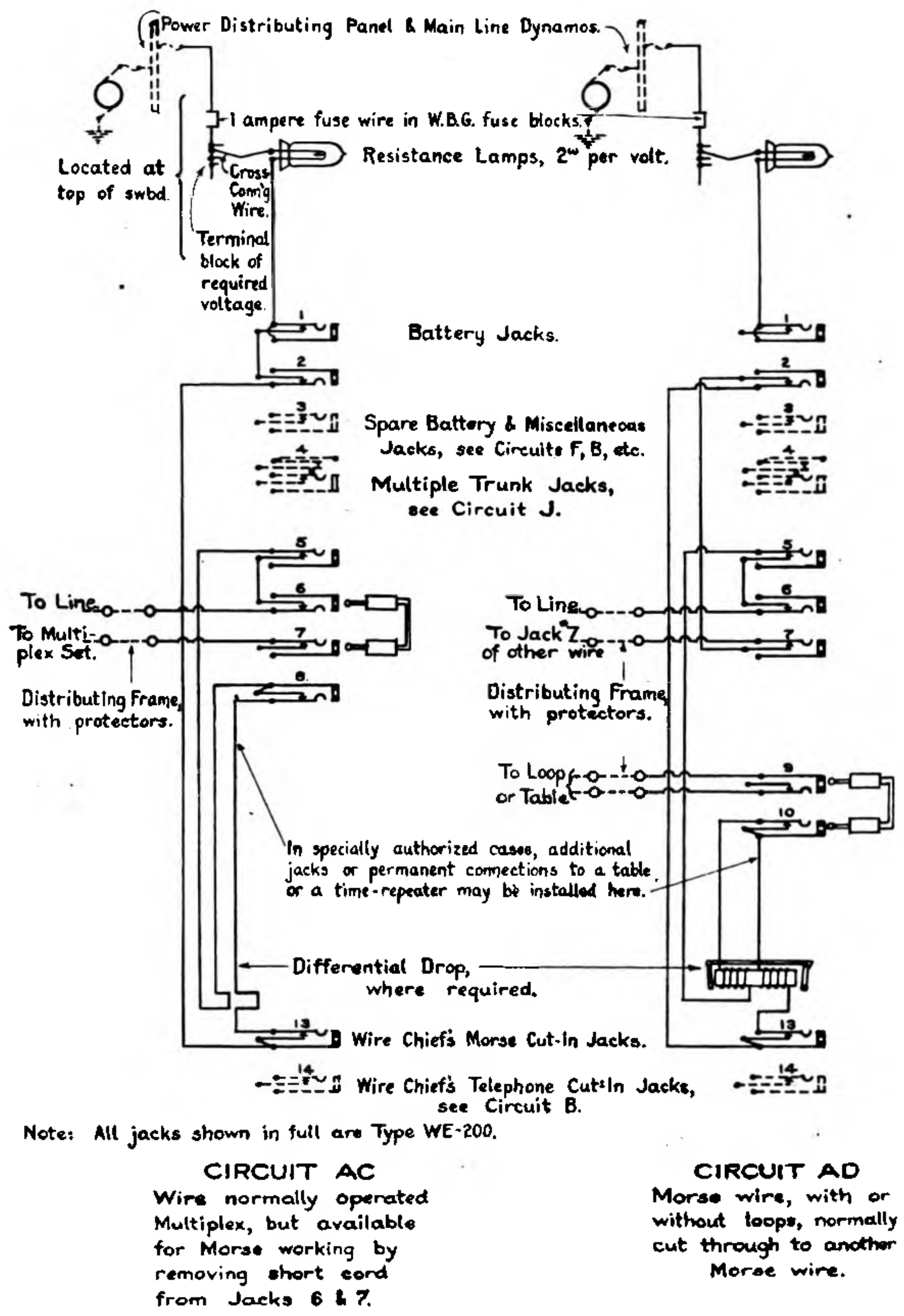


FIG. 3—SWITCHBOARD CIRCUITS AC, AD.

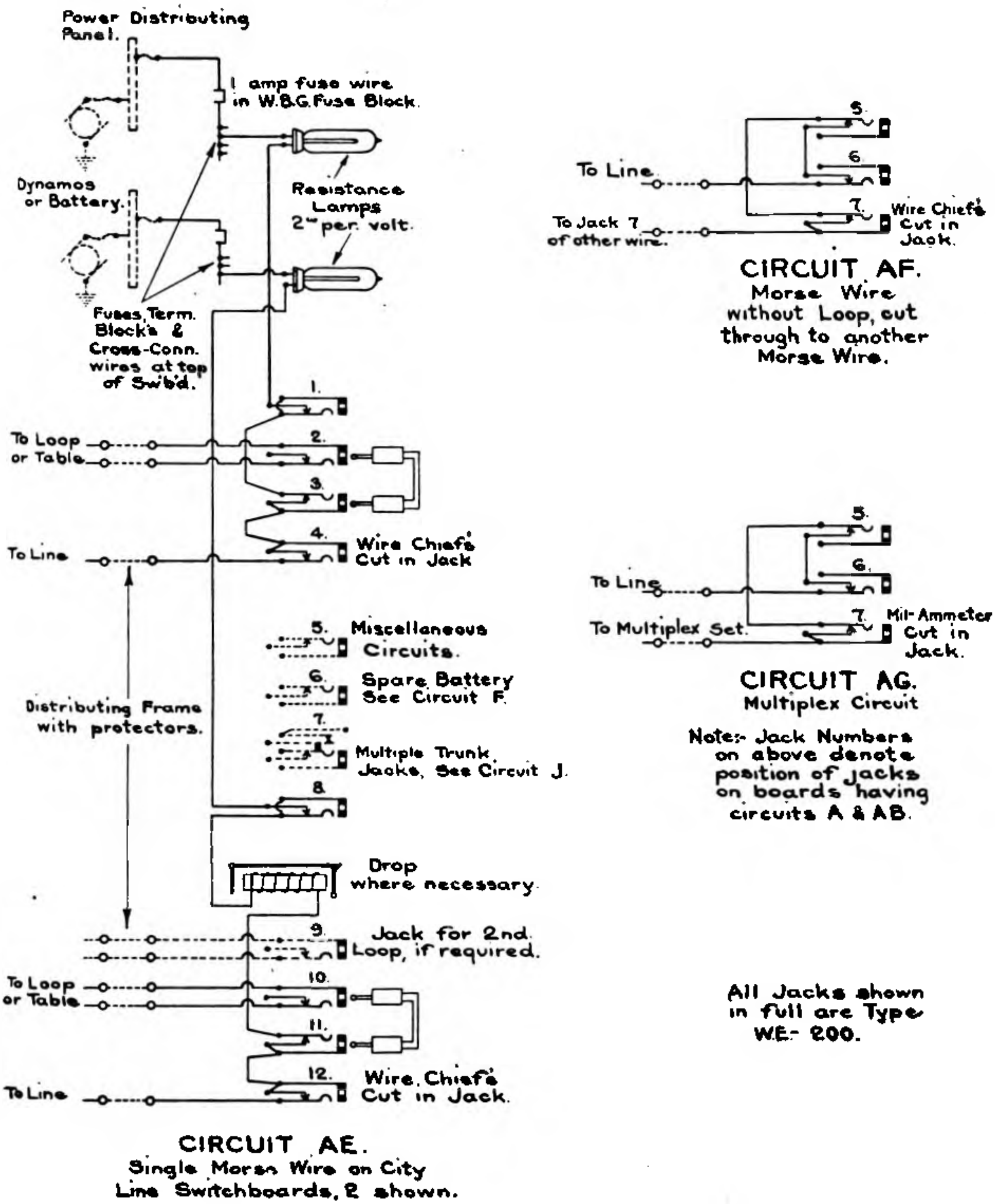


FIG. 4—SWITCHBOARD CIRCUITS AE—AG.

cross connected to a multiplex set instead of to jack No. 7 of another wire. Jack No. 7 of circuit AG may be conveniently used as a place for the insertion of a milammeter plug when current readings are desired on the main line of a multiplex circuit. Patching or testing may be done at jacks 5 and 6 in the same way as described for circuits A or AC. *(To be Continued.)*

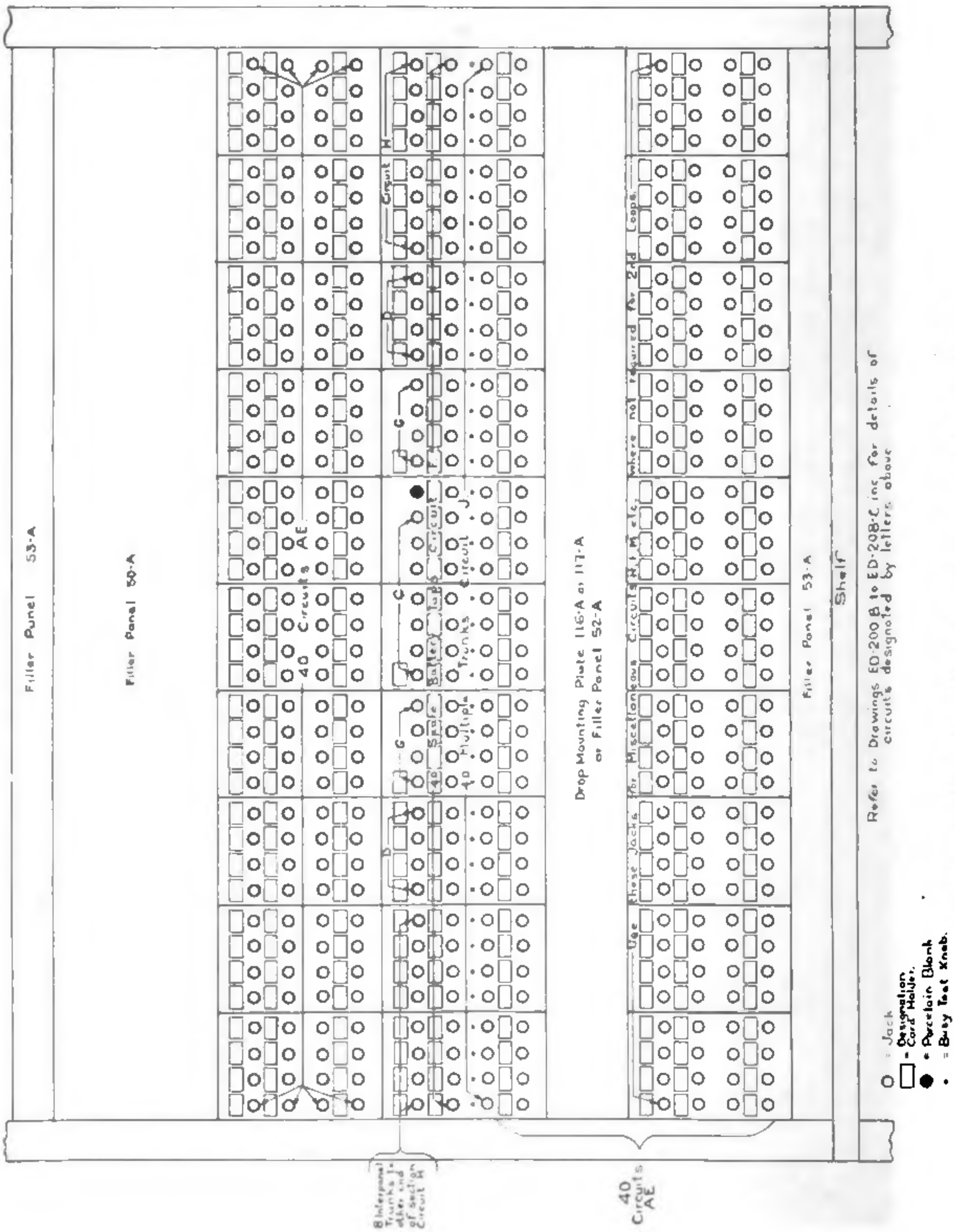


FIG. 5—MAIN SWITCHBOARD, TYPICAL PANEL LAYOUT FOR CITY LINE SECTION.

CURING TIMBER BY ELECTRICITY.—A process for electrochemically treating timber has been invented by a Frenchman, who calls it "electrocuring." It is claimed to thoroughly season the timber over night. The timber is submerged in a solution containing ten per cent borax, five per cent resin and a small trace of soda. Current applied to lead electrodes draws out the sap of the wood cells.

(Continued from page 298.)

Ohio Central Railway, 419 miles in length, is dispatched by telephone, except the Mud Fork branch, two miles in length, and the Green Run branch, three miles in length. This is a single track road. The Zanesville and Western Railway, single track road, eighty-seven miles in length, is dispatched by telegraph. The Cleveland Short Line Railway, twenty miles in length, and Lake Erie and Pittsburgh Railway, thirty-seven miles in length, are dispatched by telephone. The telephone system of dispatching is regarded as most beneficial to the railroad, as it is a quicker means of communication, and the train dispatcher can get in touch with the conductor or the engineer without passing through the third party. We do not contemplate extending the telephone system for dispatching purposes, excepting on the Fort Wayne, Cincinnati and Louisville Division of the Lake Erie and Western Railroad, as stated above."

Old Timers' Reunion.

Following is the programme, as far as it can be arranged at the present time, of the reunion of the Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps, which will be held at Detroit, Mich., August 26, 27 and 28.

The headquarters will be at the Hotel Cadillac.

The business meetings will be held in the morning of Tuesday, August 26, and in the afternoon there will be an automobile ride.

On Wednesday, August 27, there will be a steamboat ride from 10 a. m. to 5 p. m. Luncheon will be served on board, and there will be music for dancing.

On Thursday, August 28, the day will be spent in taking trolley and ferry rides, and in the evening a banquet will be held at the Hotel Cadillac.

There is every indication that the attendance of members and their families will be large and enthusiastic. Detroit is one of the most beautiful of American cities, and its suburbs are exceedingly attractive, largely on account of the immediate proximity of interesting bodies of water and the historic associations of that section of the country.

The president of the Old Timers this year is Mr. H. J. Kinnucan, a well-known telegraph official, of Detroit, Mich., and he is doing all in his power to insure an interesting and profitable meeting.

Mr. F. J. Scherrer, New York, is secretary of the Old Timers Association, and Mr. David Homer Bates, New York, for the military telegraphers, both of whom will be glad to give further information.

Industrial Physics.—A course of "Industrial physics" has been instituted at the Massachusetts Institute of Technology, Boston. It is designed to fit men with inventive faculties to solve practical problems in physics, electro-chemistry and electricity. Mr. Theo. N. Vail, president of the Amercian Telephone and Telegraph and Western Union Telegraph Companies believes that this course will be of value to business interests.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What part of a telegraphic circuit is the internal circuit?

What constitutes the resistance of an internal circuit?

What constitutes the external circuit?

What are the four component parts of an electric circuit?

What is an open circuit and what is a closed circuit?

What is the chief difference between an open and a closed circuit?

What class of circuit is generally used in the United States?

What are the chief characteristics of a closed circuit?

Make conventional diagrams to represent the following electrical apparatus and parts of circuits: a derived circuit and its connection with the main circuit; a crossing of two wires but kept from electrical contact; the direction of a current in a wire; a rheostat or artificial resistance; an adjustable rheostat; a voltaic cell; a storage battery; an electric generator; a ground plate; a common main-line relay; a polarized relay; a sounder; a recording instrument or register; a galvanometer; a Morse key; a three-point key; a single-current transmitter; a double-current transmitter; a condenser; a lightning arrester; a pole-changing switch; a switchboard; a three-point switch.

Why is the earth employed as part of a telegraphic circuit?

The resistance of the earth is high compared with that of metals; what compensation does it offer for its high resistance?

Draw a diagram illustrating the principle of the earth circuit.

How is electrical connection made with the earth?

What other material is used for ground plates besides copper?

How are the ground plates buried in the earth?

What other means is used besides ground plates for securing ground connection?

Why should the connecting wire of a ground plate be coated with insulating material at the point of connection?

(To be Continued.)

THE RAILROAD.

The St. Louis Convention of Railway Telegraph Superintendents.

The Association of Railway Telegraph Superintendents will meet in annual convention at the Planters Hotel, St. Louis, Mo., May 20, and the sessions will occupy four days.

This will be the thirty-second annual meeting of the association, which was formed in Chicago, November 20, 1882. The object of the association as set forth in the constitution is, "the advancement of the efficiency of the telegraph, telephone and other electrical departments of the railroad service."

The officers of the association are: President, John B. Sheldon, Omaha, Neb.; first vice-president, Wm. Bennett, Chicago, Ill.; second vice-president, A. B. Taylor, New York; secretary and treasurer, P. W. Drew, Chicago, Ill.

"Inductive Disturbances as Affecting Telegraph and Telephone Circuits," by Mr. P. J. Howe.

"Protection Against Lightning and High-Tension Currents for Telegraph and Telephone Equipment," by Mr. M. H. Clapp.

"Main Line Power for Selective Circuits, Including Transmission and Signaling," by Mr. R. F. Spamer.

"Full Use of Wires," by Mr. H. D. Teed.

"Organization for Maintenance of Lines," by Mr. M. C. Allen.

"Organization for Wire Chiefs and Telephone Inspectors," by Mr. J. B. Sheldon.

At 2 p. m. May 22 officers will be elected and installed.

On Friday, May 23, such unfinished business as may be announced at the previous day's afternoon session will be taken up at 10 a. m.

J. B. SHELDON, PRESIDENT

A. B. TAYLOR, SECOND VICE-PRESIDENT

P. W. DREW, SEC'Y AND TREAS.

Executive committee—the four officers together with Charles Selden, Baltimore, Md., and E. A. Chenery, St. Louis, Mo.

The entertainment committee consists of E. A. Chenery, chairman, F. E. Bentley, T. M. Haston, H. D. Teed, J. P. Church, R. L. Logan, B. A. Kaiser, Val B. Mintun, A. F. Eyerman, W. E. Harkness and B. L. Winchell, jr.

The association has 111 active members and seventy-five associate members, and has a steady growth.

Following is the programme:

An informal get-together assembly will be held at 8.30 p. m., Monday, May 19, in parlor A of the hotel, and the first business session will be called to order at 10 a. m., Tuesday, May 20.

Following is a list of the papers to be read at the convention:

"General Principles Underlying Telephone Transmission," by Messrs. Elem Miller and C. A. Robinson.

"Use of Telephone by Railroads for Dispatching Trains, Handling Messages, etc., by Mr. J. C. Johnson.

All members, ladies and guests are requested to register at the secretary's desk and there receive the official badge of the association.

The ladies' reception committee will be in attendance at the hotel during the convention and will act as escorts when desired to those unacquainted with the city.

CONVENTION ENTERTAINMENT.

Tuesday, May 20.—12.30 p. m. Ladies: Luncheon in the tea room Jefferson Hotel, Twelfth and Locust streets. (Courtesy Railway Telegraph and Telephone Appliance Association.) 2.00 p. m. Ladies: Special private trolley cars to leave Twelfth and Olive streets for a trip to Shaw's Garden. One-half hour stop, then proceed to Strauss's studio, where attendants will show the party through this famous art shop. (The rules of Shaw's Garden prohibit the carrying of canes, umbrellas or packages inside the garden and these articles can be checked at the gate.) Return to Planters' Hotel 5:00 p. m. (Courtesy Railway Telegraph and Telephone Appliance Association and Mr. J. C. Strauss.) 7.00 p. m. Entire Party: Informal dinner and vaudeville Missouri Athletic Club, Fourth and Washington Ave., as guests of the St. Louis League of Electrical Interests, Jovian Chapter. A welcoming and get-together gathering.

Wednesday, May 21.—1.00 p. m. Ladies: Special trolley cars leave Planters Hotel for Buckingham Club, where luncheon will be served followed by a musicale. (Courtesy Railway Telegraph and Telephone Appliance Association.) 6.00 p. m. Entire Party: Steel ferry-boat "W. S. McChesney, jr." Ride on the Mississippi River. (Courtesy Terminal Railroad Association.) Refreshments will be served and plantation music and songs provided while enjoying this scenic trip on the river. (Courtesy Railway Telegraph and Telephone Appliance Association.) Return to wharf 10.30 p. m.

Thursday, May 22.—5.00 p. m. Entire Party: Auto ride through residence and park sections. (Courtesy Railway Telegraph and Telephone Appliance Association.) 7. p. m. Entire Party: Informal dinner and vaudeville, Cafareta's, Delmar and Hamilton avenues. (Courtesy Southwestern Telegraph and Telephone Company.)

Friday, May 23.—1.00 p. m. Entire Party: Special trolley cars leave Planters Hotel for Anheuser-Busch Brewery, where a visit through this famous plant will be made and refreshments served.

TRAIN DISPATCHERS' CONVENTION.—The Train Dispatchers' Association of America will hold its annual convention in Los Angeles, Cal., June 17.

Convention of Order of Railroad Telegraphers.

The grand division of the Order of Railroad Telegraphers began its biennial convention in Baltimore, Md., May 12, and the ladies' auxiliary assembled at the same time. About 2,500 members of the two orders were in attendance, and it is expected that the convention will extend over ten days. A reception was held at Albaugh's theatre on the night of May 12, and the entertainment includes theatre parties, boat rides, etc. Delegates were present from all parts of the United States, Canada and Mexico.

Southern Pacific El Paso Office.

The El Paso, Tex., office of the Southern Pacific Railway will be remodeled as soon as an addition to the present building is finished. Three Western Union standard nine-foot tables and a repeater table will be installed. Legs will be run from the repeater table to the operator's tables. The company will establish a repeater station at Sanderson, 300 miles east of El Paso, in order to get a quadruplex East, San Antonio and Houston working the common side and New Orleans the polar side. There are now eleven operators at El Paso besides Mr. A. W. Dunbar, who is in charge, and when the common side of the quadruplex referred to is ready for operation one or two more operators will be added to the force. On the Tucson division a set of dispatchers and a day chief are located at El Paso working to Bowie.

Improved Keyboard Perforator.

Mr. Edward Kleinschmidt, of New York, has invented a keyboard perforator which embodies several important improvements over machines of this class now in use.

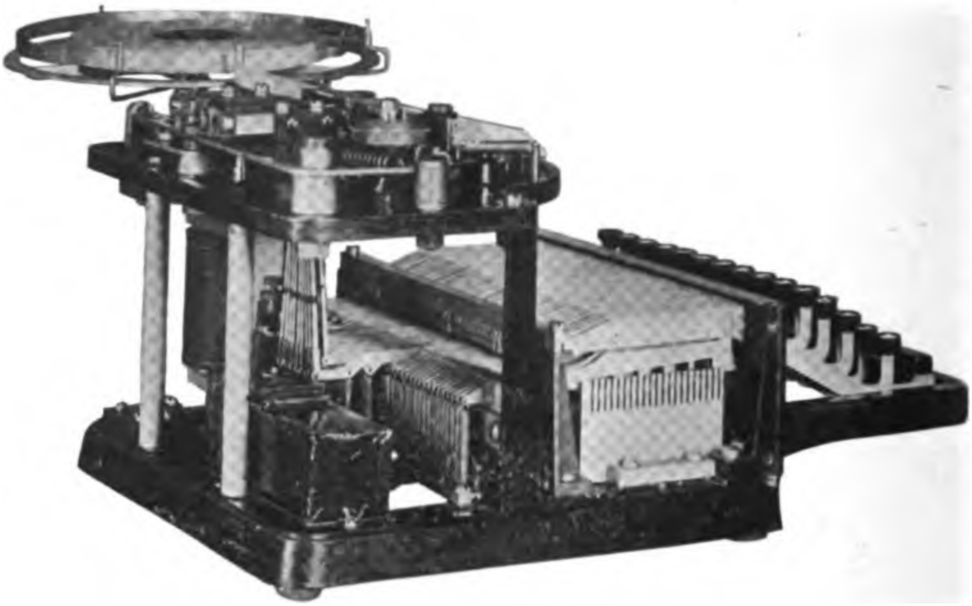


FIG 1—SIDE VIEW OF PERFORATOR.

FIG. 2—FRONT VIEW OF PERFORATOR.

The machine is designed on the lines of a typewriter rather than those of machine construction generally used in this kind of an apparatus. In most perforators thus far designed, the punching and feeding mechanism is dependent on an electric motor which, through a clutch, operates a set of cams that in turn operate the various functions of the machine in proper sequence. In others a number of magnets are used to bring about the same results. In the new perforator Mr. Kleinschmidt has eliminated not only the electric motor, but has also reduced the number of magnets necessary to operate the machine, only one, in the form of a solenoid, being necessary. This solenoid not only actuates the punching mechanism, but also the feeding mechanism. It is sufficiently large so that it will not heat from constant operation. The current consumed is about 7/10 of an ampere at 110 volts. The plunger is air-cushioned so that in operation the noise from the machine is reduced to a minimum.

The keyboard arrangement is similar to that of an ordinary typewriter. It has a very light and even touch and is capable of high speed. The machine has been operated at a speed of ninety words a minute by an experienced operator.

The exceedingly light and even touch is made possible by the unique construction of the punch-selector operating mechanism. There are only three elements between the key bar and the punch selector—the selector bar, the parallel bar and the connecting bar. These are designed and mounted so that in contacting with one another there is no lateral motion and, therefore, no friction.

The variable feed feature is operated by a floating lever, the position of which is controlled by the punch selectors, thus eliminating the extra feed stops and selectors for them, generally used in the machines of this type. This is an entirely new feature and greatly simplifies the construction of the keyboard. It also lightens the touch of the keyboard by eliminating the extra selectors that would otherwise be necessary for the feed stops. The punching mechanism is placed on top of the machine and is so arranged that the punches and dies may be easily renewed. The entire machine is of an exceedingly simple construction and is as easily taken care of as is the ordinary typewriter.

In designing the machine the principal object was to construct a keyboard perforator that would be simple and durable and would have very few moving parts and the parts that were likely to wear should be easily replaced.

There is a great demand for perforators from the telegraph companies, and it is stated that exhaustive tests of this machine have demonstrated its value.

The two accompanying illustrations show very clearly the construction and appearance of the machine.

OBITUARY.

Jos. Von Newton, aged 28 years, an operator in the Savannah, Ga., Western Union office, died April 6.

Francis A. Pressell, aged 57 years, of the Western Union Telegraph Company, Philadelphia, Pa., died April 17.

Meller K. Smith, aged 47 years, an operator for the Postal Telegraph-Cable Company, Philadelphia, Pa., died April 14.

J. Graham Seabrook, aged 42 years, formerly traffic chief of the Savannah, Ga., Western Union office, died in Atlanta, Ga., April 26.

John J. Wolfrum, aged 48 years, an operator for the Western Union at Kansas City, Mo., for the past twenty-five years, committed suicide April 20.

Thomas Murphy, head of the broker firm of Thomas Murphy & Co., Syracuse, N. Y., and a former telegrapher, was killed in an automobile accident near Syracuse May 4.

A. D. Wilbur, aged 69 years, an old-time telegrapher, died in Catskill, N. Y., May 5. He had been an operator for over fifty years, and was manager of the Postal office at Catskill for the past twelve years.

John K. Calvert, aged 75 years, a well-known old-time New York printer-operator, died in New York May 4. Deceased was a native of New York City, and entered the telegraph service in 1851 as messenger for the Bain Chemical Telegraph Company. He was always associated with the printer branch of the service, and was widely known in the East.

Benjamin R. Western, aged 73 years, president and treasurer of the Manufacturers' Publicity Corporation, New York, and well known to the electrical trade, died at his home in Brooklyn, May 1, after a brief illness. Mr. Western was a practical journalist before entering the advertising business and was the original proprietor of the *Engineering and Mining Journal*. He was also the founder of the *Manufacturer and Builder*, and editor of the *Coal and Iron Record*, all of New York. He established the Manufacturers' Advertising Bureau, which was later changed to the Manufacturers' Publicity Corporation.

Edison Patent Suits.

On May 5, the United States Supreme Court dismissed for want of jurisdiction the cases of George Harrington, Thomas A. Edison, et al., against the Atlantic and Pacific Telegraph Company, and George Harrington, Thomas A. Edison, David J. Reiff and Philip S. Hill, administrators, etc., of Josiah C. Reiff, deceased, against the Atlantic and Pacific Telegraph Company and George J. Gould, et. al., as executors and trustees under the last will and testament of J. Gould, deceased. The effect of the dismissal is to refer the action to the Circuit Court of the United States for the Southern District of New York.

This suit concerns the Edison automatic system, also the Edison duplex and quadruplex systems.

Cable Cutting.—The Postal Telegraph-Cable Company has started a libel action in the United States District Court at Norfolk, Va., against the British steamer "Crown Point" for $1,000 damages alleged to have been caused to a submarine cable of that company by the steamer's anchor. On April 22 the steamer anchored in a forbidden area, and when she was ordered to another anchorage the cable, it is alleged, was brought up with the anchor and cut in order to clear it.

Western Electric Appointments.—The following appointments have been made in the Western Electric Company's organization: O. D. Street and E. W. Rockafellow to be assistant general sales managers, and E. A. Hawkins, telephone sales manager.

MUNICIPAL ELECTRICIANS.

Police Signal System in Des Moines.—A police telephone signal system is to be installed in Des Moines, Iowa. A new telephone switchboard will be placed in the central police station, through which the signal system will be handled. There will be twenty-five telephone stations located in the business district of the city, each equipped with a large bell and electric light to summon the patrolman on the beat when wanted. The fourteen patrol stations now in use will be connected with the central switchboard, also. The cost of the system to the city will be $750 per year.

The Watertown Convention.

The eighteenth annual convention of the International Association of Municipal Electricians will be held at Watertown, N. Y., August 19 to 22. The meetings will be held in the Odd Fellows Hall, where, also, the exhibits will be displayed. The convention headquarters will be at the new Woodruff Hotel, which is near the meeting hall.

Several important papers are promised and the convention will no doubt be a most profitable one to all concerned. Several matters of importance will be acted upon, including a new constitution and by-laws.

The entertainment feature of the convention is an ambitious one, and there will be plenty of enjoyment for all—for the ladies of the party at all times, and for the men when they are not at work.

The annual dinner of the association will be held at the Woodruff on the evening of August 21.

Mr. Clarence R. George, Houston, Tex., is secretary of the association.

New Police Signal Boxes.

Mr. Warren E. Fastnacht, superintendent fire alarm, York, Pa., has invented two improved police telegraph signals boxes upon one of which he has been granted a patent and on the other a patent will be issued shortly.

The box patented was invented to more fully protect the first one, upon which a patent is to be issued, and the object of the two boxes is to meet a general demand in cities for a box that will accommodate more officers than do the boxes in use at the present time.

In one of the boxes the index lever on the outside and the contact lever on the inside move through an arc, bringing the contact points into position before the desired row of code pins on a revolving drum, which is set in motion by the second lever. The code pins in both boxes are interchangeable and the number of the box or the character of the code can be changed without removing the mechanism from the box.

In the second box (the one on which a patent has been granted) the index lever moves along a rod and over a row of selecting pins to the desired code, and then the lever is given an inward push, which selects the code, locks the lever, throws a pair of common contacts into circuit and revolves the drum. The act of selecting and sending in the report is done with the same lever and without the removal of the hand.

Both boxes are fool proof, that is, when the drum is set in motion the index lever is locked and will not release until the drum has come to rest, so that a report cannot be interfered with while it is being sent in.

In the first box there is a hooded light over the index dial which can be lighted at night by the officer pressing the button in the end of the index lever while in the act of setting it.

In the second box the index dial is transparent and is lighted from the rear by an outward pull on the lever while setting it.

Both boxes have adjustable spot lights on the inside for inspection or repairs at night. These lights are operated by local batteries.

The whole transmitting mechanism in both boxes is self-contained on a piece of asbestos wood, and can be readily removed for repairs by turning several screws without exposing the mechanism to the weather. Another commendable feature is that the index levers in both boxes remain where set until moved for the next report, the citizen's key working independently of the position of the index lever.

The outer appearance of the first box is practically the same as those now on the market, but the second box is much smaller, and more compact and the inner box is made entirely of asbestos wood to eliminate insulation defects.

The city of York has adopted these boxes, the first box having been in service for the past two years. Several more will be placed this year.

A Remarkable Performance in Perforating Messages.

Miss Jimmie Vandigriff, of the automatic department, Western Union Telegraph Company, Atlanta, Ga., an excellent likeness of whom is presented herewith, on April 29, made the phenomenal record of perforating 1,003 messages in eight and one-quarter hours actual working time.

Miss Vandigriff was warmly congratulated by the officials and by the office force and was presented with a large bouquet of beautiful flowers by a number of her admiring friends.

MISS JIMMIE VANDIGRIFF, ATLANTA GA.

Miss Vandigriff laughingly remarked at the conclusion of her wonderful performance, "When I learn to use all my fingers, I think I can get up some speed."

Care of Leclanche Cells.

Following are the rules for the care of Leclanche battery cells.

The elements of the Leclanche cell are a glass jar containing zinc, carbon, salammoniac and soft clean water. The carbon is the negative element and positive pole of the battery; and the zinc is the positive element and negative pole.

Each cell will have an electromotive force of about one and one-fourth volts and an average resistance of from one to two ohms.

Place six ounces of salammoniac in the jar and add water enough to reach the shoulder of the jar when the carbon cylinder is inserted. Stir the solution until little or no salammoniac remains undissolved; insert the carbon cylinder, taking care to keep the upper part dry and clean; place the zinc rod in the central hole and see that it goes down all the way to its shoulder.

These cells are only employed for intermittent service, and should last from three to six months (according to use). They should then be taken down, thoroughly cleaned, all accretion scraped from the carbon cylinder and the cell set up with a new zinc element and a fresh solution. Salammoniac should never be added to the old solution in these cells. Examine the zincs occasionally and if found to be considerably eaten away they should be renewed without disturbing the other elements and solution.

Book on Storage Batteries.

Storage Batteries: Their Theory, Construction and Use. By A. E. Watson. Second edition. Price, $1.50.

This excellent work has been completely revised and enlarged and brought up to date. The author is assistant professor of physics in Brown University, Providence, R. I., and the manner in which he has treated his subject shows that he is thoroughly familiar with it. The contents are descriptive and general, and there are no mathematics whatever to confuse anyone not familiar with algebra.

The book contains chapters on the construction of plates, the action of the lead storage battery, how to make a storage battery, disease and remedies of the storage battery, boosters, etc., and gives much information valuable to anyone interested.

This book or any other on electrical and kindred subjects may be obtained of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Bound Volumes of Telegraph and Telephone Age.

For those of our readers who desire to have the past year's issue of TELEGRAPH AND TELEPHONE AGE in a form in which they can readily preserve all of the copies for future reference we would recommend a bound volume. We are now able to supply these containing the twenty-four issues of 1912 for the nominal price of $3.50. There are several features in one of these volumes, which comprises nearly 900 pages of reading matter, which are alone worth much more than the amount asked. The most important series of articles during the year was the "Course of Instruction in the Elements of Technical Telegraphy," which is widely studied and highly commended. These articles, together with the series by Mr. Willis H. Jones entitled, "Some Points on Electricity," are worth many times the price of the book. We have also published articles by the best-informed authors upon the developments in wireless telegraphy, and, in fact, there will be found recorded in this book all of the important improvements in the wireless art during the past year. The use of the telephone for train dispatching has largely increased since January, 1912, and we have kept pace with its development by presenting to our readers many articles upon this subject, written by some of the best-posted men in the railway and telephone world. Those interested in any branch of the telegraphic industry will find much valuable information in one of these bound volumes. A copy of this work will be sent to any address, upon receipt of price, $3.50, by J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

INDUSTRIAL.

CABLE TRANSMISSION BY VIBROPLEX.—Transmission from New York to Waterville, Ireland, direct over the Commercial Cable recently by means of the Horace G. Martin vibroplex, was an achievement of noteworthy interest. It proves the value of this instrument as a sending machine, and this occasion was a supreme test, which at one stroke wiped away all misgivings as to its ability to carry signals along distances. Mr. J. E. Albright, 253 Broadway, New York, sole agent for this machine, regards this best as an unqualified victory for the vibroplex.

Handy Calculating Rule for Telegraph and Telephone Engineers.

The slide rule, as is well known, is a great time saver in making mathematical calculations, and is in wide use among telegraph and telephone engineers, as well as engineers in other professions.

Messrs. Keuffel & Esser, New York, have recently added a feature to their standard slide rule which makes it of greater value and service to electrical engineers. The improved instrument enables one to determine the different properties of copper wire, such as size, conductivity, weight, etc., without the use of tables. Scales show the carrying capacities and sizes of wires, and with one setting of the slide and runner, it is possible to read directly for any standard copper wire, the diameter in mils, area in circular and square mils, weight in pounds per 1,000 feet, and resistance in ohms per 1,000 feet, etc.

Measuring Time.

Time is the chief commodity of the world and is an element entering largely into every industry, yet how few people know anything of the history of its measurement. It is the chief factor in all human calculations and plans and is the one element that cannot be eliminated. This being so it was natural that man from the earliest times should have given consideration to the measurement of this universal element.

The Calculagraph Company, New York, has just issued a pamphlet which throws much light upon this interesting subject. The booklet is entitled "Horology—an Historical Sketch," and gives a history of time measurement and of time-measuring instruments. It takes us back to the earliest days in the world's history, and while the story as told in this pamphlet is interesting from an historical standpoint, it is very practical as well.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

John J. Gartland, an old timer of this department, died in Ridgefield Park, N. J., May 1. A few months ago he gave up work on account illness.

Michael H. Collins, a well-known telegrapher of this office and a brilliant old-time operator, was stricken with apoplexy on May 1, and died a few hours afterwards.

John A. Kenna, aged 53 years, a well-known New York telegrapher, died suddenly on April 24. Mr. Kenna worked in the Boston office of this company for many years prior to his coming to New York twenty years ago, when he became identified with the Commercial News Department, and continued in that service until his death.

PHILADELPHIA WESTERN UNION.

Miss Harriet E. Lamb, aged 26 years, daughter of Mr. F. G. Lamb, chief clerk to superintendent J. W. Reed, died April 21 at Philadelphia, of consumption, after an illness of eighteen months. The office employes presented a beautiful "arm" of roses and smilax.

PHILADELPHIA POSTAL.

Mr. R. L. Massey has been appointed night traffic chief to succeed G. W. Dunn, resigned.

Mr. D. McNicol, of the electrical engineer's office, New York, was a recent visitor here.

Mr. E. E. Martin, of Atlantic City, N. J., has been transferred to Philadelphia to the equipment department to succeed K. L. Vernon, transferred to New York. Mr. Floyd Moore succeeds Mr. Martin in Atlantic City.

THE first annual meeting of The Mutual Investment Association of the employes of the Philadelphia Postal Telegraph-Cable Company was held May 5. The treasurer's report shows receipts $1,039.44; expenses, $139.65, leaving a net profit of $1,299.79. Messrs. C. E. Bagley, Cyrus Moffett, A. E. Zintl and J. R. Denniston constitute the finance committee. Mr. J. A. McNicol was elected treasurer and Mr. J. H. Wilson was elected secretary. The finance committee was especially commended for its good work.

A certificate of membership in the Telegraphers' Mutual Benefit Association, 195 Broadway, New York, affording protection for the family and dependents in the amounts of $500 or $1,000, which is at once available and cannot be diverted from its mission, should be held by every eligible person between the ages of 18 and 45 engaged in telegraph and telephone service, either commercial or railroad. If those not now members could realize and fully understand the stern necessity for beneficial help too often experienced by bereft families, would they not make earnest effort to secure such provision? Write for particulars.

Telegraph and Telephone Age

No. 11 NEW YORK, JUNE 1, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

Precautionary Measures.

BY WILLIS H. JONES.

We all realize that the degree of efficiency, and length of life of any given apparatus depends principally upon the safeguards thrown around it to prevent outside influences from interfering with its normal operation. The mechanical or constructive safeguards of each class are usually arranged and provided for by the engineer with that end in view, yet it will be found that in nearly every case unexpected or at least unusual harmful influences sometimes develop the source of which and the remedy therefor laymen often fail to discern or apply.

FEATHER DUSTERS.

A feather duster, for instance, seems to be about as innocent a looking article as a cause of trouble as one could think of, yet experiments have proved that the life of many thousands electric lamps have been unwittingly shortened by the use of dusters in cleaning the glass bulbs.

In one of the experiments made the filaments of twenty-nine per cent of the lot were found broken within the twenty-six days, while in another instance four out of thirty newly installed lamps showed broken filaments after one or two vigorous treatments with the duster. The breakage was not due to the shaking or jarring of the filament which a blow given the bulbs might be suspected of causing, but to the disruptive discharge of the static electricity developed when the glass bulbs were repeatedly struck by the feathers.

Obviously, then, feather dusters should never be used for this purpose. In many places precautionary notices are posted to that effect. It would be well, however, if a knowledge of the harmful tendencies of a feather duster so used was more generally acquired. The proper article for cleansing lamps is a piece of cloth, with which the lamps should be rubbed.

Operators who use electric lamps in their homes will therefore find it advisable to instruct their better halves as to the facts in the case and thereby reduce expenses by diminishing the number of lamp renewals.

ABNORMAL VIBRATIONS IN MOTORS AND GENERATING MACHINES.

If a motor-generator or other similar machine vibrates excessively while running the fault should be remedied at once, otherwise the apparatus will soon suffer more or less damage from the unnecessary rocking it receives. The abnormal vibrations in such machines are usually due to one or the other of the two following causes, viz.: the machine is either not placed level on the bench or other support, or its rotating armature and shaft are mechanically unbalanced. If an investigation shows that the setting is correct the armature should then be removed and balanced by an experienced repairman. Endeavoring to deaden vibrations by means of rubber or felt matting should only be resorted to after other means fail. The true remedy, of course, is to eliminate the cause of the fault; not to smother it.

RELAY COILS IN SERIES.

In all large telegraph offices it frequently happens that it is necessary to transmit a press item to seven or eight newspaper office simultaneously in order to avoid repetitions. To do so, a local circuit is usually made up in the switchboard, consisting of a battery attached to one lip of the spring-jack and a ground connection to the other lip. The coils of the newspaper and office relays consisting of 150 ohms each being then inserted in series form a circuit that is nearly all inductive and for that reason cannot be operated with any great speed, although it may be provided with the normal current as indicated by an ammeter while the circuit is closed. Under these conditions the receiving operators usually complain that the signals are too light and attendants frequently make matters worse by increasing the battery power. The proper remedy, however, is to increase the ratio of non-inductive resistance in the circuit. This should always be as great, if not greater than that of the resistance of the coils combined.

In modern offices special local circuits designed for newspaper and combination work provide against this by inserting three or four ohms non-inductive lamp-resistance per volt in the battery lead. In offices where such provision has not been made and a single or double "flip" continues to be used, the necessary additional non-inductive resistance should be inserted in the form of resistance wedges, such as are used at switchboards for reducing current. Hence, for this class of work a comparatively high E.M.F., say, the second potential, with plenty of artificial non-inductive resistance inserted, gives much better results than will a lower pressure sending current through the relay coils alone.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, May 26:

American Telephone and Telegraph Co.	129½
Mackay Companies	82
Mackay Companies, preferred	68½
Western Union Telegraph Co.	65½

Telegraph and Telephone Patents.

ISSUED MAY 6.

1,060,576. Key Construction and Support for Telephone Apparatus. To W. P. Andrick, E. Lowe, and H. W. Haff, Jamaica, N. Y.

1,060,598. Apparatus for Grounding Telephone Wires. To P. T. Hudson, Everton, Mo.

1,060,851. Passenger-Driver Telephone Signal System for Vehicles. To H. G. Pape, Buffalo, N. Y.

1,060,939. Automatic Telegraph Transmitter. To L. M. Potts, Baltimore, Md.

1,061,238. Telephone Signal. To A. U. Gerber, Chicago, Ill.

ISSUED MAY 13

1,061,285. Selective System of Telephony. To R. C. M. Hastings, Columbus, Ohio.

1,061,286. Selecting Apparatus for Telephone Systems. To R. C. M. Hastings, Columbus, Ohio.

1,061,287. Telephone System. To R. C. M. Hastings, Columbus, Ohio.

1,061,515. Telephony. To C. A. Bals, Chicago, Ill.

1,061,516. Telephone Exchange System. To C. A. Bals, Chicago, Ill.

1,061,541. Primary Battery. To E. E. Hudson and D. Elmes, Newark and Orange, N. J.

1,061,572. Electric Battery. To C. F. Schuh, Newark, N. J.

1,061,589. Busy Signal Attachment for Telephones. To A. M. Beeler, Seattle, Wash.

1,061,650 and 1,061,651. Telephone System. To F. G. Agrell, Stockholm, Sweden.

1,061,766. Diaphragm of Telephonic Receivers and Like Instruments. To A. Marr, Manchester, England.

1,061,813. Telephony. To S. G. Brown, London, England.

1,061,849. Transmitter. To F. Kayser, Philadelphia, Pa.

1,061,852. Exchange System for Telephone Lines and the Like. To A. Lawrence, Elizabethtown, Ill.

1,061,898. Telephone Lock-out. To W. L. Campbell, Chicago, Ill.

PERSONAL.

MR. J. A. HULIT, a former telegrapher, late of the Automatic Company, Chicago, and a well-known telegraph engineer, is in New York on business.

COLONEL A. B. CHANDLER, formerly president of the Postal Telegraph-Cable Company, New York, together with Mrs. Chandler, has gone to his home at Randolph, Vt., for the summer season.

SIR WILLIAM HENRY PREECE, the eminent English telegraph engineer, expects to visit the United States this fall. Sir William was chief engineer of the British Post-office for many years, and was largely instrumental in bring the English telegraph service up to its high state of efficiency.

MR J. GENNINGS, general manager and editor of the Central News Association of London, and editor of the *Telegraph Chronicle*, arrived on the steamer "Olympic," on May 21, on a business trip, which will keep him in this country about two weeks. Mr. Gennings is an old time English operator and well known throughout the world for his activities in press circles in Great Britain.

MR. WILLIAM H. ALLEN, formerly secretary to Hon. P. V. De Graw, late fourth assistant Postmaster-general, has accepted the position of assistant to President Walter P. Phillips, of the Phillips Manufacturing and Trading Company, which has recently taken offices in the Woolworth Building, in this city. Mr. Phillips continues his relations with the American Graphophone Company, in which he is a considerable stockholder, and will make his residence in Bridgeport, Conn., as heretofore.

T. R. GEORGE, until recently in charge of the development branch of the engineering department at the Western Electric Company's plant at Hawthorne, Ill., has been appointed head of the Hawthorne division of the General Telephone Sales Department. His place in the engineering department has been taken by R. R. Ireland, formerly in charge of one of the sections of the New York division. G. M. Dallas has been appointed assistant manager of the Atlanta house of the company. William Mueller, for many years in the wooden pole business, has taken a position as head of the Chicago branch of the company's pole department, left vacant by the death of James C. Kenny. C. W. Murphy has taken a position as railway and mine sales specialist, with headquarters at the Pittsburgh house.

MR. H. A. TUTTLE, president and general manager of the North American Telegraph Company, Minneapolis, Minn., in renewing his subscription for another year, writes: I have taken TELEGRAPH AND TELEPHONE AGE so long, I would feel lost without it."

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

Mr. Edward Reynolds, general manager of the company, now occupies the office on the Broadway and Murray street corner of the building, the office formerly occupied by Mr. E. J. Nally.

Mr. W. I. Capen, general superintendent of plant, is making a trip of inspection of the company's facilities in the Pacific Coast States. He is at present in San Francisco. He will not return to his office until the middle of June.

Mr. C. F. Leonard, superintendent, New York, announces the following changes of managers in New York. Mr. C. Many has been transferred from the office at 72nd Street and Columbus Avenue, to that at 94th Street and Columbus Avenue; Mr. T. Logan, formerly night operator at 66th Street and Columbus Avenue, has been appointed manager to succeed Mr. Many at the 72nd Street and Columbus Avenue office; Mr. H. J. Reinhardt, formerly of the Harlem West Side office, has been appointed manager of the new office at 416 Fourth Avenue and Mr. R. Jacobs has been transferred from the 23rd Street and Lenox Avenue office to the Harlem West Side office; Mr. T. V. Rahtes has been transferred from the 94th Street and Columbus Avenue office to the office at 23rd Street and Lexington Avenue.

Mr. John F. Skirrow, associate electrical engineer, was an Albany, N. Y., visitor lately on company business.

Mr. Donald McNicol, of the electrical engineer's department, has returned to New York, after a trip of inspection through the Eastern Division.

The Toledo, Ohio, office has been transferred from Mr. A. L. Lafferty's district to the district presided over by Superintendent F. W. Sprong.

The main office at Yonkers, N. Y., is being remodeled and brought up to date.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

Mr. Belvidere Brooks, vice-president, Mr. A. R. Brewer, treasurer, Mr. G. M. Yorke, engineer, W. N. Fashbaugh, general superintendent of traffic, and others, who attended the Association of Railway Telegraph Superintendents at St. Louis, have returned to their respective offices.

Mr. W. R. Chapman, superintendent at St. Louis, Mo., announces the following appointments: Mr. M. N. Keady, formerly manager at Hannibal, Mo., has been appointed manager at Joplin, Mo., vice Mr. O: O. Horner, resigned. Mr. O. J. Kastner, formerly employed in the traffic department at Jefferson City, Mo., has been appointed manager at Hannibal, Mo., vice Mr. M. N. Keady.

Mr. John McRobie, general manager of the American District Telegraph Company, New York, has returned from a two weeks' business trip in the the interest of the service.

Mr. C. H. Davis, manager at Brattleboro, Vt., has been appointed manager of the same interest at Narragansett Pier. R. I.

Mr. W. H. McKeldin, chief operator of the Washington, D. C., office was a recent New York visitor.

A Conference of district commercial superintendents was held in Philadelphia, Pa., May 21 and 22. Mr. A. G. Saylor, general manager, Eastern Division, presided.

The Commercial News is the title of a monthly publication prepared by the members of the Commercial Efficiency Promotion Association, who are connected with the commercial department of the third district, Pittsburgh, Pa. The first number—May—contains matter of interest to the commercial department, neatly executed on typewritten pages. Superintendent A. C. Terry is the author of the leading article, which is entitled "Energy and Efficiency."

Decorating Morse Monument.—The eighteenth annual decoration of the Morse monument took place on Memorial Day under the patronage of the Morse Electric Club. The floral designs, which have been varied each year, represent not alone the conception, but the handiwork of Mr. M. H. Kerner, who has borne in mind and supervised this sacred function without omission every year since 1895.

THE CABLE.

E. E. Morrison, aged 57 years, a well-known cable operator identified with the Western Union cable service, at 16 Broad street, New York, died suddenly on May 15. For eight years he was the official telegrapher of the United States Senate at Washington, D. C. He was a native of Vermont.

The exclusive concession enjoyed for a great many years by the Western Cable Company to enter the city of Rio de Janeiro with its cables from Europe, this year will not be extended. It expires July 1, 1913. An opportunity will therefore be presented to the Central and South American Telegraph Company, which has direct connections between the United States and South America by its own cable via Galveston and the west coast, to enter Rio de Janerio from the south. German, British and French cables all land at Brazilian points, but as yet no American cable has entered Brazil.

A Perfect Boy Scout.—*The New York Herald* a few days ago, printed a very complimentary notice to the first perfect boy scout. This honor was awarded to Howard B. Reynolds, age fourteen years, son of Mr. B. H. Reynolds, superintendent of the Central and South American Telegraph Company, New York. Recently a series of competitive examination were held to determine the efficiency of the organization. At each test Howard Reynolds received a report marked 100 per cent. The final test was that of signaling. The Meyer code of signaling was used, the same as that used by the navy. When the boy took his report card home, it was marked 100, and on the back of the card was a message from the scout master declaring Howard to be one of the finest specimens of the Bay Scout he had ever seen.

Telephone Pioneers of America.

JOHN J. GHEGAN.

Mr. John J. Ghegan, president and general manager of J. H. Bunnell & Co., New York, entered the telephone service in 1877, and in 1878 he organized the first telephone exchange in Newark, N. J., after having installed many private telephone lines during the previous year.

Prior to entering the telephone service Mr. Ghegan had been connected with the telegraph, having learned the art in Philadelphia, Pa., in 1870. At the time he became interested in the telephone he was night manager of the Western Union Telegraph office in Newark.

After the consolidation of the Gold and Stock Telegraph Company with the Bell Telephone Company, Mr. Ghegan returned to the telegraph, becoming manager of the main and branch offices of the Western Union Telegraph Company in Newark. After the combination of the Western Union and American Union Telegraph Companies he constructed lines for the Mutual Union Telegraph, and later became manager of that company's office in Newark. Mr. Ghegan left the Mutual Union service, and went to Mexico in 1882 as general manager of the Mexican Northern Telegraph and Telephone Company in the States of Nuevo Leon, Coahuila and Tamaulipas. He remained in Mexico for two years, and then returned to the United States, and accepted a position as export and technical man for the firm of J. H. Bunnell & Co., and when the concern was incorporated in 1899, he was elected vice-president and secretary, later becoming president and general manager, which position he still holds. Mr. Ghegan is a charter member of the Telephone Pioneers of America and takes an active interest in electrical affairs and development. He has invented several electrical devices which are now standard.

JOHN J. GHEGAN, NEW YORK (1877).

Theo. N. Vail Thinks Business is Sound.

In an interview, Theodore N. Vail, president of the American Telephone and Telegraph Company, expressed his views of the business and financial situation as follows:

"It seems to me that the fundamentals are sound. Most of our troubles are superficial and are therefore susceptible of rapid and decisive improvement. From the security market standpoint it is entirely possible that the tendency toward depression may persist for some months more, but with underlying conditions as favorable as they are to-day, the recovery to a more normal and happier frame of mind is merely a matter of time and patience.

"People tell me that the money markets are under close sail and that the money pilots have cautioned against stormy times ahead. This is the very best guarantee in the world that we shall not have them. These same conservatives forget the fact that we are to-day laboring under the strain of having to assist in the great work of financing Europe through its war troubles, and that business expansion has been held in check in this country as by an iron leash.

"Every bit of development work, every new enterprise which it has been physically possible to hold back, has been stopped or not initiated. Business is simply normal—what is barely necessary to keep the country in operation as a going concern, and no more. We have slowed down so far that when activity starts in again, say in another year or two years, in a big way we shall probably be so cramped for railroad and industrial facilities that the problem of handling the volume of business pressing for transaction will choke our arteries of commerce and flood our mills and factories to a point making economy of operation exceedingly difficult. That is one of the most serious troubles to-day, and not the Balkan war, the tariff or tight money. We have slowed down too far and too fast, and we shall have to pay an excessive price for expansion when the demand is here.

"Business in the United States adjusts itself to change with wonderful facility. That is the history of the past. It will be the history of the future. I am not worrying over the tariff nor prostration in industrial New England. What we want is more courage, and a disposition to make the best of things, remembering that in this very human world expediency and a sense of compromise are the part of wisdom and discretion.

"The same business men who are trembling lest their factories will be closed because of textile tariff or other tariff alterations, have opposed a rational increase in railroad freight rates. And yet an increase in freight rates is the very biggest thing which could possibly happen in this country at the present time.

The railroads need it, must have it. When they get it, and I feel morally certain they will get it, then their financing credit will be restored, their ability to grow and expand will be assured, and this will work down along the line to every industrial town and city in the land."

New Western Union Main Switchboard.

(Continued from page 316, May 16)

"AH"—Intermediate Test Station Circuit. This circuit (Fig. 6) provides the simplest practicable arrangement for a through wire cut into the switchboard for testing purposes. On main switchboards, however, its use will probably be confined to cases where a considerable number of wires of minor importance, and with only a limited amount of testing, are to be cared for.

"AI"—Wire with Loop at Intermediate Station. This circuit (Fig. 6) is the equivalent of two "AD" circuits, and is intended for those cases where it

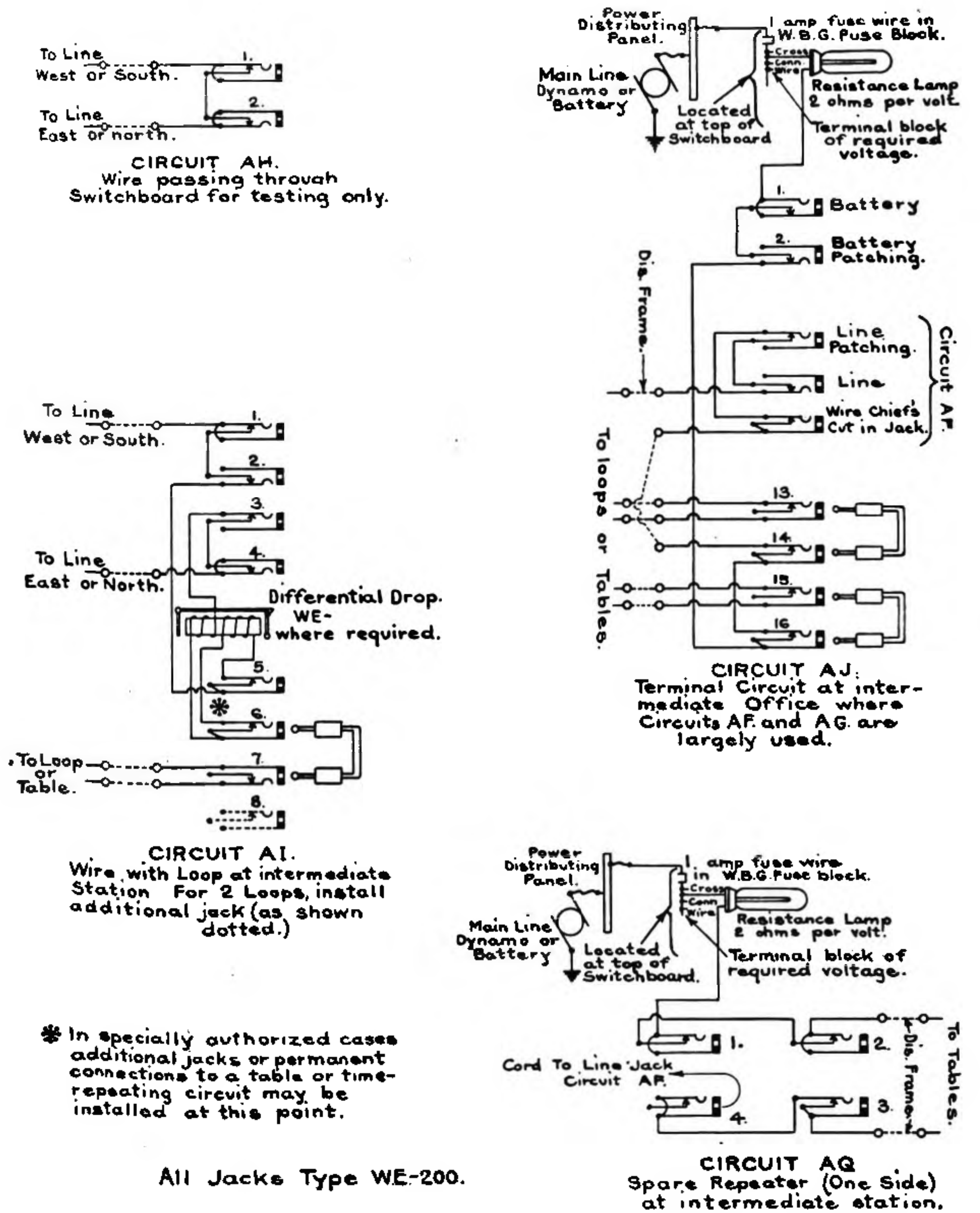


FIG. 6—SWITCHBOARD CIRCUITS AH TO AJ AND AQ.

is feasible to handle wires running in two or more directions at the same switchboard section. It will be most frequently used at the more important intermediate stations where few, if any, wires are supplied with battery, but where loops, or sets, are cut in on many of the wires, and patching is frequently required. Opening, grounding or patching operations are performed in the same way, as de-

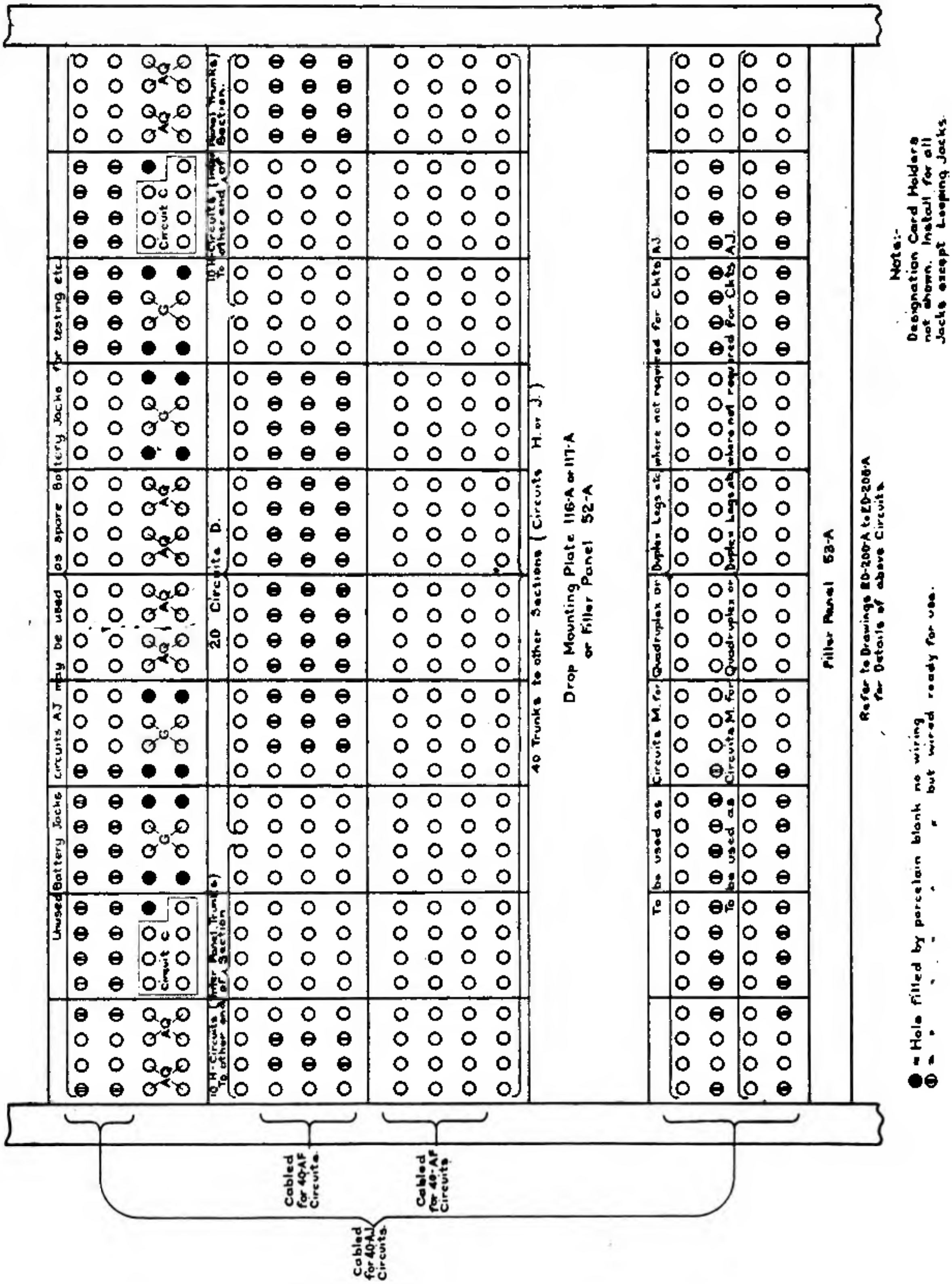


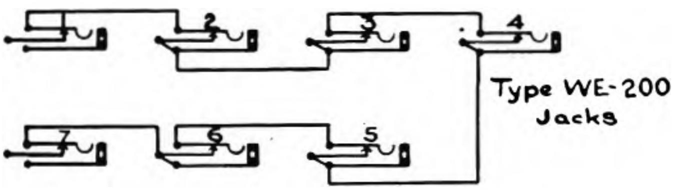
FIG. 7—MAIN SWITCHBOARD. TYPICAL PANEL LAYOUT FOR INTERMEDIATE OFFICE.

scribed under the head of circuit A. A differential drop is included, to permit an operator whose loop or set is connected to the board, to signal the switchboard attendant that his services are needed on the circuit. It should be noted that where an intermediate loop is nearly midway between the terminal batteries of a circuit, there may be some difficulty in operating the differential drop by merely pressing the ground push button at the operator's set. In such cases, the operator should be instructed to press the signaling button twice, once with his key closed and, again, with his key open.

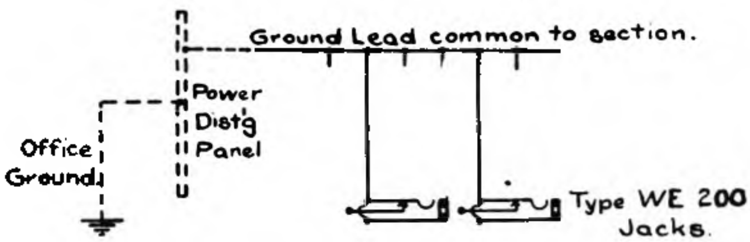
"AJ"—Terminal Circuit at Intermediate Station. To secure uniformity of wiring and layout at intermediate stations it is often desirable to assign two or more horizontal rows of panels exclusively to "AF" or "AG" circuits. In such cases each terminating single Morse wire may be provided for by connecting together at the distributing frame an "AF" and an "AJ" circuit; it will be seen that this combination is equivalent to an "AB" circuit, the only difference being the locations of some of the jacks. It is desirable, of course, that the jacks of an "AF" and an "AJ" circuit so connected together shall be in one vertical row; and if practicable the jacks of any other "AF" or "AG" circuit in the same row should be replaced with filler buttons to avoid confusions. This is illustrated in Fig. 7.

"AQ"—Spare Repeater Circuit at Intermediate Office. As stated under "circuit AJ," most boards at intermediate offices are wired with two or more rows of "AF" or "AG" circuits. Circuit "AQ" (Fig. 6) provides for such cases where it may be occasionally necessary to cut in a repeater on a through Morse wire. It will be readily seen that each side of the repeater circuit includes four jacks, in groups of two each, wired through the distributing frame to the repeater tables. This circuit may be patched into any wire by running a regular patching cord from jack No. 4, as indicated by the arrow, to the line jack of an "AF" circuit. The battery tap normally connected to the repeater through jacks Nos. 1 and 2 may be discarded when necessary and a spare tap substituted for it by running a patching cord from jack No. 2 to a spare battery jack, circuit F. A looping jack (No. 3) is provided to permit the wire chief to cut in his testing set, circuit L, for supervision and testing.

"C"—Open or Split Loop Group. When a loop fails it is frequently desirable to "split" a good loop terminating at the same branch or subscriber's office, and operate a grounded Morse set on each of the two wires of the loop. Circuit C (Fig. 8) provides for this condition at the main switchboard. The loop to be split is connected to jack 4 by a regular patching cord, and other loops or repeaters required in the combination are similarly connected to jacks 2, 3, 5, and 6. Regular patching cords may then be run from jacks 1 and 7 to spare battery taps (circuit F), or to other circuits, as desired.



CIRCUIT C
" Open" or "Split-Loop" Group.



CIRCUIT D
Ground Jacks.

FIG. 8—SWITCHBOARD CIRCUITS C. AND D.

"D"—Grounded Jacks. For testing and other purposes it is often necessary to connect a line wire or other circuit to ground. This may be accomplished by running a regular patching cord from one of these ground jacks to the proper jack of the circuit to be grounded. (See Fig. 8.)

(To be Continued.)

LARGE MANUFACTURING CABLE PLANT.—What is said to be the largest telephone cable factory in the world is that of the Western Electric Company at Hawthorne, Ill. Enormous weights of raw material are handled and made into cable in a single year. There are thus utilized 2,000 tons of paper, 10,000 tons of copper and 30,000 tons of lead.

Course of Instruction in the Elements of Technical Telegraphy—XL.

(Copyrighted.)

(Continued from page 304, May 16)

[We began in our issue for October 16, 1911, the publication of a course of instruction in technical telegraphy. The course, which was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, is published for the benefit of those of our readers who desire to fit themselves for better positions in their vocation. It is elementary throughout and is divided into chapters, following one another in logical order.

The course has received the hearty commendation of telegraph officials and experts for its scope and accuracy and its sound practicability. In each chapter examples are presented in order to illustrate the application of the rules to practical cases, and each chapter is followed by a series of questions pertaining to the subject of the chapter, to be worked out by the student in order to review his progress. Back numbers containing these valuable articles can be obtained on application, at 10 cents per copy.]

WESTON INSTRUMENTS—THE VOLT METER.

The volt-meter has a moving system similar to that of the milli-ammeter, but instead of the coil being shunted with a copper band it is connected in series with a very high resistance, usually about 20,000 ohms to a 150-volt instrument. When connected in parallel with part of a circuit the deflection of the needle will indicate the fall of potential in that part of the circuit with which it is placed in parallel.

If the volt-meter had only a small resistance, say 150 ohms, we would find that its inclusion in the circuit would materially affect the pre-existent circuit conditions, for, assuming A B (the portion of the circuit in parallel with the volt-meter) to have a resistance of 100 ohms, then with the volt-meter connected the resistance between A and B becomes the joint resistance of A B and volt-meter, or $\frac{100 \times 150}{100 + 150} = 60$ ohms. But now give the volt-meter its proper resistance of 20,000 ohms and we have as the resistance between A and B, $\frac{100 \times 20{,}000}{100 + 20{,}000} = 99\ 1\text{-}2$ ohms, which is practically the same as before the volt-meter was included in the circuit.

The high resistance of the volt-meter is thus accounted for, and it may be noticed that as the coil in the milli-ammeter only receives a small fraction of the current owing to its low resistance shunt, so the coil in the volt-meter receives but a fractional part of the current owing to the low resistance (in comparison) of the other parallel branch. The instrument, however, is so constructed that large deflections can be obtained from very small currents. To find the E. M. F. of a battery, connect the volt-meter between the end copper and zinc and the deflection will show the voltage. The difference of potential developed by a battery is, as was previously stated, independent of the resistance of the cells, and the volt-meter deflection will therefore be practically the same whether the battery is newly set up or in good working order, for variations in the internal resistance make no appreciable difference in the current strength, owing to the enormous (in comparison) resistance of the volt-meter.

The foregoing test will therefore fail to indicate the presence of a faulty cell, although the internal resistance may have been considerably increased by such a cell and the E. M. F. available for the external circuit correspondingly diminished.

For example, suppose the battery is faulty and that the internal resistance instead of being 200 ohms is 1,000 ohms. The current with the battery on short circuit is $\frac{100}{1{,}000} = .1$ ampere. Now connect the battery with a circuit of, say 4,000 ohms resistance, and the current is $\frac{100}{4{,}000 + 1{,}000} = .02$ ampere. The potential expended in the battery is $i \times r = 1.000 \times .02 = 20$ volts; the E. M. F. available for the external circuit is therefore $100 - 20 = 80$ volts. Had the battery been in good condition the internal resistance would have been 200 ohms, the current in the circuit $\frac{100}{4.200} = .024$ ampere, the fall of potential in the battery $200 \times .024 = 4.8$ volts, and the available E. M. F. for the external circuit $100 - 4.8 = 95.2$ volts, an increase of 15.2 volts over the faulty battery, although the volt-meter would have registered the same deflection in each case. To test a battery, therefore, the volt-meter must be used in conjunction with a milli-ammeter, since a deflection of 500 milli-amperes on the latter instrument with the battery on short circuit will at once show the internal resistance to be normal.

A fairly accurate battery test might, however, be made with the volt-meter alone, by inserting it at the switchboard between one pole of the battery and ground and noting the deflection, which should correspond to the E. M. F. available for the external circuit. The distant station would, of course, require to be on ground during the test.

For localizing line escapes the volt-meter is even more useful than the milli-ammeter on account of the larger deflections obtained. To measure the insulation resistance of a line, the volt-meter is connected in series with it, and a working formula obtained from the fact that the fall of potential would be the same through the volt-meter alone, as through the volt-meter and line in series, the E. M. F. falling to zero in each case; but as this formula is the result of a perhaps formidable algebraic equation, we will endeavor to put it in a simpler form.

(To be Continued.)

Mr. J. Maddox, superintendent, American District Telegraph Company, San Francisco, Cal., writes: "Please note that I am anticipating you once, at least, by enclosing herewith money order for $2.00 in renewal of my subscription, before it became necessary for you to call my attention to it."

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, ... *Publisher*

253 BROADWAY, NEW YORK.

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CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, JUNE 1, 1913.

The St. Louis Convention.

The convention of the Association of Railway Telegraph Superintendents, which was held in St. Louis, May 20-23 was, it can be truly said, the most successful ever held by that body. From a practical standpoint it was a most profitable one for the members, and the entertainment features were liberal and enjoyable.

It must be exceedingly gratifying to the members to know that their association is rapidly growing in size and importance. It has a greater number of members now than it ever had before, and it is evident that the higher officials of the roads that are not represented in the association are taking cognizance of the fact that it is doing excellent work in the interests of the roads it represents. The result of this naturally means that it will continue to grow.

The association is gaining the reputation of being a hard-working body. It works long hours and accomplishes a great deal, the entertainment features being merely incidental as far as they relate to the members—they work in the day time and play between times only, the extensive entertainment being provided mainly for the wives and daughters and guests of the members. It is characteristic of the members to take their wives with them to their conventions, and this is a commendable feature, and might be more extensively adopted by other representative bodies. At the Jovian entertainment on Tuesday evening this matter was referred to by the statesman of the Jovian order in his address. He pointed out that this was the first instance on record where ladies were present at a Jovian entertainment, and suggested that it might be beneficial if the practice were more generally adopted by the order.

The papers read at the convention were masterpieces of their kind, and the members would do well to read and study them carefully, over and over again, because they contain a great deal of essential information. Many of them dealt with principles, and the language of expression employed could not be improved.

The convention as a whole was a highly educational one, and the members returned to their duties with the feeling that the time spent at the meetings had been profitably employed.

Our Thirtieth Anniverary.

The present issue of this journal marks the beginning of the thirty-first year of the paper's existence and the publisher acknowledges with gratitude the support and encouragement extended by the members of the fraternity, individually and collectively.

In a sense, we are proud of our achievement, but we are, at the same time, not unmindful of the fact that the success of the journal is not the result of our own work alone, but, in a large measure, to the help and support of others. The paper has always enjoyed the esteem of the craft and has attained a reputation for accuracy of statement and general reliability, which is very gratifying to the owners.

During the life of the paper many great events in the world's electrical progress have taken place. When the journal was established the telephone was on trial for its life, and wireless telegraphy has since come into existence and become a factor of first magnitude in the world's activities. Cable and land telegraphy have also been extended to a degree that was little dreamed of thirty years ago, and developments still go on at a rapid rate.

As to what the future has in store no man can tell, but it is reasonable, judging from the experiences of the past, to predict that great developments, and possibly, great discoveries are merely waiting for the development of mans' intelligence to bring them to light. The possibilities are unlimited, and everything points to a great future in the arts of communication by electricity.

MR. L. CLARK, manager of the Western Union Telegraph Company at Marietta, Ohio, writes: "I thank you for renewing my subscription and hope you will always do so in the future unless notified to the contrary." Mr. Clark adds: "I presume, of course, that you are aware of the recent flood we passed through. It caught us hard. Our operating room is located on the second floor, and we had six and one-half feet of water on the second floor, so you will know we had some water. There was all the way from twenty to twenty-five feet of water on the main streets, there being about twenty-five feet on the street in front of our office. This being a river town and accustomed to floods, and pepole knowing how to take care of themselves at such times, no lives were lost, but there was a heavy property loss."

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

How should a ground plate be placed in earth of low conductivity?

What are the advantages derived in the use of the earth as part of a telegraph circuit?

Is the insulation of an earth-return circuit easily maintained?

State some of the reasons why it is sometimes difficult to get a good ground connection.

What is an open-circuit telegraph line?

In such a circuit is the battery at either end normally connected to the line?

In what respect do the keys used on open-circuit lines differ from those used on closed-circuit lines?

Can an intermediate office be placed on an open-circuit line?

To introduce an intermediate office on such a line, would the arrangement of apparatus be any different to that at the terminal stations?

What is a closed circuit?

In what respect does a closed-circuit line differ from an open circuit?

How many contact points are there on a closed-circuit key and on an open-circuit key?

In a closed circuit, is the battery normally in contact with the line or not?

In an open-circuit line are the batteries and relays in series or parallel?

How in a closed-circuit line?

When a key on a closed-circuit line is closed, is the current uninterrupted or broken?

What is the American modification of the closed-circuit system?

In what way does it differ from the closed-circuit arrangement just considered?

Compare the two diagrams on page 108 of Pope's book.

Name one of the principal advantages of the closed-circuit system?

In a closed-circuit system is it essential that a battery should be placed at each end of the line?

On short lines would one battery be sufficient?

On very long lines is a battery at both ends generally sufficient. If not, what arrangement is usually adopted?

What is the object of a telegraphic circuit?

What is the effect upon the relays of ultimately closing and opening the circuit?

How much current should be employed to operate relays?

What forces are required to be overcome in the operation of a relay?

On lines of ordinary length when the key is open, and no current flows from the battery, is there necessarily no current on the line?

(To be Continued.)

The Death of Stephen Dudley Field.

One of the most engaging personalities in the inventive field of applied electricity, including that of the telegraph was Stephen Dudley Field, who died at his home at Stockbridge, Mass., on May 18, after an illness of four months. Mr. Field, who was sixty-seven years of age, was a nephew of the late Cyrus W. Field, of Atlantic cable fame, and of David Dudley Field, the eminent jurist. Mr. Field's name has been closely linked with much that has made for American electrical progress. He learned telegraphy in the early sixties at Pittsfield, Mass., and soon became an expert operator.

Mr. Field equipped the first long distance telephone line in this country. It ran from the French corral in San Francisco to the summit of the Sierras, sixty miles, and had twenty-four stations. Some of Mr. Field's greatest inventions were perfected in California, notably the first electric elevator, the first successful electric hotel annunciator, the first multiple call district telegraph box, the first central station for light and power in the United States, in first electrically illuminated theatrical representation, the first police patrol telegraph, the first automatic ringer and first selective signal in a telephone exchange, the first dynamo plant for telegraph lines.

For three years Mr. Field served as electrical engineer for the Western Union Telegraph Company at San Francisco, and in 1870 organized the California Electrical Works, which he ran for eight years. Returning to New York in 1879, within a year he brought out the dynamos for furnishing power for telegraph instruments, and his quadruplex known as the Field System, is now in constant use. Later he invented the tickers used on the New York and Boston stock exchanges. Four years ago he quadruplexed the Cuba cable between Key West, Fla., and Havana, Cuba, for the Western Union Telegraph Company.

A thoughtful, discriminating reader, Mr. Field had one of the best libraries. He was a member of the Institute of Electrical Engineers of Great Britain, of the American Institute of Electrical Engineers, of the Old Time Telegraphers' and Historical Association and kindred organizations.

Mr. Field was a member of the Collins expedition, which in 1864 began the construction of overland lines to Europe via Alaska, across Behring Strait and through Russia, which was abandoned on the successful completion of the Atlantic cable in 1866.

The Dayton Flood.

BY FENTON BOTT, MANAGER, POSTAL TELEGRAPH-CABLE COMPANY, DAYTON, OHIO.

Although for several days prior to the flood there had been a constant downpour of rain no one appeared to be uneasy until after midnight, Monday, March 24. Anxious watchers reported little streams of water running over the levee at different points, and as the rivers rose these small streams increased in size and number, until by four o'clock Tuesday morning the water was pouring over the levees in all parts of the city.

Whistles and firebells sounded a general alarm about five o'clock Tuesday morning, but many people continued their slumber, not believing the conditions were so serious until some one despatched horsemen in various directions to cry a warning.

Mrs. Bott and I were awakened by a horseman dashing down our street at a mad gallop crying, "Run for your lives, the flood, the flood," but we were inclined to think the fellow badly excited. However, following almost on the heels of the rider, came a rush of water several feet high, which caused us to take a more serious view of the situation. By the time we could get into our clothing the water was knee-deep and rising very rapidly. As leaving our home was out of the question, we tried to save some of our household effects by carrying them to the second floor. We had accomplished very little before the water began to pour through the furnace registers, and we were obliged to hastily pile the light pieces on the heavier furniture and go to the second floor. The water continued to rise and by noon had reached the second story of our residence; we then took refuge in the attic.

The suffering and anxiety of the next sixty hours cannot be realized except by those who passed through the ordeal. The weather was bitter cold; there was no heat, no light, and that awful rushing water all about. Barns, houses, horses, cattle, dogs and every conceivable kind of wreckage went tearing by. The current was terrific. The water had now reached such a height that houses were moving off their foundations and all about us people were building rafts, removing their surplus clothing and shoes, waiting for the moment when their own home would roll into the awful flood. Many thrilling rescues were made. People in cottages or story-and-a-half houses were obliged to leave, and in many cases men, women and children were thrown ropes and dragged through the flood to some attic window.

To add to the horror of it all fire broke out in many directions and spread rapidly, owing to the high wind. A whole row of pretty houses, half a square from our home, caught fire, and of the fourteen helpless people who were driven into the flood the bodies of five have since been found in the débris.

This awful condition continued for two days and two nights before the waters began to recede and the boats could get through the swift current. Everyone was starved and numb with cold, and the steaming hot cup of coffee that was placed to our lips as our feet touched the blessed land was a God-send.

Everyone is familiar through the newspaper accounts with the happenings of the next day or two. Our once beautiful city was devastated beyond description. There were street cars lying in cellar excavations; dead horses and cattle everywhere; dozens of business blocks had been either burned or undermined and wrecked; hundreds of homes of wealthy and poor alike were ruined; nothing but ruin and desolation everywhere. There were thousands of refugees walking aimlessly about carrying bird-cages, cook stoves, cats, dogs, bedding and every kind of personal property imaginable, most of them on their way to the bread line which was many blocks long, at every relief station.

Until Friday morning following the flood it was not possible to reach the business section of the city, and then only by boat and hip boots. The city was in charge of the state troops and no one was allowed to enter it unless on urgent business. After explaining my mission I was given a soldier as an escort, who was instructed to see that I reached my destination. After securing a boat and hip boots we made a start for the Postal Telegraph office.

Our beautiful office, which has been my pride for years, was a pitiful sight. The water line on the wall was eleven feet two inches from the floor, and there was a thick deposit of the dirtiest mud I ever saw all over everything up to that height. The current had washed through the office, taking the furniture and everything else that would float out through one of the large plate-glass windows. Superintendent F. W. Sprong, of Chicago, and manager F. H. Minning, of Cincinnati, who for several days had been hanging around the outskirts of the city waiting for the water to recede, arrived about this time in an automobile looking for my dead body, and they both seemed very much gratified to find me alive and well, but hungry.

By the middle of the afternoon we had an office opened near the West End terminal pole about a mile and half from our main office. I opened a temporary receiving counter on a store box on the sidewalk at the main office, set a force of men to work shoveling mud and using the fire hose, and with the aid of two automobiles loaned me by personal friends we were doing business at the old stand, the autos filling in the gap between the main office and the temporary office. The Western Union Company was less fortunate and did not get into its old location until about two weeks later.

The work of rebuilding our lines into the main office was greatly handicapped by the terrible conditions following the flood. The railroads were practically washed out of business and much of our material had to come in by automobile until the express companies established a service. There was no heat, light or food in the downtown district. At this point, superintendent Sprong and I visited the National Cash Register Company, and Mr. Harry Snyder, head of the telephone, telegraph and mail-ing departments, proved our savior. Mr. Snyder arranged for a lunch counter to be established with an attendant day and night, for the exclusive use of our employes, and for a week about fifty of us, including the construction men, were given hot coffee, sandwiches, pure water and fruit. I cannot say enough in praise of the assistance rendered by The National Cash Register Company and its president, Mr. John H. Patterson. Not only did he give assistance to the "Postal," but to all wire companies or others who were in need of first aid.

The work of rebuilding Dayton is progressing rapidly. There is a splendid optimistic feeling evident everywhere, and within a year or two the city will be bigger, better and more beautiful than ever.

Some Facts Concerning Telephone Transmission.*

BY ELAM MILLER AND C. A. ROBINSON, ENGINEERING DEPARTMENT, AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

This paper was a very clear and comprehensive discussion of the subject of telephone transmission and losses.

After giving an outline of a simple telephone circuit and the extremely small amount of energy available for telephone transmission, the authors referred to the losses in line circuits, using several curves to give some idea of the relative rates of loss of circuit, or current alternation, etc.

The standard cable and its use were described at some length. In using the mile of standard cable as a unit of measure, a standard circuit has been adopted, and the transmission efficiency of a telephone circuit including the substations at the ends, is completely determined by comparing it to the standard arrangement commonly called the "standard circuit."

Switchboard and apparatus losses were next discussed. One of the most common causes of relatively large transmission losses is that low impedance drops are bridged on long distance circuits either on the long distance line or trunk itself, or on the connecting cords.

Excessive losses are also caused when operators cut in on a circuit with the usual form of operators' telephone set equipment.

Substation loop losses were touched upon, and the magnitude of the current loss was shown by means of curves.

Grades of transmission was the subject next considered. Different grades of transmission are obviously required for different classes of transmission, the authors pointed out. The transmission requirements in railroad work are decidedly different from those of a commercial telephone company. A grade of transmission equivalent to eighteen miles of standard cable should be entirely satisfactory to permit of the passing of train orders on dispatching circuits without any mental strain on the part of the listeners and without any unnecessary repetition on the part of the speaker. For regular talking circuits as normally operated by railroad companies it would seem that a thirty-mile transmission between telephone stations should prove statisfactory.

Interference of every nature was discussed at length. As to cross-talk, the telephone transposition systems, which are in general use give satisfactory results when regular commercial forms of telephone substation equipment are employed on the different circuits. The general tendency at this time seems to be to use train-dispatching circuits, and message circuits as side circuits of phantoms and to employ the phantoms as regular talking circuits. This may mean that in such cases new transposition schemes will have to be devised to decrease the length of exposures between the various circuits, especially the exposures between the phantoms and their own side circuits, and in this way to prevent the cross-talk from being excessive when loud-speaking instruments are employed. Generally speaking, in order that the cross-talk between any two circuits may be well within commercial limits no irregularities of any kind should be introduced in these circuits at an intermediate point in any transposition unit, and any bridged stations which it is necessary to place on the circuits should be located at the junction points of adjacent unit transposition sections. When located in this manner these irregularities do not unbalance the cross-talk system.

* Abstract of paper read at the annual convention of the Association of Railway Telegraph Superintendents, St. Louis, Mo., May 20.

Meetings of Associations, Societies, etc., During 1913 and 1914.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, at New Orleans, La., May 19, 1914. Secretary, P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION, New York, second Wednesday in March, 1914. Secretary, M. J. O'Leary.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS, at Watertown, N. Y., August 19-22. Secretary, Clarence R. George, city electrician, Houston, Tex.

OLD-TIME TELEGRAPHERS AND HISTORICAL ASSOCIATION AND SOCIETY OF THE UNITED STATES MILITARY TELEGRAPH CORPS, at Detroit, Mich., August 26, 27 and 28. Secretary of the Old-Timers, F. J. Scherrer, 30 Church street, New York; secretary of the Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

TELEPHONE PIONEERS OF AMERICA, at Chicago, Ill., October 16 and 17. Secretary, Henry W. Pope. 15 Dey street, New York.

MR. A. M. FLOYD, manager of the Postal Telegraph-Cable Company of Texas, at Galveston, Tex., in renewing his subscription for another year, writes: "I cannot afford to be without TELEGRAPH AND TELEPHONE AGE, now."

New Main Office of the Western Union Telegraph Company at Omaha, Neb.

The Western Union Telegraph Company recently moved into its new quarters in the "Woodmen of the World" Building, Omaha, Neb, a handsome eighteen story structure.

The operating and plant departments occupy the entire sixteenth floor, while the bookkeeping and telephone departments, school, rest and toilet rooms, are located on the fifteenth floor. The offices of the district commercial, plant and traffic superintendents are also located on the fifteenth floor. The public offices are on the grade floor, and form an L running from Farnum street to Fourteenth street, thus affording the benefit of two distinct commercial offices. The Farnum street office is devoted principally for the reception of telegrams, while the Fourteenth street office is arranged for the delivery, American District Telegraph and messenger departments. A counter is provided, however, in the latter office for the reception of messages for customers desiring to use this entrance. All fixtures are finished in Circassian walnut to match the general building trim. The simplicity in the design of the equipment gives the office a very businesslike and handsome appearance.

Pneumatic tubes connect the operating departments with the delivery and receiving departments. The operating department is equipped in accordance with the latest engineering developments and differs radically from any telegraph installation heretofore made. The operating tables, instead of being divided into small units, as has been the custom heretofore, are arranged in long rows. For instance, the initial installation of 162 Morse positions is cared for on nine long tables. Each of these tables is provided with a moving belt, traveling over its center and within reach of the operators sitting on either side of the table. These belts all travel in the same direction, and carry telegrams deposited upon them by the operators to chutes, which discharge to another belt running at right angles to the tables and located on the floor. The latter belt is encased in a floor trench having a length of 100 feet, and carries all telegrams which fall upon it to a routing center located at one extreme end of the room, where the telegrams are elevated automatically from the floor and deposited upon a counter top before the routing clerks. The total length of the floor belt, including the return side, is approximately 220 feet long. The great advantage of picking up telegrams by means of belts is that no delay occurs, with the exception of

FIG. 1—MORSE DEPARTMENT

the actual transit time, between the time that a message is received and the time it is deposited before the routing clerk. The human element of delay is entirely removed. It also affords instantly a check upon the accurate timing of messages by the operators. The belts are driven by independent motors, and may be stopped by attendants at the individual tables or at the routing center, if desired.

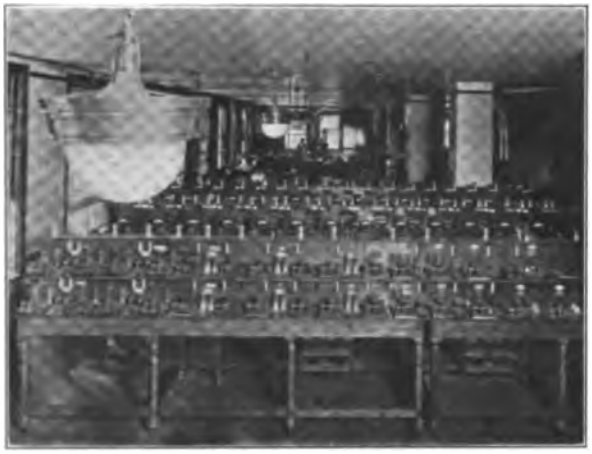

FIG. 2—MULTIPLEX DEPARTMENT

Telegrams are distributed for transmission by means of the Lamson distributing system. The stations are located at the ends of the operating tables so that the distibuting clerks have a minimum distance to travel.

FIG. 3—PRINTER DEPARTMENT

The telephone department on the fifteenth floor is also connected by means of a Lamson pick-up and distributing carrier. The Morse department occupies the main section of the room facing Farnum street, while the printer and plant departments oc-

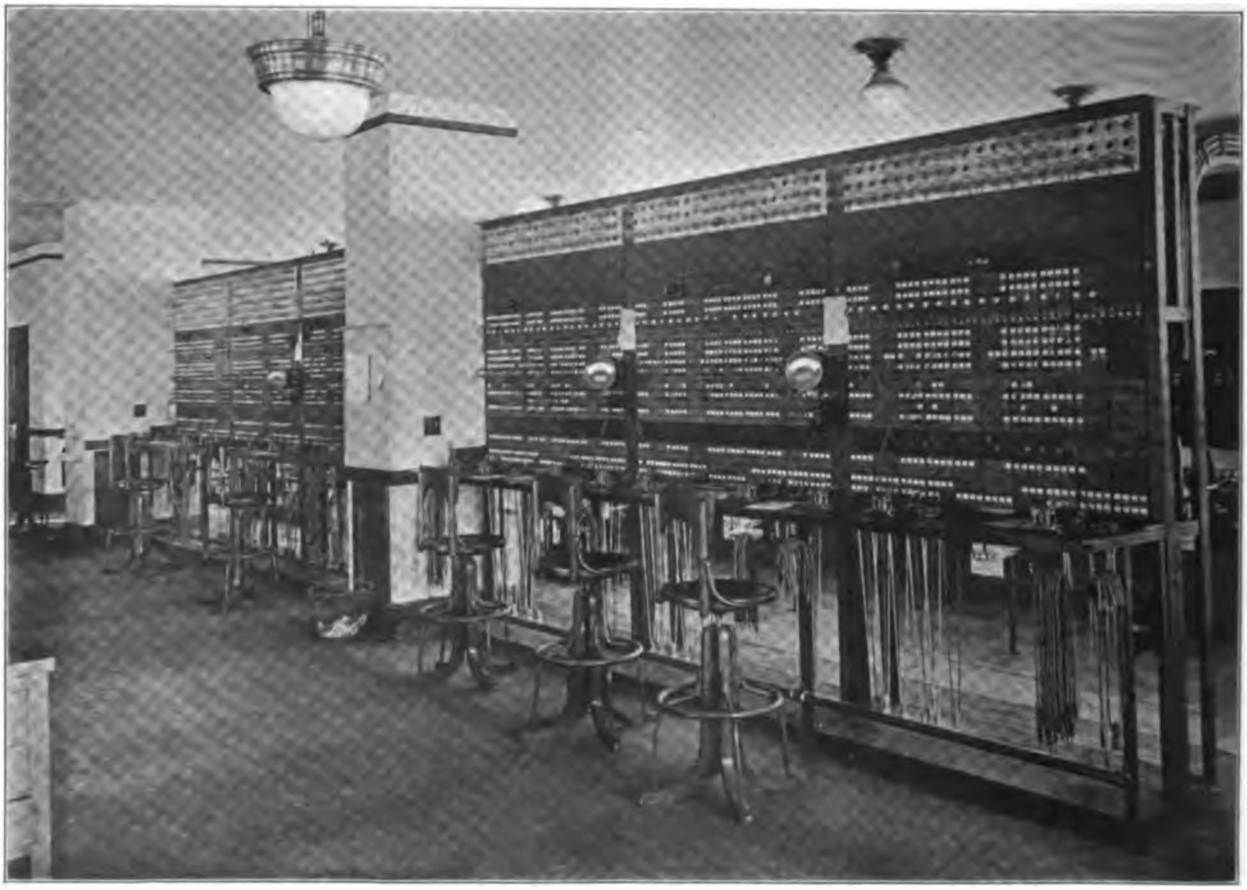

FIG. 4—TEST BOARDS

cupy the L along Fourteenth street. The printers used are of the Barclay type. The balancing and switching facilities connected with the printers are of the latest development and permit of changes with the minimum time. The routing center and service departments are together, thus affording the least delay possible in handling all services.

The initial installation of repeater tables consists

FIG. 5—MOTOR-GENERATORS AND CABLING IN REAR OF TEST BOARDS

of three tables, each twenty-two feet long. The equipment upon these tables is of the latest design and occupies the minimum of space. All operating and repeater tables are provided with pressed steel

FIG. 6—ROUTING AND SERVICE DEPARTMENTS

cabinets at their ends, for the accommodation of the wiring terminals, which are of porcelain.

The test boards consist of six sections of main board and one section of loop board. They are of the latest development and are made up entirely of metal, slate and porcelain. A detail description of the test boards is now being published in these columns. The boards, when in full operation, present an astonishingly small number of cord connections, because all regular set-ups are permanently arranged, and do not require the use of long cords, as has usually been the case in past practice. The design of these boards is such as to concentrate the the greatest number of circuits in a given working space and the utilization of a minimum of spare

FIG. 7—TELEPHONE DEPARTMENT

equipment which has always been found necessary heretofore in test-boards practice. The cross-connecting frames are placed immediately in the rear of the test boards. These frames accommodate approximately 7,500 wires. All cables connecting the frames with the test boards and the frames with the tables and other equipment are lead covered. The copper conductors of these cables are enamel-coated and cotton-wrapped.

The motor-generator plant is placed in the rear

FIG. 8—MAIN BUSINESS OFFICE

of the cross-connecting frames and test boards, and consists of two 26-volt machines, three 80-volt, three 160-volt, three 240-volt, three 320-volt and two large auxiliary units for breakdown service. These are mounted on a concrete bench, which also accommodates the pneumatic tube motor-blower equipment. Directly above the motor-generators is placed the control switches upon a plain Monson-Main slate panel. The total length of this panel and bench is forty-two feet. All connections are made with copper straps. The secondaries of all machines are carried to a distribution panel at the end of the motor-generator bench, where they distribute to the various services through fuses of the proper size.

An up-to-date work-bench is provided for use in making repairs to printers and typewriters. The bench is divided into a number of drawers arranged to take the various repair parts.

The relay files are located on the sixteenth floor, and stored in steel fireproof drawers, tiered one above the other, where they are easily assembled for reference. The regular messages originating at Omaha, are stored in similar files located on the fifteenth floor.

At night the rooms are lighted by means of semi-indirect fixtures, which afford excellent diffusion and a notable absence of shadows. The illumination from these lights is so efficient that the wiremen making the installation of the telegraph equipment could see their work under the tables, even into the deepest recesses of the underside of the repeater tables, as clearly as they could the equipment upon the table top.

The ceilings and walls are finished in Western Union standard colors, namely, ivory white for the ceilings and cream for the walls. Commodious quarters are given up to rest rooms, lunch rooms,

FIG. 9—DELIVERY AND A. D. T. DEPARTMENTS

locker rooms and toilets for both sexes. There is a high-class cafeteria lunch room in the basement of the building, which is proving to be of advantage to the telegraph employes, as well as other tenants in the building.

The plans are so arranged as to permit growth of any of the departments with the minimum of changes, and the space occupied in the future will

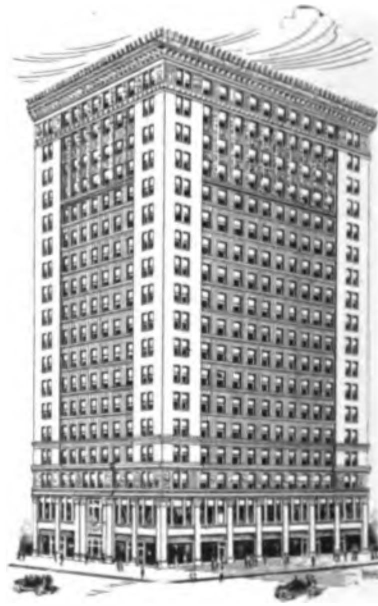

FIG. 10—VIEW OF TELEGRAPH OFFICE BUILDING

be on adjacent floors instead of being scattered through the building.

The messengers' quarters are in the basement, under the Fourteenth street office space, and provide locker rooms, tailoring department, recreation room, lavatories and shower baths. The latter are equipped for hot and cold water, with automatic thermo-regulators, preventing the water from exceeding safe temperature.

Mr. E. A. Chenery, superintendent of telegraph of the Missouri Pacific Railway Company, St. Louis, Mo., writes: "I hand you herewith my check to cover renewal of subscription, which I note by the cover has expired. Of course I don't wish to be without Telegraph and Telephone Age, and am satisfied you will see that I am duly protected."

The Passing of the Astor House.

John W. Lewis, manager of the Western Union Telegraph office, Astor House, New York City, has been in that hotel, which is now about to be torn down, over fifty-nine years, and of the thirty thousand telegraphers in the United States, he holds the record of being operator for the longest period in continuous telegraph service.

In some reminiscences of his career, published in a recent issue of an evening paper, Mr. Lewis refers to some interesting events during his long years of service at this famous hostelry.

When the civil war started, he was at his telegraph instrument daily, from early in the morning until late at night transmitting important telegrams between President Lincoln, Thurlow Weed, William H. Seward, Secretary of State, and many army and navy United States Government officials.

He received the news of the death of the first man to fall in the civil war, Col. Elmer Ellsworth, who pulled down from a hotel flagstaff at Alexandria, Va., a Confederate Government flag, and was immediately shot dead by Major-General Stonewall Jackson's brother.

When President Lincoln was shot, the whole North was in an uproar, intense excitement prevailed in New York. One of the first messages then sent over the wires by Mr. Lewis, was addressed to "The acting President of the United States, Washington, D. C.," in which the sender announced the shooting of President Lincoln, and begged to be assigned to the most desperate duty for the extermination of traitors here or elsewhere. The message was signed by a person, whose name is not now remembered, and whatever reply, if any was made, did not pass through the Astor House Telegraph office.

Mr. Lewis enjoys many pleasant recollections. After the close of the civil war, he attended the reception of General U. S. Grant at the Astor House, where he received a warm handshake, and a few kind words from the General.

On other occasions he was visited by Generals W. T. Sherman, George B. McClellan, Joseph Wheeler, hero of Santiago, John C. Fremont, and others, enjoying half an hour, or so, conversation with each.

Mr. Lewis always stuck closely to business, in so doing made many friends. Among them may be mentioned the late James H. Hackett, high-class comedian, and his son Recorder John K. Hackett, N. Y., ex-Mayor, A. Oakey Hall, N. Y., ex-Gov., John T. Hoffman, N. Y., Ezra Cornell, founder of Cornell University, and his son ex-Gov., Alonzo B. Cornell, N. Y., the late P. T. Barnum, and many others.

Mr. Barnum had a kind spot in his heart for Mr. Lewis, and permitted him to enter his museum without charge at all times, where could be seen a great variety of wonders, and also to attend the theatrical performances there, which were always of fine quality. The museum was located at Broadway, Ann, and Fulton streets, and always extensively patronized.

All the main offices of the different telegraph lines were located in, and below Wall street, in the early fifties, as follows:

The "Magnetic Telegraph Company," 5 Hanover street, to Philadelphia, Baltimore, Washington and the South.

The "Union Line," 23 Wall street, to New Haven, Springfield, Boston and the East.

The "National Line," also at 23 Wall street, to Pittsburgh, Cincinnati, Louisville and the Southwest.

The "New York, Albany and Buffalo Line," 2½ Wall street (in basement), to Poughkeepsie, Albany, Buffalo, etc., etc.

The "House Printing" Telegraph Co., occupied the building, 21 Wall street, and was considered a wonderful thing at that time.

Among the prominent persons in the telegraph interests then, were Samuel F. B. Morse, William M. Swain, Zenus Barnum, Amos Kendall, John Kendall, Ezra Cornell and Alonzo B. Cornell.

Mr. Lewis accepted many telegrams from Professor Morse, and refers to the Professor's practice of drawing a skull and cross bones on his telegrams to indicate that they were to be sent D. H.—"Dead Head." He will never forget the Professor's kind, gentle manner, and his clear pure face, bright with intelligence.

Many telegrams were sent from the Astor House office to San Francisco, Cal., when the rate for ten words was seven dollars and forty-five cents, and for each word over ten, fifty-seven cents, and from New York to Portland, Ore., ten dollars for ten words, and ninety cents for each word over ten.

Consolidation of the telegraph lines at different periods occurred, until they have finally reached the present enormous size.

During the civil war, the New York City General Post-Office was located on Nassau street, from Liberty to Cedar streets, in an old church building. As gold and silver stood at a very high price at that time, United States postage stamps were very often used to make change. On any business day, fifty to one hundred persons could be seen standing in line, waiting to buy stamps.

The Astor House opened in the year 1836. The prominent persons from all parts of the world made the Astor House their headquarters, when in New York City, as do also their descendants to this day. Warren Jones, who turned the key to admit the first guests to the Astor House, told Mr. Lewis he did so, occasionally, in conversation.

In the year 1855, Columbia College was located on grounds about twelve feet above the street level, and extended from Church street to College place, (now West Broadway), and from Barclay street to Murray street, New York City.

When the telegraph office known then, and ever since as "A. H." started in the Astor House, it was considered "way up town." It was the "First Branch Office" opened in the United States, if not in the whole world.

In the early fifties, the two steamship lines between New York and England, were the Collins

Line, at the foot of Canal street, New York City, sailing Saturdays, and the Cunard Line, foot of Grand street, Jersey City, sailing Wednesdays. The trip to, or from England, occupied nine to twelve days, which was the quickest means of sending or receiving news at that time.

Steamships arrive from, and leave for both countries now, almost daily, and make trips in five to seven days. A very great change came in the rapid transmission of news, when the ocean cables were laid. Electricity since then, conveys almost instantaneous news. So many inventions have been made by Thomas A. Edison, and others, that electricity is now leading the world we are living in.

Before horse cars came into use, stage lines were the general means of travel in and around New York City. There was the "Kipp and Brown" Stage Line, from the Battery, up Broadway to Canal street, to Hudson street, up Hudson street, to Eighth avenue, etc.

The "Bloomingdale" Stage Line, was from the Battery, over the same course to Hudson street, to Ninth avenue, to Bloomingdale.

The "Tyson," also called the "Telegraph Stage Line," started from the Courtlandt street Ferry, through Courtlandt street, to Greenwich street, to Canal street, to Broadway, to Grand street, thence to Grand street Ferry, East River. In the winter seasons at that time, a good snowstorm furnished fine sleighing in New York City for a month. Very long stage sleighs were run, drawn by six to eight horses, with jingling bells. This caused great merriment among the passengers. The "Stages" seated about twelve persons, the "Stage Sleighs" about fifty.

That dear old building, 145 Broadway, New York City, on the south-west corner of Liberty street, must not be overlooked. It was the home of the "American Telegraph Company," the "Atlantic and Pacific Telegraph Company," and the "Western Union Telegraph Company," the later company's first New York City home. Many telegraphers to-day recall very pleasant recollections of the time when they were in that building, where Colonel E. S. Sanford, Colonel Marshall Lefferts, General Thomas T. Eckert, Colonel A. B. Chandler, David Homer Bates, J. D. Reid, and many other notable gentlemen were directing successfully the telegraph interests from time to time. In 1874, the "Western Union Telegraph Company" moved into its new building, 195 Broadway, corner of Dey street.

Mr. Lewis has enjoyed very pleasant business relations with all the telegraph officials, and others of the profession from the beginning, and is a "charter member" of the "Telegraphers' Mutual Benefit Association."

Although so long in service, Mr. Lewis carries his years lightly, and he moves about as spryly as a very much younger man. His step is elastic, and he is as wide awake as most of the younger generation now in the service.

The Cruiser "Salem" Wireless Long Distance Tests.

Mr. Editor: I notice in the issue of May 16 of your journal, a statement in connection with the test betwen Arlington and the cruiser "Salem," that the undamped oscillations produce very superior results over those secured with the spark system. In view of the fact that you have spoken of these undamped oscillations in connection with the electric arc as contrasted with the damp oscillations produced by the electric spark, I fear that some misunderstanding may result from such statements. I wish to call your attention to the real cause of the superiority of one system, the undamped oscillations, over the other, the damped oscillations. I believe the marked difference between the two can be placed to the credit of the heterodyne receiving apparatus that was employed throughout the major part of this test. The heterodyne receiving apparatus was supplied by the National Electric Signaling Company, as part of the spark equipment, but was found upon using it with the arc equipment to be far superior to the receiving apparatus that had been provided for use with the arc equipment. This superiority was well recognized by the engineers of the National Electric Signaling Company, and the result of the test in the above respect occasioned no surprise on their part. This improvement was so marked, however, that the Navy Department officials in charge of the test on the "Salem" practically abandoned all other receiving apparatus, when working with the undamped oscillations, after the first four or five days when they first tried out the heterodyne receiving set with the undamped oscillations. It is possible with the heterodyne set working with these undamped oscillations to secure a pure flute like musical tone adjustable as to pitch so as to suit the individual taste of the operator and to build up, by an amplifying process, the strength from the signals very materially.

I am writing this note in order that the value of the heterodyne receiving apparatus may not be overlooked, as we attribute the major part of the difference that was shown, between the operation of these two types of radiation, to the receiving apparatus, and as yet no public mention has been made of this particular fact in which Fessenden's heterodyne receiver has been given its proper credit.

Very truly yours,

S. M. KINTNER,

for the receivers of the National Electric Signaling Company,

Pittsburgh, Pa., May 22, 1913.

MR. E. W. COLLINS, general superintendent, Postal Telegraph-Cable Company, Chicago, Ill., writes: "You did the right thing in renewing my subscription to TELEGRAPH AND TELEPHONE AGE, check enclosed in payment thereof. It is just thirty-one years since I first subscribed for your periodical, and this is my thirthieth renewal. TELEGRAPH AND TELEPHONE AGE grows more essential to my comfort and well-being as the days go by, and I wish it and its good editor continued prosperity."

Use of Telephone by Railroads for Dispatching Trains, Handling Messages, Etc.*

BY J. C. JOHNSON, SUPERINTENDENT TELEGRAPH, PENNSYLVANIA RAILROAD, PHILADELPHIA, PA.

Train dispatching was first introduced with the telegraph as a means of communication on the Erie Railroad in 1850, as has been brought out in previous papers, and which event has been appropriately celebrated this last year. It is believed that some of the honor and glory which has gone to the Erie Railroad on account of this fact should have been shared with the Pennsylvania Railroad, as the method of handling train orders by telegraph was developed on the Belvidere-Delaware Railroad, a division of the Pennsylvania Railroad, independent of any similar work carried on by the Erie Railroad and without any knowledge of what they were doing. This was carried on by Mr. Welsh, superintendent and engineer, and Mr. Anderson, assistant superintendent. The rules developed by these individuals relative to the transmission of train orders by telegraph and movement of trains under those orders were in force for many years, and formed the basis of the original set of rules for such business which were subsequently adopted by the Pennsylvania Railroad.

Twenty-five years after the introduction of the telegraph for train dispatching, the telephone was invented and the question was soon raised as to whether or not this new and improved method could be drafted into the service for directing train movements. This received favor in some quarters, but as a general thing its advantages were not recognized by the people in authority on the different large railroad systems. At the present time the advantages of the telephone are better understood, as experiments and experience have proved its flexibility and adaptability for the purpose of dispatching trains and for handling general railroad business upon the busiest sections of railroad in the country.

The telephone was first used on the Pennsylvania Railroad for dispatching trains in 1897 on the South Fork Branch, which is thirty-two miles in length. At the time this system was installed it was believed that special instructions would be necessary to handle this class of business my means of telephone, but these special rules were not put into effect, leaving it to the judgment of the train dispatcher. With a volume of traffic increasing from an average of four trains daily in 1897 to more than eighty trains daily in about six years, without having an accident due to a misunderstanding of orders was conclusive evidence of the success of this manner of operation.

Railroads of the United States are to-day among the largest users of telephone service in the transaction of their business, not only with the public at large, but in connection with the internal operation of their systems. This use of the telephone by them is not recent; in fact, they were among the first to recognize the advantages of telephone service. On the Pennsylvania Railroad alone there are approximately 17,000 telephones either owned or leased from operating companies.

During the past five or six years great interest has been taken in the use of the telephone in connection with dispatching on the main lines of railway systems. While this is not the only important service which is being performed by telephones on the railroads, it is the one which is receiving the most consideration by them at the present time.

Although telephone train dispatching was used successfully on some of the shorter lines where the number of stations made it feasible to signal by means of code ringing, the invention of selective devices by which any one of a given number of offices could be directly signaled on the same line even when a conversation was going on, really made the telephone practical in this class of service.

In order to determine to what extent the various large railway systems in the United States were using the telephone in connection with their operation and to make comparisons between the telephone and telegraph from an operating and maintenance standpoint, blank forms were submitted to all of the systems having a rated trackage of 1,000 miles or more. About fifty systems are included in this classification. It seems that many of the roads have been so busy installing their systems that questions of first costs, maintenance and efficiency have not been sufficiently studied to enable them to give very accurate information.

Tables are then given by the author showing total and average figures obtained from thirty-five roads, representing 100,934 miles of single track and 14,179 miles of two or more tracks, out of a total of 241,000 miles of single track and 25,353 miles of two or more tracks in the United States."

Continuing, the author states that on nine out of twenty-three divisions of the Pennsylvania Railroad, the telegraph is kept for emergency when the telephone is installed.

There is practically no reduction made in the number of telegraph operators at small stations by the use of the telephone.

There seems to be no method of accounting by which the saving in telephone operation is definitely shown.

From a comparison of the average cost per way station installation on other roads and as shown under the Pennsylvania Railroad classification, it would indicate that there is some extravagance in our installations.

Monthly maintenance is an item which varies widely, our average being \$3.35 as against \$1.23 as shown on the other roads. This higher cost seems to be somewhat in proportion to the initial cost of the way stations, and may be accounted for by our having more complete or more complex apparatus. This might be a point which would bear some investigation and possibly standardization.

The cost of the maintenance of telegraph equipment is somewhat better standardized and our cost compares favorably with that of other roads.

*Extracts from paper read at the annual convention of Railway Telegraph Superintendents, St. Louis, May 20.

Our lower figures for train orders per dispatcher's circuit per day are possibly accounted for by our having more automatic signal equipment, which would tend to cut down this average figure.

The number of cases of trouble in our way station and dispatching instruments shows up very high as compared with the average of other roads, with possibly the same explanation as holds for monthly maintenance.

Under average cost per mile of circuit, the figures differ widely, and this is probably accounted for by different items being included, some considering only the wire, pins, insulators and labor, others possibly including the placing of cross-arms, etc., some using copper wire, where others base their cost on iron wire.

From the figures obtained on other roads than the Pennsylvania Railroad, the cost of maintenance per mile of circuit per month is hardly a fair average, as this shows the telegraph higher than the telephone, when in reality it should be about one-half, on account of there being only half the wires and insulators to maintain; also that many of the long and important circuits are operated as simplex or composite, which would tend to further complicate the division of maintenance charge.

The percentage of efficiency due to bad weather conditions would indicate that there was possibly some misunderstanding, as the figures vary between quite wide limits. It is a well-known fact that the telephone will operate very well during foggy or rainy weather, when on account of the higher voltage being used for telegraph there is a sufficient leakage over the insulators to ground to seriously interfere with its operation, and correspondingly reduce its efficiency.

None of our divisions are at the present time using portable telephones on freight trains, although these are used quite extensively on other roads. A certain increase in efficiency of crews on some classes of trains is sure to result from the use of these portable instruments, as the crews are then enabled to receive their orders without any appreciable delay, and their movements can thereby be more readily directed.

Nearly all of our divisions are equipped with intermediate telephones in boxes or booths at sidings, which enables the different train crews to obtain orders for movements directly from the dispatcher or from the nearest tower or block office.

The number of telephones located at our automatic signals, especially on those sections of the road having two or more tracks, is very large as compared with the other roads.

Spacing telephones located at intermediate points not included in the previous classifications are evidently being installed on many of the roads, and from the figures obtained it would seem that they are not spacing them as closely together as on the Pennsylvania Railroad. We find these of great value on many occasions, and have devised special boxes and booths for installing them.

TRANSMITTER BATTERY. On our main line, Mr. Johnson continues, the dispatcher's transmitter battery is usually a four-volt storage battery. In some instances the caustic soda cells of large ampere-hour rating are being tried. Emergency Battery is also provided.

SELECTOR BATTERY. This varies from 110 to 240 volts, depending upon the length of the circuit. An emergency selector battery is maintained in most cases and always kept in good condition and available for use in case the regular battery is in any way crippled. This is either in the form of a duplicate storage battery, dry cells, or duplicate connection from another power source.

LOUD SPEAKING RECEIVERS. We have conducted some experiments with loud speaking receivers with a view to relieving the dispatcher of the burdensome head receiver and providing him a substitute to use during lightning storms. There is quite a field for development in this particular part of the apparatus, and we are confident that something will eventually be developed along this line, which will be the solution.

At all of our dispatchers' offices we have emergency equipment kept in reserve and always in good repair, which can be readily put into service in case of failure.

LINE CONSTRUCTION. Our standard line wire is No. 9 B. & S. hard drawn copper. A considerable portion of our circuit is now run in paper insulated, lead-covered cables through towns and cities, where we have very loaded lines, or where the local regulations restrict open wire construction.

PROTECTION. The protective equipment is practically the same as that used by the operating Bell Companies. On some of the more exposed portions of our lines we are installing auxiliary protectors on the poles. These are usually located on the top cross-arms, and it is intended that they should operate on lightning discharges and high voltage crosses only, for the purpose of relieving the regular protection located at cable boxes or at entrances to offices.

TRANSPOSITIONS. The lines are very carefully transposed and each line is given a special study to eliminate all noise and cross-talk. Simplex is being operated on a number of our dispatchers' lines with excellent results.

Another feature which may be interesting is the emergency underground cable installation which is being considered by our company at the present time. This it is intended to install along our right-of-way with loops into every tower, block office and way station and equipped with patching panels and suitable signal devices, which would enable us to always signal any station and patch around any sections of line in trouble. We could thus get communication through on the important circuits, including the dispatchers' circuits, no matter what might happen to any one of several sections of the aerial line. This would involve some engineering features which would necessarily have to be worked out to insure satisfactory and successful operation with telephone selectors and also long distance transmission.

The use of transmitter arms or telephone brackets is almost universal on our different divisions, as we have found from experience that they operate very satisfactorily.

Methods of wiring to offices from the line depend somewhat upon the total number of wires entering the office and its location. In case the tower or office is on the opposite side of the track from the telephone line, the wires are usually carried underground and either in rubber insulated or paper insulated lead-covered cable, properly installed in iron or wood conduit.

Limited trains and private cars are also equipped with telephones, which may be connected to the local telephone company's lines or to our lines while lying in the large terminal stations. Private cars as a rule are provided with instruments which may be used on either common battery or magneto service.

EMERGENCY CABLES. At different points on the road, standard 1000-foot lengths of five pair emergency cables are kept on special reels. This is for the purpose of making quick temporarary repairs around any section of damaged line which may be caused by storms, slides, blasting operations or otherwise. These consist of 10 stranded conductors of high grade rubber-insulated wire, made up in the form of twisted pairs.

An equipment for emergency service which has been proposed but which has not as yet been adopted on account of working out some of the details, is a special car equipped with emergency switchboard apparatus, selector equipment, dispatchers' apparatus, emergency cable, etc. This was intended to be used to quickly restore telephone exchange or dispatching service at any important point, such as division headquarters, where such service might be crippled on account of fire, flood or otherwise, as it always means a considerable delay to obtain this apparatus from the telephone company or manufacturers.

Full Use of Wires.*

BY H. D. TEED, SUPERINTENDENT TELEGRAPH, ST. LOUIS AND SAN FRANCISCO RAILROAD, SPRINGFIELD, MO.

There are doubtless some of our members who are at times confronted with problems of taking care of ever-increasing telegraph and telephone traffic, which would seem at the first glance to require an investment in additional wires. Often this is found to be absolutely necessary. Sometimes a careful study and intimate knowledge of the physical condition and relative position on the pole line of present wires will offer a solution. Where present facilities cannot be utilized and additional wires are absolutely required, the ultimate use and possibilities of future additions and combinations that may be effectuated should in all cases be carefully considered.

We have considered it, on the Frisco lines, of paramount importance to keep our circuits, no matter whether old or new, telegraph or telephone, in the best possible physical condition. It is the anatomy of the wire that we use, and if a part of that anatomy becomes impaired or defective, only by the intelligent use of such indispensable testing instruments as the voltmeter, ammeter, and bridge can the defects be entirely eradicated. We have, for the past seven years, equipped our testing offices with these necessary instruments.

The next most important step is to secure the services of an energetic and resourceful young manager and wire chief and two assistants for each wire testing district, who realize the investment represented by the facilities over which they are to exercise supervision. Unless they are made to fully realize this and enter into the spirit of demonstrating their own ability to handle the large investment entrusted to their charge, it matters little what kind of a wire you have up, or put up. Even though the wire be flawless and erected with the greatest care, extraneous influences may develop defects, which, if not promptly located and removed, will greatly reduce the working efficiency of the wire. Incidentally, it is of equal importance that appropriate equipment be selected for any class of service.

In 1908 the Frisco, like several other roads, awoke to the advantages and economies that could be worked out by the substitution of the telephone in train dispatching, and at the same time reasoned that if the telephone was a money-saver in expediting the movement of trains, the same would apply to the handling of the message traffic, or better still, eliminate it to a great extent and incidentally reduce the great volume of correspondence with which all roads are more or less burdened.

A careful study of our line showed that we possess an advantage over many of our neighbors. Starting at Springfield, Mo., where are located our principal operating department heads, our lines radiate in six directions, four of them being the heaviest traffic sections on the road. These we decided to equip with not only a telephone dispatching circuit, but a paralleling message circuit as well, and on these two circuits superimpose a third or so-called phantom for through business between all the terminals connecting with our private branch exchanges, making a complete and flexible system for not only train dispatching and message service, but for inter communication between our larger terminals, in a way rivaling that of the commercial companies. There had not, however, so far as we could learn, been an installation of this kind made previously. Another seemingly serious obstacle to the carrying-out of the plan was the necessity of cutting two of the longest and heaviest dispatching circuits in the middle to meet operating conditions, forcing us to make up one of the side lines of abutting circuits. Owing to lack of space we were obliged to place an additional cross-arm over the entire 750 miles, on which we strung four number nine gauge copper wires, transposing each circuit every half mile alternately, and placing a phantom transposition every two miles. The result was perfectly quiet side and phantom circuits before any selectors were applied. The cutting of the dispatching circuits necessitated the installation of some special equipment in the middle of the line and at the terminals by means of

* Extracts from paper read at the annual convention of the Association of Railway Telegraph Superintendents, St. Louis, May 20.

which we were enabled to maintain the quiet side lines and phantom.

The middle-of-the-line equipment, that is to say, the points where the abutting dispatching circuits are bridged together, consists, in addition to the regular master selector equipment, of four one microfarad condensers on the terminal of each wire on the respective dispatching circuits and two No. 39A repeating coils, the centers of the coils being connected together. The message circuit terminals are similarly connected through condensers, permitting the passage of voice currents. The impulse currents actuating the selectors are passed around the condensers by ultilizing a 3,500-ohm relay, the local points opening and closing the intermediate main battery.

The terminal equipment consists of eight one-microfarad condensers, two in multiple, on each wire, and two No. 39A repeating coils tapped in the center and carried to the private branch exchange board jack. A No. 47J bell is bridged across the tap, providing a means of signaling between the exchanges on the phantom. the standard signaling current at the private branch exchange boards being sufficient to ring through. The dispatching and message circuits are also cut into the private branch exchange boards, but no connections are permitted on the former. The signaling on all the message circuits is done by the monitor operators, who are all located in the main private branch exchange operating room at Springfield, and they are on the lines all the time during the day. At night the signals, actuated by generators at all stations, are switched across the line and attract the monitor operator's attention. The monitor operator's board is provided with trunks to the various auxiliary private branch exchanges. The through calls on the phantom are handled by the private branch exchange operator; likewise, calls from the phantom to substations off her board. A phantom call for a station on any message circuit is trunked to the monitor operator, who signals the station desired. The system is, therefore, flexible.

The phantom represents, in effect, an investment of approximately $143,000, or the cost on the poles of two No. 6 B. & S. gauge copper wires fifteen hundred miles long, yet this circuit cost the Frisco Railroad less than $800 and gives three circuits out of four wires.

We have not attempted to utilize these wires for telegraph service, as the release of the telegraph dispatching circuit and the Morse circuit on all the territory referred to gave us two additional iron wires which are used for through business; all local business is now handled telephonically.

Very satisfactory and economical telephone service is obtained from the use of composite or telegraphone instruments operated on Morse circuits when confined to short distances. The Frisco has in quite a number of instances avoided opening telegraph offices by connecting a telegraph office with a non-telegraph office by means of these instruments, permitting the non-telegraph office to obtain all necessary information regarding trains, orders for cars, etc. An installation of this kind costs so little, however, that it is difficult to overcome the inclination to attempt to operate them a greater distance than they can reasonably be expected to work.

On a portion of the line ninety miles long, where we have a metallic manual block made up of two No. 8 iron wires transposed every half mile, a condition arose almost over night necessitating an additional local message Morse circuit.

Each station had two telephones, one used for blocking in each direction. By connecting the centers of the ringing coils in series with the telegraph switchboard at each station, and the centers of the terminal coils with battery a simplex circuit was obtained and placed in sevice on the second day. No additional apparatus excepting the Morse instruments was used.

H. D. Rogers.

Mr. Hiram Draper Rogers, of Boston, Mass., who celebrated the fiftieth anniversary of his marriage in that city, May 26, was for several years connected with the telephone and telegraph in the West, prior to engaging in the manifold and carbon paper business. He was born in Cincinnati, Ohio, December 16, 1834, and his early life was spent in the grocery business. When the telephone first came out, Prof. Alexander Graham Bell offered Mr. Rogers the Ohio agency, but like many others Mr. Rogers did not look upon the instrument as having any future worth. He, however, took an interest later in the firm of Post & Co., the largest manufacturers of telephone instruments in the West for many years. He was the first to introduce the typewriter in the West, and he was a charter member of the Board of Directors of the Fourth National Bank of Cincinnati, besides taking an active part in the great electrical developments during the early days. While engaged in the electrical business he was appoined Western agent for the Gold and Stock Telegraph Company, and during this connection he invented and patented a manifold printing process. This was the beginning of the business developed under the name of the Rogers' Manifold and Carbon Paper Company, of New York, which became widely known, and which supplied the manifold and carbon papers used by the Government, the telegraph companies and press associations. Mr. Rogers retired from the firm several years ago. and is now residing in Boston, in the enjoyment of good health.

Mr. C. L. Clevenberg, formerly in the telegraph service at Toronto, Chicago and now in another line of business in New York, in renewing his subscription, writes: " I congratulate you on the uniform excellence of your journal."


KERITE
1850
1913
DAYS
KERITE
1880
1890
1900
1910

Annual Convention of the Association of Railway Telegraph Superintendents.

The thirty-second annual convention of the Association of Railway Telegraph Superintendents was held at the Planters Hotel, St. Louis, Mo., May 20, 21, 22 and 23, over 200 members and ladies being present.

In calling the meeting to order on Tuesday morning, May, 20, President J. B. Sheldon expressed his gratification at seeing so many members and their wives present, and called upon Mr. Belvidere Brooks, vice-president of the Western Union Telegraph Company, New York, for a few remarks. Mr. Brooks complimented the association on having so large an attendance. He referred to the importance of harmonious relations between the telegraph company and the railway telegraph superintendents, and to the problems that were constantly arising for solution.

Mr. Charles Selden, of the Baltimore and Ohio, Baltimore, who was at one time a resident of St. Louis, was called upon to welcome the members to St. Louis, which he did in his usual felicitous style. Mr. E. P. Griffith, of the Erie, New York, on behalf of the association replied to the welcome.

The minutes of the previous meeting as printed were adopted, and then Secretary P. W. Drew, of Chicago, read communications from the Western Union Telegraph and American Telephone and Telegraph Companies extending the free use of their wires to the active members.

The report of the auditing committee, which was read by Chairman F. S. Wilbur, showed total receipts, including cash on hand June 4, 1912, of $1,972.50 and disbursements, $1,377.00, leaving a balance on hand of $595.50, and Secretary Drew announced that the association now had 200 members, active and associate.

The following active and associate members were elected:

Active—F. F. Riefel, superintendent telegraph, Lake Shore and Michigan Southern Railway, Cleveland, Ohio; R. R. Hobbs, superintendent telegraph, Louisville and Nashville Railway, Louisville, Ky.; E. J. Parrish, superintendent telegraph, New York, Chicago and St. Louis Railway, Cleveland, Ohio; J. D. Jones, division operator, Pennsylvania Railroad, Pittsburgh, Pa.; W. M. Hayes, superintendent telegraph, Pere Marquette, Railroad, Detroit, Mich.; F. W. Smith, superintendent telegraph, Bessemer and Lake Erie Railway, Greenville, Pa.; A. C. Adams, assistant superintendent telegraph, Chicago, Milwaukee and St. Paul Railway, Milwaukee, Wis.; E. L. Meyers, chief electrician, National Railway of Mexico, Mexico City, Mex.; R. N. Young, and D. Coons, superintendents of telegraph, Canadian Pacific Railway, Moosejaw, Sask. and Calgary, Alba., respectively; J. Matthews, telegraph manager, Gulf, Colorado and Santa Fé Railway, Galveston, Tex.; C. E. Nutter, assistant superintendent telegraph, Atchison, Topeka and Santa Fé Railway, Topeka, Kan.; R. F. Finley, engineer, New York Central Lines, Chicago, Ill.; M. B. Overly, engineer, telegraph department, Cleveland, Chicago and Cincinnati and St. Louis Railway, Indianapolis, Ind.; Wood Wilson, chief telephone inspector, Philadelphia, Baltimore and Washington Railroad, Wilmington, Del.; C. McCormack, superintendent telegraph, Chicago and Eastern Illinois Railroad, Danville, Ill.; C. J. Steinel, superintendent telegraph, San Pedro, Los Angeles and Salt Lake Railway, Los Angeles, Cal.; C. A. Plumley, assistant superintendent telegraph, Cincinnati, Hamilton and Dayton and Baltimore and Ohio Southwestern Railways, Cincinnati, Ohio; M. A. McCarthy, division operator, Baltimore and Ohio Southwestern Railway, Seymour, Ind.

Associate—G. A. Dull, railway agent, Central District and Printing Telegraph Company, Pittsburgh, Pa.; J. A. Kick, sales engineer, Western Electric Company, Chicago, Ill.; E. C. Hennie, General Railway Equipment Company, Sandwich, Ill.; Jay Houghtaling, Western Electric Company, Minneapolis, Minn.; Elsworth Keith, Automatic Electric Company, Chicago, Ill.; J. F. Skirrow, associate electrical engineer, Postal Telegraph-Cable Company, New York; C. B. Semple, and W. T. Kyle, Duplex Metals Company, Chicago, Ill.; G. G. Valkmar, New York Telephone Company, New York; R. N. Hill, Western Electric Company, New York; P. H. Chapman, National Electric Speciality Company, Toledo, Ohio; G. A. Graber, Kerite Insulated Wire and Cable Company, Chicago, Ill.; H. T. Wreaks, secretary, Wire Inspection Bureau, New York; H. W. Lucia, assistant engineer, sales department, General Railway Signal Company, Rochester, N. Y.; H. L. Krum, electrical engineer, Morkrum Company, Chicago, Ill.; Andrew Nilson, president, Electric Time Recorder Company, Chicago, Ill.; R. F. Spamer, engineer, sales department, Western Electric Company, New York; R. W. Whitehead, division plant superintendent, Western Union Telegraph Company, Chicago.

The reports of the executive committee and the topics committee were presented, as was also the report of the Committee on Wire Crossings, which was read by Mr. G. A. Cellar, of Pittsburgh, chairman. The latter report was, after a few amendments, adopted, and it was ordered that a copy of the specifications be submitted to the American Railway Association, and that the Wire Crossings Committee be continued indefinitely.

At the afternoon session Chairman E. P. Griffith read the report of the committee on "Form for Delivery of Telegrams to Trains." The committee concluded that a universal system for making such deliveries or reporting non-deliveries would be impracticable, and therefore recommended that the various railroads inaugurate a system that would meet the conditions existing on their respective lines.

A paper entitled "Some Facts Concerning Telephone Transmission," by Elam Miller and C. A. Robinson, was read in abstract by Mr. Robinson and discussed by Mr. M. H. Clapp. Extracts from this paper will be found elsewhere in this issue.

The next paper, entitled, "Use of Telephone by Railroads for Dispatching Trains, Handling Messages, etc.," by Mr. J. C. Johnson, of the Pennsylvania Railroad, Philadelphia, was read by Mr. I. C.

Forshee, electrical engineer of that road. This paper gave rise to a lengthy discussion, which was participated in by Messrs. Wm. Bennett, Charles Selden, E. P. Griffith, W. J. Camp, C. S. Rhoads, and others, the cost of way station telephone equipment being the subject of special interest to the members. Reference was made by the various speakers to the utility of concrete telephone booths, Mr. F. T. Wilbur dwelling particularly upon the importance of securing the best insulation of the wires running into the booths.

At the morning session of Wednesday, May 21, Mr. P. J. Howe, of the general plant department of the Western Union Telegraph Company, New York, read a lengthy paper entitled, "Inductive Disturbances as Affecting Telephone and Telegraph Lines."

In the discussion of Mr. Howe's paper, Mr. A. Wray, of the Rock Island Road, stated that the best means of keeping lines clear of inductive disturbances from light and power lines is to keep away from them wherever possible, and where the circuits must parallel power lines the parallel distance be made as short as possible. On his road they have harmonic ringers, which respond to alternating currents of different frequencies. This method of party line ringing is very successful. By its use any one of four parties may be called on a metallic line, or any one of eight called by ringing to ground from each side of the metallic circuit. He suggested that it might be possible to design relays that would respond only to the frequency for which they were built, and in this way make telegraph circuits free from inductive disturbances from parallel power circuits.

Mr. N. E. Smith, of the New York, New Haven and Hartford Road, New Haven, submitted a written communication, which was read by Mr. E. C. Keenan. Mr. Smith gave some experiences as a result of induction from the single phase, 11,000-volt traction system of his company, which disturbances he thought had no equal. He gave a detailed account of the efforts to overcome these disturbances, and the satisfactory results obtained.

Mr. M. H. Clapp, of the Northern Pacific Road, St. Paul, Minn., presented a paper on "Protection Against Lightning and High Currents for Telegraph and Telephone Equipment." It was discussed by Mr. I. C. Forshee, of the Pennylvania Road and others. Mr. Forshee described the methods of protection employed on his system.

Mr. R. E. Chetwood, plant engineer of the Western Union Telegraph Company, New York, stated that railroads spent much money on protective apparatus and the results expected were not obtained on account of poor grounds. It was hard to specify any standard methods of making grounds. The best way of obtaining a ground, he said, is to drive pipes in the earth and use salt. If necessary drive several pipes and connect them in parallel. Vacuum lightning arresters, he stated, could not always be relied on. Their efficiency depended upon the vacuum, and the word of the manufacturer was the only guarantee that could be obtained as to this. He stated that his company would soon introduce a new type of cable box, which would be an improvement on the present type of construction.

Secretary Drew announced that 252 names of attendants had been registered, this being the largest attendance in the history of the association. After the adjournment of the morning session, the entire party assembled on the steps of the Court House, opposite the hotel, and were photographed.

At the afternoon session, Mr. R. F. Spamer, engineer sales department, Western Electric Company, New York, read a paper on "Main Line Power for Selective Circuits, Including Transmission and Signaling."

In the discussion, Mr. E. C. Keenan, read a communication from Mr. C. S. Rhoads, jr., engineer of the Hall Switch and Signal Company, New York, in which it was stated that there are points other than first cost, depreciation, etc., which must be considered in the choice of battery supply for selector circuits. The human element, he stated, was a strong factor. Reliability is what is desired, not cheapness. Storage battery gives excellent results when properly maintained, but it has disadvantages. Dry battery has some excellent points in its favor. They can be installed and maintained by any inexperienced man. No reserve battery is absolutely necessary, and the first cost is reasonable. Primary cells, he said, are almost beyond consideration for railroad telephone service, except for certain specified uses. Chemical rectifiers are slow to come up to voltage after being idle. This fact is against them for main battery purposes. Motor-generators give reliable service and require very little attention.

Mr. E. E. Hudson, of the Thomas A. Edison Company, Orange, N. J., called attention to the reliability and low maintenance costs of primary cells.

A paper on the "Full Use of Wires" was read by Mr. H. D. Teed, superintendent of telegraph, St. Louis & San Francisco Railroad, Springfield, Mo.

In the discussion of Mr. Teed's paper, Mr. R. F. Finley, of the New York Central Lines West, reviewed the work done and what is proposed on his road in order to obtain the full use of facilities in placing the road on a telephone basis.

Messrs. M. H. Clapp, A. B. Taylor and others took part in the discussion, after which Mr. M. C. Allen, division plant superintendent Western Union Telegraph Company, New York, read a paper entitled, "Organization for Maintenance of Lines."

Thursday's proceedings—The paper of Mr. M. C. Allen, which was read at the Wednesday afternoon session, was discussed at length by Messrs. G. A. Cellar, A. B. Taylor, C. Selden, C. S. Rhoads, W. J. Camp, and others, all of whom commented favorably on the practicability of the plan outlined by Mr. Allen. Mr. Cellar stated that he saw no reason why the organization described by Mr. Allen would not apply to railroads as well as to telegraph and telephone service.

At this point Mr. H. J. Pettengill, president of the Southwestern Telegraph and Telephone Company, St. Louis, was introduced and expressed his

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delight at meeting many of his old friends among those present. He stated that his love for telegraph men was as great as ever, although he had graduated from the telegraph service several years ago.

Mr. J. F. Richardson, of the Canadian Pacific Railway's Telegraph. Vancouver, B. C., read the paper of Mr. J. B. Sheldon, entitled, "Organization for Wire Chiefs and Telephone Inspectors."

Messrs. W. J. Camp, A. B. Taylor, J. F. Caskey, and others, described the methods in vogue on their respective lines; and a general discussion ensued.

At the afternoon session amendments were made to the by-laws providing that hereafter only one meeting of the Eastern and Western Divisions be held annually, instead of two, and that the officers of the division be elected at the annual general meeting. The Eastern Division will hold its annual meeting in November and the Western Division in March. Additional meetings can be called on the application of five members.

A contribution of $25 was authorized toward the James D. Reid memorial fund.

The committee on "Preparing Uniform Rules for Train Orders by Telephone," through chairman L. M. Jones, of the Santa Fé, Topeka, Kan., reported progress.

At the session of Friday morning, officers were elected as follows:

President, Wm. Bennett, Chicago and Northwestern, Chicago, Ill.; first vice-president, A. B. Taylor, New York Central Lines, New York; second vice-president, W. C. Walstrum, Norfolk and Western, Roanoke, Va.; secretary and treasurer, P. W. Drew, Minneapolis, St. Paul and Sault Ste. Marie, Chicago, Ill.

New Orleans, La., was selected as the place, and May 19, 20, 21 and 22 the time for next year's convention.

Mr. W. H. Potter, Southern Railway, Washington, D. C., was, in accordance with the amended by-law, elected chairman of the Eastern Division, and Mr. E. C. Keenan, New York Central Lines, Chicago, chairman of the Western Division. After the installation of the new officers, the convention at 11.45 a. m., adjourned.

EXHIBITS.

The National Electrical Specialty Company, Chicago, Ill., made an exhibit of Vac-m lightning arresters.

Mr. M. K. Deale, manager of the St. Louis office of the Remington Typewriter Company, exhibited a typewriter with a Wahl adding and subtracting machine.

The Gottschalk Waterproof Sanitary Transmitter Company, New York, showed its waterproof transmitter in practical operation. It was represented by W. J. Lowrie, jr., secretary.

Mr. A. P. Eckert, sales manager of New York, represented the National India Rubber Company, of Bristol, R. I., and distributed a useful souvenir in the form of a memorandum book with removable pad.

The Electric Time Recorder Company, Chicago, had a complete operating exhibit of the Mastron time system, which embraces master mechanisms, secondary clocks, time recorders, time stamps, watchmen's registers and time locks. The company was represented by Messrs. Andrew Nilson and F. W. Straub.

The Railway Electric Manufacturing Company, Chicago, exhibited its alternating-current selector, which operates on an alternating current of about ten cycles per second with a current range of from two milli-amperes to 100 milli-amperes. The company was represented by Mr. H. O. Rugh, general manager.

The Central Electric Company, Chicago, demonstrated the value of indirect illumination for telegraph and general offices by a working exhibit of its Alexalite system of illumination. Some of the company's standard specialities, such as Okonite wire, Okonite and Manson tapes, Columbia lamps, Maxolite, weather proof reflectors, etc., were also shown. The company was represented by Messrs. J. Lorenz and G. M. Cox.

The Western Electric Company was represented by Messrs. G. K. Heyer, R. F. Spamer and R. N. Hill from New York, J. A. Kick from Chicago and E. V. Adams and G. E. Cullinan, St. Louis. The company's exhibit consisted of a general line of selector apparatus; a special wireless telegraph set for emergency purposes, such as bridging over short breaks in wire lines; new Western Electric vacuum protectors; telegraph and telephone jack boxes, and two types of Thompson-Levering Wheatstone bridges.

Thomas A. Edison, Inc., primary battery department, Orange, N. J., was represented by Mr. E. E. Hudson, sales manager, and Messrs. F. J. Lepreau and P. A. Garrity from the Chicago office. The company exhibited a primary battery set designed especially for way-station transmitters. The rated capacity of this battery is 200 hours, or sufficient to give approximately five years' continuous service on one charge, without attention, on average way-station telephones. The same battery can be used for local ringing and local relays where desired.

The exhibit of the Automatic Electric Company, of Chicago, covered the two types of private branch exchange telephone systems; the standard Keith line switch type board; the individual connection type board arranged for conference calling and 100 per cent trunking; telephone train-dispatching selector system; Holtzer-Cabot motor-generator sets, and a line of "Raven Brand" supplies. The Monarch synchronized time system was also exhibited. This is a straight two-wire, multiple system. The company was represented by Mr. J. H. Finley, supply sales engineer.

The Hall Switch and Signal Company, which has recently announced that it has taken over the business of the General Railway Equipment Company, the latter including the business of the United States Electric Company and the Sandwich Electric Company, exhibited a number of new types of telephone arms designed for railway service, and which provide substantial construction with low maintenance expense. A sample of the new complete telephone equipment used by the Missouri Pacific Railroad in districts operated under telephone, block and dispatching systems and Gill and Sandwich selectors, now manufactured by this company, were also shown. The company was represented by Messrs. W. E. Harkness and J. L. Moore from the New York office, and Mr. W. L. Cook from the Chicago office.

Mr. J. J. Ghegan, president and general manager of J. H. Bunnell & Co., Inc., New York, made an exhibit in his room of a new vibrating transmitter just brought out by his company. It has been named the "Goldbug," and in construction it is exceedingly simple, with but few parts. He also showed a new type of the C. Q. A. relay on a slate base, 5¾ by 3 inches, with a miniature spring-jack located crosswise on the base beneath the magnet spools for the purpose of connecting automatic transmitters in circuit. The relay also has an extra dead post to facilitate the connecting of a resonator and local battery, and a novel tension spring adjustment. New types of vulcan fire alarm signal boxes, a resonator-base sounder, two Ramsay switches and Jove dry cells were also shown. Mr. Ghegan distributed, as souvenirs, copies of "Lightning Flashes," tape measures, polished hard rubber match safes and celluloid-covered memorandum books.

ENTERTAINMENT

On Monday evening an informal reception was held at the Planters' Hotel, and was largely attended.

Tuesday noon the ladies of the party were given a luncheon in the Jefferson Hotel, and in the afternoon special private trolley cars conveyed them to Shaw's Garden.

Tuesday evening an informal dinner and entertainment was given to the members and the ladies by the St. Louis League of Electrical Interests, Jovian Chapter, at the Missouri Athletic Club. It was an extremely interesting and enjoyable affair. Mr. W. J. Hiss, general manager of the Southwestern Telegraph and Telephone Company, St. Louis, made a delightful toastmaster, and kept the audience in continual laughter by his humorous references in introducing the speakers. No one was permitted to speak more than five minutes. Remarks were made by Mr. Rogers, who represented the Mayor of St. Louis, and welcomed the delegates to the city; Mr. E. S. Bloom, vice-president of the Southwestern Telegraph and Telephone Company, Messrs. J. B. Sheldon, G. A. Cellar, W. J. Camp and F. D. Beardsley, St. Louis Statesman of the Jovian Order, who spoke for the Order of the Sons of Jove.

Two laughable incidents occurred during the speaking. In introducing President J. B. Sheldon, the toastmaster stated that Mr. Sheldon was an upright, home-loving man, and had a clean record up to four years ago, when something happened. What it was he did not dare tell. When Mr. Sheldon arose to speak, a fashionably dressed young woman (a man dressed up for the occasion) rushed in to where he stood and affectionately pleaded with him to return to her, claiming to be his wife. It was several minutes before the uproar of laughter caused by this scene subsided, and Mr. Sheldon could compose himself sufficiently to proceed with his remarks.

Mr. W. J. Camp was in the middle of an interesting story when his five-minute limit expired. The ringing of a loud gong announced this fact. When the gong ceased he attempted to finish, but he was promptly shut off by the bell.

Following the address there was an exhibition of ventriloquism and Edison moving pictures. The entertainment was concluded by the singing of patriotic airs accompanied by music. The orchestra was composed of employes of the Union Electric Light and Power Company, St. Louis, and rendered excellent music throughout the evening.

A luncheon was served to the ladies at the Buckingham Club, Wednesday, and was followed by a musicale. In the evening the entire party boarded the steel ferry boat, "W. S. McChesney, jr.," and enjoyed a ride down the Mississippi River. During the trip refreshments were served, and a party of six colored men rendered plantation music and songs. Dancing on deck was also indulged in.

At 5.15 p. m. Thursday the entire party was taken on an automobile ride through the residence and park sections of the city, and afterward conveyed to Cafferatta's summer garden, where a banquet was tendered the visitors by the Southwestern Telegraph and Telephone Company. A few remarks of welcome were made by Mr. H. J. Pettengill, president of the telephone company, and President J. B. Sheldon replied in behalf of the Association. Mr. W. J. Hiss, general manager of the telephone company, presided. An interesting vaudeville programme was afterward carried out. The entertainment was a delightful one, and much enjoyed, notwithstanding the cool weather, which made it necessary to wear overcoats and wraps.

On Friday afternoon the party visited the Anheuser-Busch brewery, and after inspecting the plant, refreshments were served.

NOTES

Mr. H. O. Rugh, general manager of the Railway Electric Manufacturing Company, Chicago, Ill., was taken suddenly ill on May 21, and was removed to a hospital, where he was operated on for appendicitis. Many expressions of regret were heard from the members, and Mr. Rugh's condition was announced at each day's session of the convention. His progress toward recovery was, at last reports, very satisfactory.

The entertainment committee, of which Mr. E. A. Chenery was chairman, received much praise from every one for the able manner in which they performed their exacting duties. The entire entertainment programme was of the highest order and much enjoyed by the members and the ladies of the party. Although the skies were overcast most of the time there was no rain or other untoward condition to mar the general pleasure. Among the St. Louis members of the committee were Messrs. Claude L. Matthews and W. J. Hiss.

ATTENDANCE.

Altoona, Pa.—Mr. and Mrs. J. H. Ditch.

Angelica, N. Y.—Mr. and Mrs. C. L. Lathrop.

Atlanta, Ga.—Mr. and Mrs. L. H. Beck.

Baltimore, Md.—B. H. Andersen, Charles Selden.

Battle Creek, Mich.—Mr. and Mrs. E. D. Hubbard.

Bloomington, Ill.—T. M. Haston.

Brooklyn, N. Y.—C. A. Robinson.

Chicago—Mr. and Mrs. Wm. Bennett and daughter, Margaret; Mr. and Mrs. J. H. Brennan, T. W. Carroll, M. T. Cook, Mr. and Mrs. W. L. Cook, Mr. and Mrs. A. V. Cornish, G. M. Cox, Mr. and Mrs. P. W. Drew, S. R. Edwards, J. H. Finley, Mr. and Mrs. R. F. Finley, A. G. Francis, P. A. Garrity, Mr. and Mrs. E. H. Gifford, jr., C. H. Hubbell, Mr. and Mrs. E. C. Keenan, E. Keith, J. A. Kick, Mr. and Mrs. V. T. Kissinger, Mr. and Mrs. O. T. Lademan, F. J. Lepreau, Mr. and Mrs. J. M. Lorenz, W. J. Lowrie, jr., Mr. and Mrs. W. C. Lindsay, W. H. Liscomb, C. A. Luckey, Thos. G. Meinema, A. Nilson, E. A. Patterson, G. O. Perkins, Wm. Ross, H. O. Rugh, C. B. Semple, F. W. Straub, Mr. and Mrs. F. H. Van Etten, Mr. and Mrs. R. W. Whitehead, Mr. and Mrs. F. T. Wilbur, B. L. Winchell, jr., C. A. Worst A. Wray.

Cincinnati, Ohio—C. A. Plumly.

Cleveland, Ohio—J. G. Moore, Mr. and Mrs. E. J. Parrish, F. F. Riefel.

Dallas, Tex.—P. K. Baker, J. G. Hilbert, E. M. Mulford and daughter, Marjorie S., and son, Hilliard N.; I. D. Hough, Mr. and Mrs. M. B. Wyrick.

Danville, Ill.—C. McCormack.

Decatur, Ill.—Mr. and Mrs. J. P. Church.

Denison, Tex.—Mrs. J. G. Cook, Mr. and Mrs. W. H. Hall.

Denver, Col.—E. E. McClintock, W. J. Lloyd, W. C. Titley, Mr. and Mrs. J. M. Walker, H. T. Vaille.

Detroit, Mich.—Mr. and Mrs. W. M. Hayes, Mr. and Mrs. J. J. Ross.

Flora, Ill.—John Page.

Galveston, Tex.—J. Matthews.

Gibson, Ind.—Mr. and Mrs. W. L. Connelly.

Grand Rapids, Mich.—F. A. Merrill.

Greenville, Pa.—Mr. and Mrs. F. W. Smith.

Indianapolis, Ind.—M. B. Overly, C. S. Rhoads.

Kansas City, Mo.—C. E. Marsh, Mr. and Mrs. Val B. Mintun and Miss Ruth Mintun, R. L. Logan.

Louisville, Ky.—R. R. Hobbs.

Memphis, Tenn.—W. E. Bischoff, D. J. Kavanaugh.

Montreal, Que.—W. W. Ashald, Mr. and Mrs. W. J. Camp, Mr. and Mrs. Thos. Rodger and Miss Laura Rodger, A. Dwight Smith.

New York—C. G. Baird, A. R. Brewer, Belvidere Brooks, R. E. Chetwood, A. P. Eckert, W. N. Fashbaugh, J. J. Ghegan, W. E. Harkness, Mr. and Mrs. G. K. Heyer, R. H. Hill, P. J. Howe, Mr. and Mrs. B. A. Kaiser and Miss T. Kaiser, J. R. Kearney, A. Lockwood, G. A. Nelson, W. W. Ryder, Thos. R. Taltavall, Mr. and Mrs. A. B. Taylor, Mr. and Mrs. A. D. Walters, G. M. Yorke, J. W. Young.

Oklahoma City, Okla—A. R. Lingafelt.

Omaha, Neb.—Mr. and Mrs. C. B. Horton, W. P. McFarlane, Mr. and Mrs. J. B. Sheldon.

Orange, N. J.—E. E. Hudson, H. G. Thompson.

Passaic, N. J.—Mr. and Mrs. E. P. Griffith, and son, Francis.

Philadelphia, Pa.—I. C. Forshee.

Pittsburgh, Pa.—Mr. G. A. Cellar, G. A. Dornberg, G. A. Dull, Mr. and Mrs. L. A. Lee and daughter, Dorothy.

Portsmouth, Va.—Mr. and Mrs. W. F. Williams.

St. Louis—Mr. and Mrs. E. D. Anderson, Mr. and Mrs. E. V. Adams, Mr. and Mrs. W. J. Armstrong, E. H. Bainter, F. E. Balti, Mr. and Mrs. W. G. Barry, Mr. and Mrs. F. E. Bentley, C. A. Bergsten, R. H. Bohle, J. C. Browne, Mr. and Mrs. D. M. Buchanan, Mr. and Mrs. W. R. Chapman, Mr. and Mrs. E. A. Chenery and son, K. S. Chenery; W. H. Dayton, Mr. and Mrs. A. T. Eyerman, J. L. Fay, Miss Grace Franks, Mr. and Mrs. B. W. Frauenthal, S. T. Hatcher, C. E. Heston, W. J. Hiss, R. R. Hobbs, B. D. Hull, Miss Kauffman, F. O. Ludlow, Alan MacEven, C. N. McNeill, Mr. and Mrs. J. P. Marshall, C. L. Matthews, Mr. and Mrs. J. H. Otey, T. H. Rogers, G. B. Ross, J. P. Ryan, D. T. G. Smith, W. H. Spain, Mr. and Mrs. R. Spaner, H. Sullivan, H. J. Woods.

Topeka, Kan.—Mr. and Mrs. L. M. Jones, C. Nutter.

Toledo, Ohio.—I. W. Becker, P. H. Chapman, J. F. Greene.

Richmond, Va.—T. R. Gooch.

Roanoke, Va.—W. C. Walstrum.

Rochester, N. Y.—M. F. Geer, H. W. Lucia.

St. Albans, Vt.—Mr. and Mrs. M. Magiff.

San Francisco, Cal.—Mr. and Mrs. G. J. Bayless.

St. Paul, Minn.—Mr. and Mrs. M. H. Clapp, E. E. Dildine.

Seymour, Ind.—M. A. McCarthy.

South Bethlehem, Pa.—Mr. and Mrs. J. F. Caskey.

Springfield, Mo.—Mrs. F. Kern, Mr. and Mrs. H. D. Teed.

Swissvale, Pa.—G. H. Groce.

Syracuse, N. Y.—Mr. and Mrs. S. L. Van Atkin, jr.

Valparaiso, Ind.—G. M. Dodge.

Vancouver, B. C.—J. F. Richardson.

Washington, D. C.—J. T. Nolan, W. H. Potter.

Western Springs, Ill.—Mr. and Mrs. J. H. Finley.

Wilmington, N. C.—W. P. Cline, Wood Wilson.

LARGE CABLES.—A lead-sheathed cable recently made for the Western Union Telegraph Company by the Western Electric Company consisted of two lengths of 37-pair cable, each of which was 5,500 feet long. This is 220 feet more than a mile. The thickest cable made contains 600 pairs of No. 22-gauge wire, and has an outside diameter of 2⅝ inches.

THE RAILROAD.

THE Order of Railroad Telegraphers, Dispatchers, Agents and Signalmen, met in annual convention at Harrisburg, Pa., May 19.

WIRELESS ON PENNSYLVANIA ROAD.—It is stated that the Pennsylvania Railroad is making arrangements to establish a wireless telegraph system on its lines, between Philadelphia, Altoona, Pittsburgh and other division points.

MR. FRANK TREMBLE, superintendent of telegraph, Texas and Pacific Railway Company, Dallas, Tex., writes: "This company has no train-dispatching telephone circuits, and does not contemplate the installation of this class of telephone circuits during the coming year."

MR. C. J. STEINEL, superintendent of telegraph of the San Pedro, Los Angeles and Salt Lake Railroad Company, Los Angeles, Cal., states that his road has a total mileage of 1,092, all operated by telegraph. No dispatching is done by telephone, excepting in emergencies when the ordinary railway composite telephones are used on a grounded telegraph circuit.

CANADIAN NORTHERN STATISTICS.—Mr. W. C. Muir, general superintendent of the Canadian Northern Telegraph Company, Winnipeg, Man., states that his company operates the telegraph service in connection with the Canadian Northern Railway. The pole mileage is 4,521 and the wire mileage, 5,228. The number of offices is 294. These figures apply to the Canadian Northern Railway proper, and do not include any in connection with the Canadian Northern Ontario, operating out of Toronto.

RAILWAY TELEPHONE DISPATCHING STATISTICS.—Mr. W. M. Hayes, superintendent of telegraph Pere Marquette Railroad, Detroit, Mich., reports that his road has a mileage of 2,330, and that trains are dispatched by telephone on 564 miles and by telegraph on 1,209 miles. This information was received too late for inclusion in the table on page 296 of the May 16 issue, giving statistical information regarding telephone and telegraph dispatching on railroads throughout the United States and Canada.

THE Order of Railroad Telegraphers, which concluded its biennial session last week at Baltimore, Md., was the best attended gathering of this organization ever held. It was stated that increases in pay, amounting to $2,000,000 per annum, had been secured through the efforts of the organization during the past twelve months. The membership is stated to be 42,000. There was over 500 delegates in attendance.

A trip to Washington and Mount Vernon was one of the entertainment features of the gathering.

The convention passed a resolution urging that a Federal eight-hour law be passed by the present Congress for railroad telegraphers.

Railway Telegraph and Telephone Appliance Association.

At a meeting of the Railway Telegraph and Telephone Appliance Association held in St. Louis, Mo., May 22, Mr. E. E. Hudson, of Thomas A. Edison, Inc., Orange, N. J., was elected chairman; Mr. W. E. Harkness, of the Hall Switch and Signal Company, New York, vice-chairman, and Mr. G. A. Nelson, of the Gordon Primary Battery Company, New York, secretary and treasurer. Executive committee: Messrs. H. G. Thompson, Edison Storage Battery Company, Orange, N. J.; J. Lorenz, Central Electric Company, Chicago, and A. P. Eckert, National India Rubber Company, New York.

MUNICIPAL ELECTRICIANS.

WILLIAM A. MCCONNELL, aged 65, identified with the Police Telegraph System of Brooklyn, N. Y., for the past forty-two years as a telegraph operator, died May 23.

MR. GEORGE ALEXANDER, Mayor of Los Angeles, Cal., writes us under date of May 12, to the effect that he has not yet appointed a fire and police telegraph superintendent, as has been reported. The Mayor states that he is waiting for the civil-service list of eligibles, and as soon as the list is submitted to him he will make a selection.

THE WATERTOWN CONVENTION.—The International Association of Municipal Electricians will hold its eighteenth annual convention at Watertown, N. Y., August 19 to 22, and the programme so far as arranged indicates that the meeting will be a notable one as far as papers and discussions are concerned. The entertainment programme provides for plenty of enjoyment, especially for the ladies. The convention will be held at the new Woodruff Hotel, and the annual dinner will be held in the evening of August 21. Mr. John W. Kelly, jr., chief of electrical bureau, Camden, N. J., is president, and Mr. Clarence R. George, city electrician, Houston, Tex., secretary.

CANADIAN NOTES.

Mr. D. Ross Ross, secretary and treasurer of the Montreal Telegraph Company, Montreal, Que., was a New York visitor on May 24.

The Canadian Pacific Railway Company's Telegraph, will move into its new office at Toronto, Ont., about June 16. It is stated that it will be the most up-to-date telegraph plant in Canada.

THE TELEPHONE.

Sale of Telephone Company.—The National Telephone Company, of Pennsylvania, was sold at auction in Washington, Pa., to satisfy a mortgage to secure $200,000 bonds. The property was bought by E. T. Norton, of Wheeling, W. Va.

The Telephone in Constantinople.—Progress in the installation of the telephone in Constantinople, Turkey, has been delayed by the impossibility of getting the necessary cables and ducts from Great Britain, these being contraband of war. Over 3000 subscribers to the service have been enrolled.

Telephone Service at the Panama-Pacific Exposition.—The Pacific Telephone and Telegraph Company will have a notable working exhibit at the Panama-Pacific International Exposition in San Francisco, Cal., in 1915. The main switchboard will have thirty positions, and the entire plant will be enclosed in glass, to enable visitors to the exposition to view the operation of receiving and answering calls. There will be public booths at various points in the grounds and in every exhibit place, and, taken altogether, the system will represent that of a city.

RADIO-TELEGRAPHY.

Wireless Stations in Australia.—There are eight high-power wireless stations in Australia transmitting public business. These are at Sydney, Melbourne, Adelaide, Fremantle, Hobart, Brisbane, Thursday Island and Port Moresby. Stations are to be opened in the near future at ten other places.

OBITUARY.

Charles C. Murdock, an old time telegrapher, died at Brocton, Mass., May 14. Mr. Murdock was a member of the signal corps during the civil war. He was an artist of considerable reputation.

Talking Machine Records.—Telegraphers possessing talking machines will be interested in the announcement of Mr. Walter P. Phillips, on another page of this issue. The records, as announced therein, are made of the best artistic executions, and by purchasing direct from the factory through Mr. Phillips, the middleman and his profits are eliminated. The records are forwarded free to any part of the world. We understand that Mr. Phillips desires to establish agencies. This will furnish an opportunity for our friends to engage in a side line that will bring them in liberal returns. Write to him for particulars.

OLD TIMERS' REUNION.—The Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps will hold their annual reunion at the Hotel Cadillac, Detroit, Mich, August 26, 27 and 28.

The hotel rates are $3.50 per day minimum on the American plan, and $2.00 per day minimum on the European plan. The programme of the reunion was published in our issue of May 16.

T. M. B. A. ASSESSMENT.—Assessments Nos. 552 and 553 have been levied by the Telegraphers' Mutual Benefit Association to meet the claims arising from the deaths of: Russell E. Post, at Clarksburg, Pa.; Irvin Sheldon, at Elko, Nev.; George M. Schuster, at Brooklyn, N. Y.; George W. McGovern, at Washington, D. C.; William Dumars, at San Francisco, Cal.; Edward A. Bartow, at Albany, N. Y.; James McParlan, at New York; Richard S. Peters, at Syndney, N. S.; Miller K. Smith, at Clinton, N. Y.; Francis A. Pressell, at Philadelphia, Pa.; John J. Wolfrun, at Kansas City, Mo.; John A. Kenna, at New York; Michael H. Collins, at New York; Thomas Murphy, at Oneida Castle, N. Y.; Alexander D. Wilbur, at Catskill, N. Y.; Thomas H. Spencer, at Lexington, N. C.

MR. L. B. FOLEY, superintendent of telegraph, Delaware, Lackawanna and Western Railroad Company, New York, states that the Cardwell printing telegraph is being tested on the company's New York and Scranton circuit. So far the results have been very satisfactory.

Important Telegraph Engineering Articles.

Among the important telegraph engineering articles which have appeared recently in our paper, and which ought to be in the hands of every student member of the profession, is the description of the new quadruplex system of the Postal Telegraph-Cable Company described in the December 1, 1912, issue. The bridge duplex adopted by the Western Union Telegraph Company was described in our issues of December 1 and 16, 1912, January 1 and 16, and February 1, this year. These articles were fully illustrated, and copies can be obtained at ten cents each.

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

MR. HERMAN ROSENGARDEN, aged 65 years, who had charge of the messenger boys in the delivery department at 195 Broadway, died May 22.

PHILADELPHIA POSTAL

Among the recent visitors at this office was Mr. M. M. Davis, electrical engineer and chief engineer of telephones, New York. Mr. C. H. Krewson has been assigned to the night force to look after the Morkrum printers.

Telegraph and Telephone Age

No. 12 NEW YORK, JUNE 16, 1913 Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Something About Electric Lamps.

As soon as a body becomes heated to a greater degree than its surroundings it begins to radiate energy; first in the form of heat, and later, when the heat waves have attained a certain length, part of the radiant energy is manifested in the form of light.

In electric lamps nearly all of the electric energy is transformed into heat, a great proportion of which is given off as radiant energy, only a small portion of which becomes visible as light. The higher the temperature of the radiating body, the nearer the visible radiation approaches the maximum. Hence by increasing the temperature of the filament the specific consumption of energy in watts is decreased. This accounts for the fact that high-efficiency lamps have shorter lives than those having a lower efficiency. It is said that the maximum efficiency would be reached at a temperature of 6,800 degrees Centigrade, but no solid body could endure such a heat. The temperature of incandescent lamp filaments ranges between 1,550 and 1,600 degrees Centigrade.

It is obvious, therefore, that the various improvements made in modern commercial lamps consist merely of new methods which utilize a greater proportion of the radiant energy without increasing the expenditure of electric energy. This end is attained principally by the use of different materials in the construction of the filament.

The carbon filament lamp invented by Mr. Thomas A. Edison was the first practical lamp put into use and no marked advance in lamp construction was made for many years. It consumed between four and five watts per candle. Later the Gem lamp appeared, which gave an illumination of one candle-power for about three or four watts, the higher efficiency being due to a certain process of baking the carbon filament. After this came lamps of a still higher order in which the filament consists of tantalum, tungsten, etc., and which give a somewhat whiter light. The specific consumption of tantalum filament is from two to three watts per candle; graphitized (metallized) filament, two and one-half watts; tungsten, one to one and one-quarter watts; osmium, one and one-half, and zirconium, one watt.

The useful life of an incandescent lamp is about eighty per cent of its actual life. The former refers to the number of hours a lamp may be used economically; the latter to the number of hours it may be used until the filament breaks through weakness due to its deterioration. Roughly speaking, the average useful life of most of the commercial carbon filament lamps is about 800 hours, actual life 1,000 hours, although individual lamps frequently last much longer; tungsten and tantalum lamps from 1,500 to 1,800 hours.

ARC LAMPS.

The arc lamp of the open type was invented more than a century ago, but did not become of practical value until within the past thirty years. Modern arc lamps possess a very high degree of efficiency and, like incandescent lamps, may be operated by either direct or alternating currents. The electrodes are usually carbon, but in some types other material is used. In this lamp the light emitted is due to the incandescence of the vapor-stream or arc which forms between the tips of the two carbon rods when an electric current is supplied. The intense light is due to the high degree of temperature of the vapor, being approximately 3,700 degrees Centigrade, the highest temperature at present attainable. For this reason the arc is utilized in electric furnaces for melting and reducing refractory substances.

Arc lamps are construced in two types, the "open" and the "enclosed" arc. The only difference between the two is that a small glass globe surrounds the carbon tips of the latter and forms a chamber in which the oxygen is mostly all exhausted and replaced by accumulated gas, which prolongs the life of the electrodes. The enclosed arc type gives a greater length of flame, emits a steadier light and requires comparatively little attention.

THE FLAMING ARC.

The construction and operation of the flaming arc lamp is, in principle, the same as that of the ordinary arc lamp, but the lamp emits approximately five times the total luminous flux that the enclosed arc produces for the same amount of electric energy, and operates by direct current only. It also differs from the enclosed arc type inasmuch that the greater portion of the light emitted emanates from the flame itself instead of the incandescent electrode tips.

The color of the light emitted by these lamps may be yellow, pink or silver, depending upon the composition of the electrodes. The golden flame is considered the most efficient; then comes pink, followed in turn by silver.

Flaming arc lamps are used principally for open-air installation, where a flood of light is desired, and are particularly well adapted for attracting attention to certain localities, such as hotels, theatres, etc., but are not suitable for interior illumination owing to the disagreeable odors they give out. They are also not considered suitable for the display of goods in windows and stores, as the light impairs the true color-values of such objects. Furthermore, they require considerable attention, as some types of lamps must be trimmed every day, and others at irregular intervals.

THE NERNST LAMP.

The Nernst lamp properly belongs to the incandescent class although constructed somewhat after the manner of the arc type. This lamp is probably the best for preserving the natural color values of the material upon which the light falls, with the exception that pure white assumes a slight cream color and black a somewhat rusty appearance.

The peculiarity of this lamp is that the light-emitting element, called the "glower," is a non-conductor of electricity when cold and a good conductor when hot. For this reason it must first be heated by auxiliary means before it will become incandescent. This is accomplished by means of a heat coil, and requires about ten or fifteen seconds to raise the temperature to the proper degree. Aside from this disadvantage, it is one of the most efficient lamps produced, as its current consumption is only about half that required for carbon filaments for an equal volume of light.

VAPOR LAMPS.

In this type of lamp the light is produced by the passage of an electric discharge through mercury vapor enclosed in a long glass tube having an electrode at each end. The passage of the current excites the vapor to incandescence and gives out a soft mellow light of a green tinge. It casts practically no shadow, and is used quite extensively in factories and many places where the preservation of color-values is not important. The lamp is started by first establishing a circuit through the mercury in the tube and then breaking it. The resulting arc thus formed causes the vapor to become conductive and allows the current to pass through the entire length of the tube, thus raising the vapor, which then connects the two electrodes to the point of incandescence. Vapor lamps consume only one-half of a watt per candle.

It will thus be seen that notwithstanding the advantages any one type of lamp may possess over that of another, each has its individual sphere of usefulness.

Telegraph and Telephone Patents.

ISSUED MAY 20.

1,062,004. Telephone System. To R. C. M. Hastings, Columbus, Ohio.

1,062,082. Telephone Receiver. To E. B. Craft and J. N. Reynolds, New York.

1,062,161. Telephony. To I. Kitsee, Philadelphia, Pa.

1,062,387. Measured-Service Telephone System. To J. Erickson, Chicago, Ill.

1,062,577. Telephone System. To E. E. Kleinschmidt, New York.

ISSUED MAY 27.

1,062,754. Telephonic Apparatus. To C. Adams-Randall, Boston, Mass.

1,062,824. Telegraph System. To C. M. Edwards, Galveston, Tex.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, June 9:

American Telephone and Telegraph Co.	126⅝
Mackay Companies	77
Mackay Companies, preferred	66⅛
Western Union Telegraph Co.	60

PERSONAL.

MR. H. H. HALL, an old-time telegrapher, of Ashtabula, Ohio, now retired, is visiting relatives and friends in New York. Mr. Hall began his telegraphic career in 1852.

MR. EMMETT HOWARD, the well-known old time telegrapher of Memphis, Tenn., who severed his relations with the telegraph service ten years ago on account of ill health, has fully recovered his former vigor. Mr. Howard is now district manager of the Mutual Life Insurance Company of New York, with headquarters at Memphis.

MR. T. J. DUNN, one of New York's best known operators and an inventor of transmitting devices, has almost entirely recovered from a serious accident met with early in May. A wall clock weighing thirty-four pounds fell on Mr. Dunn's head, cutting an ugly gash, which confined him to his home for over a month. Mr Dunn philosophically remarked that it was bad enough to work your brains out, but it's awful to have them battered out by what was supposed to be a friendly timepiece.

MR. H. C. WILSON, superintendent of telegraphs of the Inland Telegraph Department, Jamaica, B. W. I., retired from the service May 1. He held the position since March 1, 1879, and rendered excellent service to the colony. Mr. Wilson is a native of England, and entered the telegraph service in London at the age of 13 years. For many years he was connected with the cable service in various parts of the world, and was engaged in commercial business in Jamaica from 1876 to 1879, when he was appointed to the position which he has just relinquished. Mr. C. F. Duff has been appointed officer in charge of the telegraph department of Jamaica at Kingston, to succeed Mr. Wilson.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. E. B. PILLSBURY, general superintendent, New York, has returned to his office after an extended trip of inspection through the Eastern Division.

THE HEADQUARTERS of various district superintendents will be transferred as follows: C. H. Ashburn from Atlanta, Ga., to Richmond, Va.; W. C. Daviet from Atlanta to Louisville, Ky.; F. W. Sprong from Chicago to Cleveland, Ohio; A. L. Lafferty from Chicago to Detroit, Mich.; J. F. Looney from Chicago to St. Louis, Mo.; W. C. Lloyd from Atlanta to Birmingham, Ala.

MR. W. I. CAPEN, general superintendent of plant, New York, has returned to his office, after an extended business trip to the Pacific Coast. The extension of the lines now in the course of construction in Missouri, Kansas and Texas is being pushed rapidly to completion.

NEW LINES IN THE SOUTHWEST.—This company will during the present summer construct a new system of telegraphs in the Southwest aggregating 571 miles. Beginning at Kansas City, Mo., a line will be built along the Frisco Railroad to Joplin, Mo., a distance of 179 miles, then to Vinita, Okla., 56 miles. From the latter place the line will be extended to Muskogee, on the Missouri, Kansas and Texas Railroad, a distance of 65 miles, then to McAlister, Okla., 62 miles. Branch lines will also be constructed from Muskogee and Tulsa, Okla., from Joplin to Springfield, Mo., and from Muskogee, Okla., to Ft. Smith, Ark.

MR. C. A. JOHNSON, manager of this company's office at Meadville, Pa., arrived in New York from Italy on June 2, and will assume charge at Meadville at an early date. Mr. Johnson has been in Italy for over a year on leave of absence in the interests of the Roland Printing Telegraph System, which is in use in that country.

MR. JAMES H. WILSON has been appointed assistant manager at Philadelphia, Pa., vice A. E. Zintl, resigned.

MR. E. P. TULLY, New York City manager of the company, is spending his vacation at Atlantic City.

MR. CHARLES A. SHERR has been appointed manager of the Mackay Telegraph and Cable Company, at Little Rock, Ark., vice B. D. Snyder, transferred to Dallas, Tex.

THE GREENVILLE, MISS., office of this company is being repaired and put in first-class condition. The city loop running from the main line to the uptown office is being rebuilt, and the call circuit is being extended to all the business houses in the eastern portion of the city. Mr. C. Savage is manager.

THE SIXTH ANNUAL OUTING of the New York branch managers of the Postal Telegraph-Cable Company will be held at Witzel's Point View Island, College Point, L. I., Saturday afternoon, June 28. There will be field games, a dinner and a vaudeville entertainment. Superintendent C. F. Leonard will be the guest of honor and will make an address. The party will leave pier 8, East River, on the steamboat "Nassau," at 1 p. m. The judges of the games will be Messrs. J. J. Whalen, W. J. Deegan and F. E. McKiernan. Mr. T. J. Donovan is chairman and Mr. J. J. McDermott secretary.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

AT THE QUARTERLY MEETING of the directors, held June 11, J. P. Morgan and Vincent Astor were elected directors, to succeed J. Pierpont Morgan and H. M. Flagler, deceased. The by-laws were amended to make the calendar year the fiscal year of the company, and the annual meeting will hereafter be held on the second Wednesday in April, instead of the second Wednesday in October. The by-laws were also amended to provide for the election of a comptroller. A dividend of ¾ of one per cent was declared.

MR. E. Y. GALLAHER, general auditor, has been elected comptroller of the company. This is a new office and carries with it new duties.

MR. H. W. LADD.—The title of Mr. H. W. Ladd has been changed from assistant auditor to auditor of this company.

MR. T. A. MCCAMMON, district superintendent in charge of the main office, 195 Broadway, New York, has been appointed traffic superintendent in charge of the main and all branch offices in New York City.

MR. E. T. BURRILL, formerly general traffic chief, has been advanced to the position of chief operator of the main office operating department, 195 Broadway, New York.

MR. J. W. COLLINS, district supervisor of equipment, Philadelphia, Pa., and Mr. A. D. Wetmore, district plant superintendent, St. John, N. B., were recent executive office visitors.

THE REGULAR MONTHLY MEETINGS of the New York commercial departments 1, 2 and 3, were held May 27 and 28 and June 6, and were devoted entirely to the affairs of receiving and delivery clerks. Instructive papers were read by some of the clerks and their quality was highly commmented on by the officials present. Mr. A. G. Saylor, general manager of the Eastern Division, was present at all of the meetings and made addresses to the clerks.

THE CABLE.

Directors Re-elected.—The directors of the Central and South American Telegraph Company were re-elected at a meeting in New York on June 3.

Mr. Temple Bowdoin has been elected a director of the Mexican Telegraph Company to fill the vacancy caused by the death of J. P. Morgan. All of the other directors were re-elected.

The French Cable Company has reduced its press rates between New York and England and France to seven cents per word, such business being transmitted at any time. The new rate took effect May 25.

The French Cable Company's Employes' Association will hold its annual outing on July 6 at Witzel's, College Point, Long Island.. Mr. E. C. Sweeney is honorary president; L. M. Desnouee is the chairman; Michael J. Martin, secretary, and Chas. Limbrick, treasurer. F. J. Sherry, John McCune, George Bain, Arthur Harrigan, E. McGuire and N. A. Weiss constitute the committee of arrangements.

The New Panama-Santa Elena Cable.—The Norddeutsche Seekabelwerke cable steamer "Stephan," with the new Panama-Santa Elena cable of the Central and South American Telegraph Company, arrived at Panama, May 23. The shore end was landed May 27 and the paying out of the cable toward Santa Elena was commenced the next day, the final splice being completed off Santa Elena June 3. This is regarded as an excellent piece of cable work. The total length of the cable is 753 nautical miles. The cable is now working satisfactorily in every respect and will materially aid in expediting the transmission of messages to Peru, Chile and Argentina. For some months prior to the completion of this new direct Panama-Santa Elena cable the time of transmission between New York and Buenos Aires averaged less than sixteen minutes.

CANADIAN NOTES.

Mr. E. H. Hiscock, of the Grand Trunk Pacific Telegraph Company, Winnipeg, has been appointed electrical inspector of the same interests, with headquarters at Edmonton, Alta.

W. E. Griffiths, aged 75 years, a pioneer Canadian telegrapher, died in Toronto, Ont., June 3. He was for many years employed in the post-office service, and was superannuated thirteen years ago.

Extensions in Newfoundland.—The Newfoundland Government will build 250 miles of telegraph line along the seaboard during this season, in extension of the present facilities, which cover 500 miles. The Government will also build three more wireless stations on Labrador and establish a telephone system for St. Johns and a number of the outlying places.

Grand Trunk Pacific Telegraph.—The following appointments have been made in the Grand Trunk Pacific Telegraph Company's service: R. M. Hicks, city manager at Edmonton, Alberta, vice W. G. M. Corregan, resigned; J. D. Edgett, city manager at Saskatoon, Sask., vice R. M. Hicks, transferred; A. J. Hoag, night manager at Winnipeg, Man., vice J. G. Edgett, promoted. Mr. Hulatt is commercial and traffic superintendent of the company, with headquarters at Winnipeg.

Queen Mary Opens a Canadian Hospital by Telegraph.

On June 3, at 1:30 p. m., the door of the hospital for consumptives at Weston, near Toronto, Ont., was formally opened by an electrical signal started by Queen Mary at Buckingham Palace in London. The signal came direct from the Queen's hand to the hospital door, all of the connected circuits having been previously cleared for the interesting ceremony.

The circuit consisted of a special wire from Buckingham Palace connecting with the English land lines, the Commercial Cable Company's system and the Canadian Pacific Railway's telegraph lines to Weston.

On June 6, a soldier's monument at Stoney Creek, near Hamilton, Ont., was unveiled in a similar manner.

THE TELEPHONE.

Mr. J. C. Babbitt, of the Wisconsin Telephone Company, Marinette, Wis., has been transferred to the same service at Jackson, Mich.

Telephones in New York.—There are now over 500,000 telephones in service in New York City, and sixty-seven telephone exchanges.

New Telephone Building for Memphis.—The Cumberland Telephone and Telegraph Company is to construct a new building in Memphis, Tenn., at a cost of $200,000.

Reduced Rates in New York.—The New York Telephone Company has reduced its rates between certain sections of the city from ten to five cents per message, and between other sections from fifteen to ten cents.

Telegraph and Telephone Materials for Australia.—Tenders will be received at the office of the deputy postmaster-general, Adelaide, Australia, until July 16, for supplying telegraph and telephone materials.

Telephone Extension in Italy.—The Post and Telegraph Department, Rome, Italy, has invited tenders for the construction of telephone lines between Turin, Genoa, Naples, Rome, and other places and from Florence to Leghorn; also for constructing interurban and international telephone lines at a cost of $10,608,970.

Use of Name Metropolitan Telephone and Telegraph Company Enjoined.—The Appellate Division of the New York Supreme Court has ordered the Metropolitan Telephone and Telegraph Company to discontinue the use of that name on the ground that the name is that of the original telephone company in New York, which was taken over by the New York Telephone Company, but which is still in existence because some of its bonds are outstanding.

Franco - British Telephone. — The French chamber has adopted the bill approving an agreement for the regulation of telephonic communication between France and England. The loaded telephone cable has enabled the electrophone to be used for hearing in London a performance of "Faust" at the opera in Paris.

Anglo-Dutch Telephone.—The Dutch Government proposes to establish telephonic communication between Holland and Great Britain by September. The length of the proposed cable will be 165 kilometers (102 miles), and the cost, which is estimated at £62,000 ($310,000), will be equally shared by the British and Dutch Post Offices.

Southwestern Conference.—A two days' conference of district commercial managers of the Southwestern Telegraph and Telephone Company was held in San Antonio, Tex., May 27 and 28. The conference was presided over by Mr. W. W. Vaughan, division commercial superintendent. The meeting was concluded by a dinner.

The New York Telephone Society.—At the meeting on May 21 of the New York Telephone Society, the following officers were elected: President, D. C. Cox; vice-president, F. B. Jewett; secretary-treasurer, R. S. Scarburgh; executive committee, G. L. Yates, I. J. Thorpe, P. O. Coffin, F. W. Lienau, C. A. Merrill and L. F. Morehouse.

Ohio's First Telephone Operator.—Mrs. John Wick, of Kittanning, Pa., has the distinction of being the first telephone operator in the State of Ohio. Early in 1881, before she was married, she was chosen to operate the newly established exchange of the Central District and Printing Telegraph Company at East Liverpool, Ohio. Her name then was Miss Ursilla Kinsey.

Reduction of Rates in Chicago.—The Chicago City Council has passed an ordinance requesting the Chicago Telephone Company to reduce its rates, the reduction aggregating $500,000 per year. The ordinance also calls upon the company for an annual contribution of $100,000 to the pension and disability fund for employes, and also provides for granting increases in wages.

To Investigate Pacific States Telephone Company.—It is stated that United States Attorney-General McReynolds, at Washington, D. C., will soon begin an investigation of the Pacific States Telephone and Telegraph Company independently of the investigation being conducted by the Interstate Commerce Commission, to ascertain if there has been a violation of the Sherman Anti-Trust law, as alleged in complaints made to his department.

Nose Telephones.—It is stated that Dr. Jules Glover, a prominent physician of Paris, France, has invented a telephone transmitter which is designed to be applied to the nose as well as to the mouth. Dr. Glover's invention is based on the fact that vocal sounds coming from the larynx on arriving at the palate are split into two streams, one of which emerges at the mouth and the other at the nose. The object of the instrument is to collect both sound streams. It is stated that the device reproduces the sound of the voice with great distinctness.

Pioneer of the Trans-Mississippi Region — Major E. Russel, of the United States Signal Service, Washington, D. C., erected in 1878 what he thinks was the first telephone line west of the Mississippi River. He built the line between his residence and the railroad station, at Breckenridge, Kan., a distance of about one and one-half miles, and operated it in April of that year. He made the apparatus himself. The line possessed neither call bells nor transmitters, but it worked all right. Major Russel suggests that he is entitled to the distinction of being the telephone pioneer of the trans-Mississippi region.

Telephone Pioneers' New Committees.—At a meeting of the executive committee of the Telephone Pioneers of America, held in New York, May 8, Messrs. C. R. Truex, H. S. Brooks and C. E. Scribner were appointed a committee on membership, and Messrs. John J. Carty, H. F. Thurber and E. F. Sherwood a committee to consider and recommend changes in the constitution and by-laws. Messrs. B. E. Sunny, of Chicago, and Gerard Swope and A. S. Hibbard, of New York, were appointed a committee on plan and scope for the entertainment to be provided for the Pioneers at the Chicago meeting, October 16 and 17.

Boston Plant Chapter.—At the annual meeting of the Boston Plant Chapter of the Telephone and Telegraph Society of New England, held May 28, officers for the season 1913-14 were elected as follows: President, James H. Flanagan; vice-president, Charles E. Ames; secretary, Gordon S. Wallace; treasurer, William J. Hadley. The Chapter has over 600 members on its roll. On Tuesday evening, June 24, Mr. William H. O'Brien, special agent for the manager of the telegraph department of the New England Telephone and Telegraph Company, will address the Chapter on "International Peace." On Thursday evening, June 26, the 1913 show committee of the Chapter will tender a complimentary supper and dance to those individuals who worked so hard to make its 1913 show a success. This event will be held in the American House, Boston.

Telephone Pioneers' Convention Proceedings.—The bound volumes of the proceedings of the second annual convention of the Telephone Pioneers of America, held in New York, November 14 and 15, 1912, are now being distributed to the members. The book is an artistic piece of work, and besides the full account of the proceedings, contains excellent half-tone illustrations of many eminent telephone pioneers and views of prominent points and buildings in the city. The book contains a complete list of the names of members, the number being 1071. It contains ninety-four pages, and is a valuable addition to a library, principally on account of the historical record of the early days of the telephone which it contains. Mr. H. W. Pope, the secretary of the Telephone Pioneers of America, 15 Dey St., New York, is to be congratulated on the excellence of the work, which shows careful planning and execution.

RADIO-TELEGRAPHY.

Signor Guglielmo Marconi, of London, arrived in New York on June 11 on the steamer "Olympic." He came to testify in a patent suit brought by his company, also to inspect the new station at Belmar, N. J., and the Glace Bay, N. S., plant.

Wireless Station Burned.—The Cape Race wireless station was destroyed by fire early in May. The aerial tower, however, was not damaged.

Long Distance Wireless Telephone.—It is stated that successful wireless telephonic communication has been effected between Berlin, Germany, and Vienna, Austria, a distance of about 375 miles.

Radio Code.—The Department of Commerce Radio Service has issued a card containing the international Morse code and conventional signals to be used for all general public service radio communication. Also another card containing a list of abbreviations to be used in radio communication.

The Tropical Radio Telegraph Company has been incorporated at Wilmington, Del., with a capital stock of $10,000. The incorporators are H. E. Latter, O. J. Reichard and N. P. Coffin, of Wilmington, Del.

Long-Distance Wireless in Australasia.—Communication between the Pennant Hills, N. S. W. station, and Awanui, New Zealand, a distance of 1,400 nautical miles was recently maintained between 11 a. m. and 1 p. m. Messages have been received at night at distances up to 4,800 miles.

Amateur Wireless Organization.—Amateur wireless telegraphers have organized a society at Nutley, N. J., under the name of the National Radio Association. The officers are: H. Atherton Moore, Nutley, N. J., chairman; John Styles, Yonkers, N. Y., secretary, and Clarke Edgerton, of Nutley, treasurer. The headquarters are in Nutley.

Galletti Wireless System.—The Indo-European Telegraph Company, of London, England, has purchased outright the Galletti wireless telegraph and telephone patents, paying $160,000 therefor. Mr. Galletti claims that the invention makes available a much larger proportion of the power used, both in the aerial at the transmitting end and at the receiving end, than is the case with any other system. Direct current is used.

Another Prompt Rescue Through Wireless.—The advantage of wireless telegraphy in cases of distress at sea were again prominently demonstrated on May 29 when the steamer "Haverford," of the American Line, ran on the rocks at Rocky Bay, Ireland. Wireless distress calls brought quick relief, and nearly 1,000 passengers were rescued from the steamer. The "Haverford" was subsequently hauled off the rocks and taken to Liverpool for repairs.

Wireless on Canadian Vessels.—The amended wireless bill before the Canadian Parliament provides that from July 1, 1913, vessels trading from any Canadian port, whether registered in Canada or not, carrying fifty or more persons and plying between ports more than 200 miles apart; or carrying 250 or more persons and plying between ports more than ninety miles apart; or carrying 500 or more persons and plying between ports more than twenty miles apart, must be equipped with radiotelegraph apparatus, capable of receiving and transmitting messages at least 100 miles.

OBITUARY.

Death of S. S. Bogart.

Samuel S. Bogart, a well-known old time telegrapher, died suddenly of heart disease in New York, May 30. Mr. Bogart was a native of Plainfield, N. J., where he was born April 6, 1847. In the spring of 1864 he went to Washington on a call for volunteer telegraphers from the railroad and returned in 1869. He was manager at Trenton, N. J., for the United States Telegraph Company until the consolidation of that company with the Western Union, going then to the Lehigh Valley Railroad at Mauch Chunk, Pa. He filled various railroad positions until September, 1868, when he accepted a position in the main office of the Western Union Telegraph Company in New York, later becoming chief operator. He had charge of the transfer of the wires from 145 Broadway to the new office at Broadway and Dey street. When this work was finished he was appointed day chief, later becoming wire chief with supervision over cable and underground lines. In 1884 he was appointed general traffic manager of the Baltimore and Ohio Telegraph Company, and was afterward joint superintendent of the New York, West Shore and Buffalo Railroad; New York, Ontario and Western Railroad; National and Baltimore and Ohio Telegraph Company, with headquarters at Weehawken, N. J. In 1889 he was appointed inspecting engineer of electric railway systems. He was the inventor of several signal devices for railroads, and was frequently consulted in engineering work. In later years he was prominently identified with the United Wireless Telegraph Company, and on the failure of that concern he entered other business in New York.

Roy C. Bryant, manager of the Postal Telegraph-Cable Company of Texas, at Texarkana, Ark., died on May 29.

Selenium.—Mr. Samuel Wein delivered a lecture on Sunday, May 25, on "Selenium and its Applications," before the Electron Society of New York. The lecture was illustrated by lantern slides and the photophone. A lecture was also delivered by Mr. Cohen on "Ether of Space."

A. I. E. E.—The thirtieth annual convention of the American Institute of Electrical Engineers will be held at Cooperstown, N. Y., June 23 to June 27. Among the papers to be read are two on telephone subjects, viz.: "Test of an Artificial Aerial Telephone Line at a Frequency of 750 Cycles per Second," by A. E. Kennelly and F. W. Lieberknecht; "The Adaptation of Automatic Methods to Long-Distance Telephone Toll Switchboarding," by H. M. Friendly and A. E. Burns. An excellent entertainment programme has been prepared.

The Dayton Flood.

BY W. W. BROWNE, MANAGER WESTERN UNION TELEGRAPH COMPANY, DAYTON, OHIO.

The telegraph added another chapter to its record of achievement at the time the vast volume of water swept down the Miami Valley and through the city of Dayton, March 25 and 26.

The saving of lives, and the alleviation of misery—these were the things to be done, and the emergency was met. The telegraph saved lives in many ways and it alleviated misery in many ways.

Courageous telegraph men plunged into the swift-running waters and rescued perishing souls; telegraph instruments ticked messages that brought boats and succor; even the telegraph's inanimate poles and wires, like living things, stretched out helping hands to despairing humans in swirling currents, and afforded them safe passage from flood and flame.

The telegraph brought food for the hungry and medicine for the sick. To minds at the breaking point from anxiety about loved ones, it conveyed golden messages of reassurance.

"Words more precious than jewels," some poet said in fanciful flight about love. Here, in Dayton, in the days of the flood, it was real, and actual, not fanciful. To illustrate: There in the coat of mud left in Dayton streets by the receding waters were men searching for diamonds and jewels washed out of stores; over there was a bread-line of men, women and children, hungry and destitute, to get food. Over here were men and women, in greater number. They were not after diamonds. Like those in the bread-line, however, they were hungry for food, but they were still hungrier for the relief of distressed minds. They awaited their turn at the telegraph tables to send or receive messages. To them the yellow slips of paper bearing only words of no financial significance, were of inestimable value. To understand this one must appreciate that the spirit in Dayton during and following the flood was intensely human, everything being devoted to saving of lives and relief of distress, physical and mental, with astounding disregard for property loss.

Great things are expected of big corporations by the people. In Dayton the Western Union surpassed expectations. A man rushed up to a temporary relief station. "I got away some telegrams," he shouted in excited glee. "The folks will know my family's safe." People gathered there gazed at him unbelievingly. They had seen houses, telegraph and telephone poles crashing in the current, with wires a jumbled mass. The water was still at flood tide. Rain continued to fall in torrents. To some occurred the suspicion of derangement from excessive mental strain. But he spoke the truth, and after he convinced them there ensued a rush to get messages to the Little Wolf Creek station, by automobile as far as possible, and then by boat. Western Union men found the "live wire" in the inundated station. They got dry instruments and improvised connections, with the ingenuity displayed in a crisis. It was only twenty hours after the water rolled over the streets of business Dayton that the Western Union had wires working with the outside world. At the very time, on the roof of the main office in the business center, Western Union men were fighting the flames of a conflagration, sweeping above the floor and structures, and at the Western Union building the great blaze was stopped.

Meanwhile from the outside the big telegraph company's organization had come into action with incredible swiftness. The afternoon of that day wires were swung into the National Cash Register plant, on higher ground in the southern part of the city, and eight operators immediately plunged into the grind of messages and press dispatches that continued in growing volume for days.

The flood reached Dayton on March 25 and the water drove out operators and clerks at the Western Union office, reaching a stage of ten and a half feet. A swift current surged through the long room for two days, tearing partition and cellar walls down and carrying away all furniture and records. In the morning of the twenty-sixth the Western Union worked from Wolf Creek station. In the afternoon of the same day, eight operators and six clerks were at work at the National Cash Register plant. The Miami City station was brought into service with ten operators and two clerks. As the regular office room was wrecked, quarters were secured at the Beckel Hotel, in the heart of the city. Twenty operators and ten clerks were soon at work and on the morning of the same day, March 28, five operators and two clerks were handling business at an office established in the East End. It was literally an avalanche of telegraph business and it was handled in a manner that elicited praise from government and state officials, military authorities, business men and the people generally.

With us in the work, were the people. More generous support and assistance were never vouchsafed a public service corporation, it is safe to say. Volunteer telegraphers served, linemen received assistance on every hand, business men ignored their own business affairs to act as clerks; rich men served as messenger "boys." Anything like ordinary delivery was impossible. Whole sections of the city were uninhabited. Millionaires carried bundles of messages to relief stations where people were assembled, to be distributed to addressees. All recognized that it was great work; they were glad to be in it.

Never before, to the writer's knowledge, has there been such general and generous recognition of the value of the telegraph. Appreciation of Col. John H. Patterson, president of the National Cash Register Company, and outstanding "hero" of the flood, must be voiced. To the Western Union officials, men and women, he and his superb organization extended every possible assistance and comfort, sought or unsought, just as he did to thousands of others.

The loyalty and devotion of employes, not one of whom failed to respond to duty's call, the efficiency and cohesiveness of the Western Union organization and its ability to cope with great emergencies; the privilege of having seen the tremendous amount of good that is in men's hearts, bared by the crisis, these things compensate.

Dayton is better than normal now. The courage in the trying times was not a flash in the pan. There is a magnificent civic spirit; and it will not abate. The march is onward. The Western Union's faith in the city's future is best shown by the fact that additional office space has been leased and a single department now occupies that which formerly served all departments.

The Heterodyne Wireless Receiving System.

At a meeting of the Institute of Radio Engineers in New York on June 4, Mr. John L. Hogan, jr., of the National Electric Signaling Company, presented a paper describing the principle and apparatus involved in the heterodyne receiver. Much interest has been shown in this invention of Prof. R. A. Fessenden, especially since the recent test between Arlington, Va., and the U. S. Scout "Salem," in which it was used for all long-distance communication.

Since the "beats" principle upon which the heterodyne operates is not generally understood, Mr. Hogan opened his paper by a discussion of the classification of radio receivers and of the addition of simultaneous wave motions. Radio receivers are of two broad classes: (1) the relay or "trigger" type, in which the received energy releases an amount of local potential energy, which, in turn, operates an indicator to produce a signal, and (2) the "converter" type, which acts merely as a transformer linking the antenna and the indicator, and in which the signal is produced by energy actually received by radio from the transmitting station. Receivers of the first class (such as filings coherers) are limited by their delicacy and inefficiency, while those of the second, such as the gas, liquid or solid rectifiers, cannot utilize in producing a signal any more energy than that actually received. This has led to attempts to use microphonic or other telephone relays to amplify received signals; but, in general, these have been unsuccessful. A selective receiver which will amplify persistent waves but will not increase effects due to highly damped discharges (such as those of atmospheric interference) is needed in the art of radio transmission. The only receiver of this type is the heterodyne, whose action is to give an indication by the conjoint operation of two high-frequency alternating currents, one received from the transmitter and the other usually generated at the receiving station.

Mr. Hogan illustrated by lantern slides the graphical addition of waves of various types, treating mathematically the several cases. The production of acoustic beats by organ pipes and singing flames was shown, and the distinction between polarized and non-polarized indicators demonstrated by generation of inaudible air-wave beats with Galton's whistles.

Five types of heterodyne receiver were described. In the first two streams of waves having slightly different frequencies were received on two separate antennas. Currents set up by them passed through the coils of a non-polarized magnetic telephone and reacted on its diaphragm to produce audible signals. In the second form, a single antenna was used, one of the two interacting currents being generated by an alternator, arc or other oscillator at the receiver. The third form shown had its sensitiveness increased by use of a dynamometer telephone, and the fourth type was still more effective by the use of a static telephone receiver.

With this last arrangement of heretodyne apparatus signals had been received over 3,000 miles, in spite of the notoriously low sensitiveness of the static telephone. The great increase in effective sensitiveness could be explained by a theory of operation which had been proposed and which indicated that the static telephone used upon the heterodyne principle would respond to a given strength of sustained wave several hundred times as loud as if used simply.

The fifth type shown adds to the sensitive rectifier and telephone combination of modern receivers the amplifying power of heterodyne excitation. Receiving either from sustained wave or spark transmitters it is possible to read signals so weak that they cannot be heard with the ordinary receiving apparatus. On spark signals the intensity of heterodyne response is from five to fifteen times as great in audibility as that of the best rectifier receivers operating normally, while on sustained waves the effective amplification is still greater. This increase of sensitiveness to continuous waves accounts for the long distances transmitted by the arc temporarily installed at Arlington and used for special tests during the cruise of the "Salem" to Gibraltar. During those trials all long-distance signals, whether from arc or spark sender, were received on the heterodyne, the tikker receiver having been abandoned by the U. S. Navy engineers after the first few days of the test.

Data secured on the trials between Arlington and the "Salem" permitted modification of the constants in the Austin-Cohen transmission expression, so as to compensate for the increased sensitiveness of the heterodyne. Extending such data, it is found that two stations of the Arlington type could exchange messages regularly by day and night over a distance of 4,500 kilometers (2,800 miles), or could transmit between them daylight signals of twenty-five times audibility (readable through light static) even if 5,500 kilometers (3,400 miles) apart. These distances would be impossible with anything like similar transmitting power if any receiver other than the heterodyne were used.

A form of heterodyne still more effective than any of those described has, said the speaker, been put into use and shows great promise, but even if no step had been made beyond the type used on the Arlington-"Salem" test, this invention of Prof. Fessenden would seem certain to work a revolution in radio communication.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, ... *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, JUNE 16, 1913.

Seniority versus Ability.

We have at various times referred to the indisposition of many telegraphers to post themselves on the technical and commercial features of telegraphy in order to fit themselves for higher positions. Mr. James B. Sheldon, superintendent of telegraph of the Union Pacific Railroad, Omaha, Neb., in a paper read at the recent St. Louis convention of the Association of Railway Telegraph Superintendents, touched upon this matter in a very clear way. Referring to promotions on the basis of seniority as against ability, he says: "Comparatively few telegraphers seem to interest themselves in the duties of wire chiefs or endeavor to qualify themselves for such positions in advance. This," he continued, "may be to some extent on account of the seemingly slow advancement which causes them to neglect study, or they may be discouraged by the manager or wire chiefs in their efforts to post up on the work. However it may be, the older men are frequently not qualified for these better places when vacancies occur."

Mr. Sheldon has touched upon a fact that is unfortunately too common—that is, the neglect to fit one's self for higher positions. The fact that advancement seems at times to be slow is really no reason why a man should allow himself to become stagnant in the acquirement of useful knowledge. Knowledge is always useful, and it is important to be prepared to answer a call to fill a higher position when it is received, even if at times it seems slow in coming.

The men who possess knowledge are usually the ones selected to fill vacancies in higher places when they occur. The companies would favor the older employes always if the latter were fitted for the higher positions, but what they want is the man qualified to perform the duties of the position, the question of seniority being of secondary importance.

Proper Handling of Sending Machines.

Although sending machines are now generally recognized as part of telegraphic equipment they, like any other machine, may be handled improperly. When used with discretion they are advantageous in every way to the service, and such use should be taught where necessary.

It has been suggested that telegraph companies might with advantage to themselves delegate some competent person in the large offices to teach the proper use of this very useful machine where such instruction may be found needful. Complaints of "clipped" dots and other defects in characters arising from careless use of the instrument would cease; business would be conducted with less friction and tempers would not be likely to be ruffled.

British Post-Office Statement.

Mr. Herbert Samuel, postmaster-general of Great Britain, presented the annual statement of his department to Parliament on April 24. For next year Mr. Samuel estimates a revenue of £30,625,000 ($153,125,000), an increase over last year of nearly £1,500,000 ($7,500,000). From this the net profit is expected to be £5,860,000 ($29,300,000).

The present flourishing condition of the post-office exchequer, he said, is largely due to the taking over of the telephones last year.

"The telephone service of Great Britain," said Mr. Samuel, "has long been a by-word on account of its inefficiency, but since the post-office took it over some improvement has been made, and it is to be hoped will continue. In 1912 ninety-four new exchanges were opened, and 220 will be opened in 1913-14; 20,000 new subscribers have been connected and 162,000 miles of new wire have been laid. A special system of telephones for farmers has been inaugurated, at cheap rates, and these are proving very popular. Altogether, it seems more hopeful that some time in the future the telephone service of Great Britain may approach in accuracy and dispatch that of Canada."

Mr. Samuel reviewed the negotiations of the post-office and the Marconi Wireless Telegraph Company for a state-owned chain of wireless stations, and also to the recent Parliamentary investigation into the circumstances connected with the negotiation and completion of the agreement.

He also referred to the charges of corruption brought against Mr. Lloyd George and Sir Rufus Isaacs in connection with the purchase of Marconi shares. "The whole charge has entirely fallen to the ground," he said.

"The extension of the wireless system," said Mr. Samuel, "necessarily makes the cable companies look to themselves, and it is probably on account of this competition that there is such readiness to reduce cable rates."

Mr. Samuel has established the principle that with every renewal of cable licenses the government shall revise the rates, the company being permitted to appeal to the Railway and Canal Commissioners as arbitrators.

Great Britain owns 160,000 miles of ocean cable in comparison with 50,000 miles of the United States.

The Old Timers' Reunion.

As the time approaches for the thirty-second annual reunion of the Old-Time Telegraphers' and Historical Association and the fifty-second anniversary of the Society of the United States Military Telegraph Corps, at Detroit, Mich., August 26, 27 and 28, interest in the event grows. As already announced, the headquarters will be at the Hotel Cadillac. The minimum rates at this hotel are $3.50 per day on the American plan and $2.00 per day on the European plan. The Pontchartrain, Tuller, Wayne, Griswold, Ste. Claire, Normandie and Oriental hotels offer accommodations at moderate rates, on the European plan, the Ste. Claire and Normandie, however, being conducted on the American plan as well.

Following is the programme of the reunion:

Tuesday, August 26, 10 a. m.—Business meeting of the Old-Time Telegraphers' and Historical Association, called to order by the retiring president. Address of welcome and response. Installation of the new president. Transaction of business, etc.

11 a. m.—Business meeting of the United States Military Telegraph Corps.

2.30 p. m.—Automobile ride.

Wednesday, August 27, 10 a. m. to 5 p. m.—Boat ride. Luncheon on board. Music and dancing.

Thursday, August 28, 10 a. m.—Trolley and ferry rides.

6.30 p. m.—Banquet at the Hotel Cadillac.

Following are the officers of the two societies and the membership of the various committees:

Officers of the Old Timers: President, H. J. Kinnucan, Detroit, Mich.; vice-presidents, Wm. A. Jackson and A. L. Lafferty, Detroit, Mich.; secretary and treasurer, F. J. Scherrer, room 1929, No. 30 Church street, New York. Executive Committee: Hon. Wm. S. Jordan, Jacksonville, Fla.; Wm. Bender Wilson, Holmesburg, Pa.; Wm. J. Lloyd, Denver, Col.; G. A. Cellar, Pittsburgh, Pa.; Geo. D. Perry, Toronto, Ont.; F. J. Dayman, Cleveland, Ohio; Wm. M. Hayes, J. J. Ross, and J. Z. Hayes, Detroit, Mich.

Officers of the Military Telegraph Corps: President, Col. William Bender Wilson, Holmesburg, Pa.; vice-presidents, W. L. Ives, New York; Charles Almerin Tinker, Brooklyn, N. Y.; Marion H. Kerner, New York; secretary and treasurer, David Homer Bates, 658 Broadway, New York. Executive Committee: Col. Robert C. Clowry, Col. Albert B. Chandler, Wm. J. Dealy and Marion H. Kerner, New York; William R. Plum, Lombard, Ill.; Charles A. Tinker, Brooklyn, N. Y.; Richard O'Brien, Scranton, Pa.; John Wintrup, Philadelphia, Pa. President and secretary, ex-officio.

General Committee on Arrangements: H. J. Kinnucan, chairman; C. H. Cadwallader, F. J. Dayman, W. M. Hayes, W. A. Jackson, A. L. Lafferty, E. W. Malloy, Wm. Marshall, F. V. Moffitt, John McArdle, L. C. McCormick, B. J. Ross, J. J. Ross, E. Parsons, G. D. Perry, J. Schanher, W. H. Sparling.

Reception Committee of Old-Time Telegraphers' and Historical Association: Jas. Moxam, chairman; H. A. Beaubian, J. M. Beckwith, Robert Berry, A. H. Bliss, W. H. Bouma, T. W. Carroll, E. W. Collins, Chas. Cook, M. T. Cook, X. H. Cornell, A. B. Cowan, Albert Cox, J. C. Currier, R. H. Dunphy, Frank S. Eaton, J. Fitzpatrick. C. E. Gage, F. S. Gould, F. C. Hackett, Frank Hughes, T. C. Hughes, John H. Kane, John Kelly, Dr. Alfred Lowther, Thos. A. Mears, F. V. Moffitt, T. Mulcahy, John McArdle, Chas. McConnell, G. H. McDonough, G. H. Nussey, M. J. O'Leary, E. A. Patterson, Thos. Powers, W. A. Powers, J. M. Richardson, Chas. J. Risdon, Wm. Rosenberg, R. M. Ross, F. J. Scherrer, J. Shields, W. H. Sparling, W. J. Sullivan, J. B. Taltavall, Jos. Uhrig, B. W. Watson, F. E. Wellington, Wm. B. Wilson.

Reception Committee of United States Military Telegraph Corps: A. H. Bliss, chairman; Jos. Anderson, Chas. P. Bruch, Henry W. Dealy, J. A. Fuller, R. B. Hoover, C. W. Jaques, Stewart W. Knapp, Thomas A. Laird, Frank C. Long, S. B. McMichael, A. M. Nichols, A. W. Nohe, G. K. Smith, Arthur L. Tinker, A. A. Zion.

Ladies' Committee: Mrs. F. J. Dayman, chairman: Mrs. C. H. Cadwallader, Mrs. M. T. Cook, Mrs. J. C. Currier, Mrs. J. Fitzpatrick, Mrs. Frank Hughes, Mrs. H. J. Kinnucan, Mrs. A. L. Lafferty, Mrs. A. Lowther, Mrs. E. W. Malloy, Mrs. F. V. Moffit, Mrs. John McArdle, Mrs. Chas. McConnell, Mrs. L. C. McCormick, Mrs. G. H. McDonough, Mrs. E. Parsons, Mrs. J. M. Richardson, Mrs. B. J. Ross, Mrs. F. J. Scherrer, Mrs. W. J. Sullivan. Mrs. J. B. Taltavall; Misses Florence Bertoli, Loretta Cowan, Stella Dayman, Helen Hurst, Lilian A. Mullane, Minnie Payne, Edna Ross, Ella Shannon, Emma Walker.

Committee on Badges: F. V. Moffitt, chairman; F. J. Dayman, Jas. Moxam, E. Parsons, B. J. Ross.

Committee on Hotels: C. H. Cadwallader, chairman: W. M. Hayes, W. A. Jackson, E. W. Malloy, L. C. McCormick.

Committee on Finance: E. W. Malloy, chairman; C. H. Cadwallader, F. S. Gould, W. M. Hayes, W. A. Jackson.

Mr. W. H. Hall, superintendent of telegraph of the Missouri, Kansas and Texas Railway system, Denison, Tex., writes: "Enclosed find draft for $2.00 to cover my subscription to Telegraph and Telephone Age. I am always glad to recommend your publication to our telegraph and telephone employes, and have on several occasions recently heard favorable comment from them on the very instructive articles that are being published concerning telephone and telegraph apparatus, testing, etc. I do not believe that any wire chief can afford to miss an issue of your publication."

Course of Instruction in the Elements of Technical Telegraphy—XLI.

(Copyrighted.)

(Continued from page 334, June 1)

[We began in our issue for October 16, 1911, the publication of a course of instruction in technical telegraphy. The course, which was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, is published for the benefit of those of our readers who desire to fit themselves for better positions in their vocation. It is elementary throughout and is divided into chapters, following one another in logical order.

The course has received the hearty commendation of telegraph officials and experts for its scope and accuracy and its sound practicability. In each chapter examples are presented in order to illustrate the application of the rules to practical cases, and each chapter is followed by a series of questions pertaining to the subject of the chapter, to be worked out by the student in order to review his progress. Back numbers containing these valuable articles can be obtained on application, at 10 cents per copy.]

THE VOLT-METER. *(Continued.)*

A volt-meter of 20,000 ohms resistance shows the E. M. F. of a battery to be 100 volts. If now another 20,000 ohms be added to the circuit, the deflection will be reduced to an equivalent of 50 volts, for the resistance of the volt-meter is now (neglecting the battery resistance) one-half the total resistance and one-half the potential must have been expended in overcoming it. Hence representing the volts expended in the added resistance by d, and the volts expended in the volt-meter by d^1, we see that when the volt-meter resistance is equal to the added resistance (R), d is equal to d^1. Now it is obvious that if R be increased, the number of volts expended in volt-meter will be increased, for the volt-meter resistance is now less than half the total resistance, and the potential has fallen proportionately. On the other hand if R be decreased, the volt-meter resistance will exceed one-half the circuit resistance, and the volt-meter deflection will be correspondingly greater. It follows that the ratio of the volt-meter resistance to R governs the ratio of d^1 to d, and the proportion,

$$\text{volt-meter R} : \text{R} :: d^1 : d.$$

holds good, from which the value of R can be quickly obtained.

Example: A circuit is worked by an E. M. F. of 100 volts. The deflection obtained on a 20,000 ohm volt-meter with the wire open at the distant station is 15 volts. What is the insulation resistance?

Solution:

$$\text{volt-meter R} : \text{R} :: d^1 : d, \text{ or } \frac{\text{volt-meter R} \times d}{d^1} = \text{R}.$$

$$d = 100-15 = 85. \qquad d^1 = 15.$$

$$\frac{20{,}000 \times 85}{15} = \text{I. R. (insulation resistance) I. R.} =$$

$$113{,}333 \text{ ohms.}$$

Referring again to Fig. 30, let us see how the volt-meter may be used for locating an escape when the New York-Buffalo wire is reported heavy. Buffalo having been ordered to open the wire, New York puts a battery with an E. M. F. of 100 volts to line through the volt-meter, and obtains a deflection of, say 50 volts.

Without proceeding further he knows at once that the insulation resistance of the line must be the same as the resistance of his volt-meter, since here $d^1 = d$. The insulation resistance per mile is therefore $20{,}000 \times 440 = 8{,}800{,}000$ ohms.

To give the necesssary insulation resistance for good working the volt-meter deflection with the wire open at Buffalo would require to be less than that produced by an E. M. F. of 15 volts, any greater deflection indicating an escape which could be localized by testing in sections in the same manner as with the milli-ammeter.

QUESTION PAPER.

(1) Why is the coil of the milli-ammeter shunted?

(2) What fraction of an ampere is a milli-ampere?

(3) What means are employed to render the milli-ammeter a dead beat instrument?

(4) The resistance of a circuit is 2,000 ohms, the current twenty-five milli-amperes; what is the voltage?

(5) Why is the milli-ampere unit used in preference to the ampere?

(6) What do you understand by insulation resistance?

(7-*a*) A circuit 500 miles long has a battery with an E. M. F. of 200 volts. With the wire open at the distant terminal station, what would be the maximum deflection on a milli-ammeter consistent with a fair state of line insulation?

(*b*) On a 20,000 ohm volt-meter?

(8-*a*) What is the insulation resistance of a circuit in which the potential expended is 100 volts when the reading from an insulation test is 10 milli-amperes?

(*b*) What is the insulation resistance when the volt-meter shows a deflection of 20 volts?

(*c*) If the circuit is 300 miles long, what is the insulation resistance per mile?

(*d*) Does this indicate a fair state of insulation?

(9) When a volt-meter is connected in series with a circuit, what does the deflection indicate?

(10) When the volt-meter is connected in parallel with a circuit what does the deflection indicate?

(11) A 20,000-ohm volt-meter is connected in parallel with a length of circuit corresponding to fifty ohms resistance; prove that its inclusion in the circuit has not materially affected the circuit resistance.

(12) If a deflection of ten volts be obtained from ten gravity cells, is the battery in good condition?

(13) Why is the volt-meter provided with a mirror?

(14) In Fig. 39, test the E. M. F of M B^2 with a volt-meter by connecting it with two points on the board.

(15) The distant station complains of your battery; what would you do to prove its efficiency?

(To be Continued.)

Thirty Years Ago.

BY WALTER P. PHILLIPS.

In a very appreciative editorial article about the Associated Press and its universally conceded efficiency, published recently in the Bridgeport, Conn., *Morning Telegram,* I saw a reference to the former having been twenty minutes ahead of its competitors in its announcement of the assassination of King George of Greece. I had the honor to be the manager of the Associated Press at Washington for several years and among the thrilling events that came to pass during my administration was the assassination of President Garfield and the subsequent trial of the lunatic, Charles Guiteau. On the day that the case was expected to go to the jury every special correspondent in Washington had set up some kind of a job or other to beat the Associated Press. That was one of their favorite pastimes in my day, and the way these amateurs in handling wires scored failures in this direction was exasperating from their point of observation and decidedly comforting for the boys who represented the old reliable "Rock of Gilbraltar," as David R. McKee, my successor as Associated Press manager, used to call it. He was a hustler whose disappearance from the ranks of journalism is a distinct and most regrettable loss.

Although I was never in the court room but once during the dramatic proceedings, with their constant interruptions by the prisoner, I determined that on the most eventful day of the session I would appear in person and do a little reporting myself. My representatives—stenographers and general writers—told me with a considerable show of anxiety that special loops had been run to many points in the immediate neighborhood of the court room, and it was a very lonesome drug store indeed that did not have an operator on duty, and all the delay to which the correspondents were subjected in reaching the home offices of the newspapers they represented was the very short amount of time it required for sprinting messengers to take despatchers from the court room to the improvised telegraph offices to be passed along to the main office of the Western Union or Mutual Union, uptown, to be distributed from there to outside points. One of these temporary offices, I remember, was in a saw and planing mill near the building occupied by the Agricultural Department, and it was looped in on the regular departmental wire. It occurred to me that the wire was liable to be busy with governmental work, and unless the operators had been advised and were in sympathy with the particular correspondent, who expected to use it instantly in getting his story to the main office of the Western Union in the Corcoran Building, to be sent thence to Boston, Chicago or elsewhere, these operators would resent being interrupted and would not give way.

As one of the craft I knew that every telegrapher is born with a strong tendency to "fight circuit" if the slightest suspicion arises in his mind that some one is encroaching upon his prerogatives. But I did not trouble to explain this, and as it happened that was precisely the situation when the correspondent, half dead from running—he went himself and trusted to no slow-gaited messenger—filed his despatch. There was a notorious resort in the neighborhood known as Mahogany Hall, and which was fitted up in palatial style. This improvised telegraph office having no "call" assigned to it was jocosely fixed out with one by the operator of the occasion—"M. H." being given to the sawmill, because of its proximity to the infamous Mahogany Hall. The moment the operator, who had been keeping very dark lest his location might be suspected and the clever plans of the correspondent thwarted by some one inimical to his interests, opened his key and tried to stop the regular proceedings, the Agricultural Department operator asked, "Who are you?" and was told that it was "M. H." The main office in the Corcoran Building held things up to ascertain who "M. H." was, and was told it was a new office in the neighborhood of Mahogany Hall. That was the straw that broke the camel's back. Chaos resigned, and the delay in getting started on that particular wire was half an hour. On other wires there was a considerable delay from lack of a preliminary understanding, and the result was that the average beat by the Associated Press over everybody was twenty minutes. As all my competitors—the special correspondents—saw that the Associated Press had no special loops, and was evidently relying on a branch office in the Post-Office Department over which I could get my despatches in, say, half a day, which from the special correspondent's point of view in those days was pretty quick service for the Associated Press, they had no apprehension about so weak a rival getting ahead of them. They told me of their plans with entire frankness, and I saw how full of danger they were from the telegraph man's point of view; but I wasn't talking very much.

The telephone was scarcely used at all in those days—1882—for newspaper work. I had arranged, long in advance, with Mr. George C. Maynard, manager for the Bell Telephone Company in Washington, to give me an individual wire for my own personal use. It ran to my office, also in the Corcoran Building. This wire extended from the public booth just outside the court room door, and when the jury went out I called our day manager, A. I. Mudd, and said: "Stay right where you are and hold the wire, Mr. Mudd, and I will see that no one enters this booth unless he climbs over my dead body. I think I can hear what the jury says by standing right outside the booth, prepared to brain the first man who attempts to enter it." Everybody was so anxious that no one who came from the court room noticed my presence near the telephone, and if he did, he saw no significance in it. In fact, the excitement was so intense, notwithstanding a dead silence prevailed as the jury returned and took their seats, that so small an object as a mere man attracted no attention from anybody. Presently the clerk asked, "Gentlemen, have you agreed upon your verdict?"

"We have," said the foreman.

"And what is your verdict?" continued the clerk.

"Guilty as indicted," replied the foreman in steady tones. Before anyone could conquer nerve enough to enable him to leave his seat, I stepped quietly into the booth and said, in as commonplace a tone as I could command, "It is all over,'Iggie' my boy, the verdict is guilty as indicted.' Good-bye."

"Guilty as indicted," Mr. Mudd repeated after me. "Thank you, Mr. Phillips." We hung up our telephones, and I went back to the Corcoran Building in one of the public Herdics that ran up and down Pennsylvania avenue. As I was taking it comfortably in the Herdic, the correspondent whose destination was Mahogany Hall, or rather the sawmill adjacent thereto, dashed past and took a short cut through the grounds leading to the National Museum on the road to Mecca. When I reached my office I found that the quiet Mr. Mudd had distributed the information received from me within ten seconds of the time the foreman of the jury had answered the clerk's second question, and in less than two minutes the fate of Guiteau was known from Maine to San Francisco, and before my Mahogany Hall competitor had really got his row started on the governmental wire, the news that General Garfield's assailant was quite sure to be hanged, as he was on the following thirtieth day of June, our news had been flashed across the cable, and was known not only in every capital in Europe, but as fast as possible it was making its way to the Orient—not at the gait it reached the Pacific Coast, but at the jog trot, telegraphically considered, that was regarded as a triumph when telegrams between London and China and Japan had to be relayed and censored at every new frontier via Paris, Copenhagen, etc. Had we possessed the Pacific cable of to-day, for which the world owes so much to the late John W. Mackay and to George G. Ward and his associates, our tidings would have been known in China, Japan, Australia, India and the Philippines as promptly as it was made public anywhere else on this whirling globe.

Mahogany Hall has been deleted by the District Commissioners long ago, I suspect, though saws still sing, perhaps, in the tones of the buzzing bees, as of old, but not many remember, I dare say, the day on which the sawmill was changed into a telegraph office, and a certain news hustler failed, for not the first time by any means, to put the kibosh on the Associated Press. When I found what Mr. Mudd had done so serenely and efficiently I proceeded to enlarge my familiarity with his given names, and addressed him as Aloysius Ignatius, and it was with a great effort that I refrained from kissing him. He was a very dignified and low-spoken man, who made no pretensions, but who never failed to arrive on schedule time with the goods that were called for. And then he had—this was more than thirty years ago, mind you—a young and sweetly pretty wife, and who knew but an indulgence in osculatory performances involving her youthful husband might not lower me in her esteem? So we clasped hands and let it go at that. She was a blue ribbon woman, a devout follower of Francis Murphy, the eloquent temperance advocate, and was liable to construe any abnormal practices on my part as an outcome of alcoholic indulgence.

No matter how lovely the eternal feminine may be, or however much her mentality has been changed by modern events, she still indulges in the privilege of her sex to jump to conclusions. No manager can succeed who hasn't the confidence of the wives of his trusty lieutenants, and thus it fell out that I drew the line at the hand clasp. But I took my hat off to Mr. Mudd, and have loved him ever since. God bless you, old man, wherever you may be, and may Heaven keep and guard you and yours forevermore. In every emergency you were a brick, but on this particular occasion you were as one of those precious bricks of which Charles Warren Stoddard's "Savage" was another, and of whom Stoddard said that "Kana-ana was a brick that was baked in God's own beautiful sunshine."

Do you observe that the twenty minutes' feature of this great beat is quite conspicuous?

A few years after this episode I changed from my position with the Associated Press in Washington to The United Press in New York. It was one of my dreams to get $100 per week out of Mr. Bennett for a service for his evening paper, the *Telegram*. It was not eligible, at that time, to receive Associated Press despatches, and it was my natural victim. The matter was discussed with Mr. Bennett, on one of his rare visits to New York, but he had so many other matters of importance to pass on that he simply left word for me, with George F. Williams, his general factotum at the time, that he had decided not to do business with me. The Derby was coming on, and Mr. Williams gave it out that he would show The United Press that he did not need our service or anybody else's. The Mackay-Bennett cable was quite a new thing, and was not so crowded then as all the cables have since become, under the influence of greatly lowered rates. It had a branch office in the Herald Building, and Mr. Williams was just ignorant enough of practical telegraphy to suppose it was as easy for Epsom Downs to work direct into the branch office of the Commercial Cable Company, in the Herald Building, as it would be for New York and Boston to work together over the land lines. We made a plan with the late William B. Somerville, then superintendent of press transmission for the Western Union Telegraph Company, and himself an operator, to have the telegraphist at Epsom Downs give London the name of the winner, and for an operator sitting alongside to pass it on to the man in charge of the connecting office in Ireland, his side partner to get it on the cable instantly and when North Sidney had it, to give it to us over a straight wire from that point right into The United Press office at No. 187 Broadway. The winner was Lord Roseberry's "Ladas," and it being the only horse that started whose name began with L, at the very instant Epsom Downs made the "L" we had it in New York, and in one second we had the news in San Francisco that Lord Roseberry had added to all his other honors and his achievements in politics and literature the peculiar distinction it confers on an Englishman to have his horse win the Derby. The name of "Ladas" will long be remembered, for he did a glorious thing for a handsome and princely gentleman in winning the great sporting event that is one of the solidest of British institutions and one that was established as early as 1788.

And Williams—I will tell you a story. The Associated Press had in Louisville two German clients —the *Zeitung* and the *Anzeiger*. One day the owner of the former arrived in New York with a demand on us to cut Schmidt off for ignoble practices. According to Myerheimer, his rival had "blayed it bretty low down, don't it," on him many times. but now had come the culmination. The war between France and Germany was on. Sedan had not yet fallen, but the news was startling from day to day. The conservative Myerheimer was opposed to "extras" after the regular morning edition was on the press, and he had a tacit agreement with Schmidt that neither should print an "extra" without consulting with the other. "Well," explained Myerheimer, "last Thursday morning me and Schmidt met in Rothmick's beer saloon, and out cries Schmidt: 'Hello, Otto, how you vas?'

"I vas well," I said. 'Come and we will talk aboud it'.

" 'All right, my beauty,' that was Schmidt all ofer. Then he asks me to drink some bock mit him, and I say 'Schmidt, we had many fall outs, alreatty yet, but dese is war times in Chermany and I go you one glass provided after that you take one on me. I do not vish, I said, to pe under opligations to you, Schmidt. Understand?' Schmidt laughed and bye and bye we had so many bocks it didn't metter who paid for 'em. Hark, by chings, what is that I hear? 'Extra—*Anzeiger*! !' Then I shoost make one jump for my office. I get out my paper—my extra *Zeitung*—four hours behind him. So I vant him expelled from the Associated Press."

The jejune Williams, from a telegraph operator's view point, was beaten twenty minutes, and the next thing we heard was that he had been sent to Botany Bay or some other idyllic place, and that John Habberton, the genial author of 'Helen's Babies,' had been changed from an editorial position on the *Herald* to that of managing editor of the *Telegram*. He knew nothing of our negotiations with Mr. Bennett, and we captured the author of that most pleasant novel, "Breuton's Bayou," and many other delightful stories, and from that time forward for thirteen or fourteen years the *Telegram* was a United Press paper. Whether Mr. Bennett ever knew what miracles we performed behind his back, we never knew. Habberton was superseded in due time, in accordance with the regular course pursued on the Bennett papers, and his successor, finding the *Telegram* in possession of the service when he came, raised no questions and went on receiving and paying for the news up to the very hour when the Associated Press and The United Press consolidated, in 1897, and the *Telegram*, under the wing of its bigger brother, the *Herald*, became an Associated press paper.

An ingenious writer on the *New York Times* attempted to figure out, taking the time at which the fact of Ladas' victory was known in San Francisco and comparing it, Greenwich time, with the exact second when the operator at Epsom Downs made the preliminary letter "L," and found it to be considerably less than one second. In concluding his article this writer said that while the elapsed time was too brief to be determinable, it was safe to say that before Ladas had passed under the wire and a blanket had been hastily thrown over him, the fact that Lord Roseberry's horse had won the Derby was known throughout the American continent. Williams was also beaten, hands down, by the Associated Press, which had made no special effort to score a beat against anyone. They brought the news over in the regular course of business and distributed it thirteen minutes before the *Telegram* heard anything.

You will observe that twenty was again the mystical number of minutes involved.

Inductive Disturbances as Affecting Telephone and Telegraph Lines.*

BY P. J. HOWE, GENERAL PLANT DEPARTMENT, WESTERN UNION TELEGRAPH COMPANY, NEW YORK.

In this paper Mr. Howe called attention to the possibilities of inductive disturbances in telephone and telegraph lines, and described the manner in which these disturbances take place. The conditions which are liable to cause trouble were discussed, also various arrangements of circuits or apparatus, which either prevent or restrict the inductive effects. He described in detail the subjects of electro-magnetic, and electro-static induction; telephone and telegraph systems; alternating current power systems; methods of preventing and over coming inductive disturbances and prevention by modification of power system. In conclusion he said. "The solution of the problems of interference between the different types of systems must be one by which the power, telephone and telegraph engineers both give and take. The problem cannot be solved by expecting the telephone and telegraph systems to take care of themselves. It seems as if the better plan from all viewpoints will be for the power engineers to make some concessions in the arrangement of their systems, which will prevent or reduce interference, and the telephone and telegraph engineers to employ whatever means are available for the protection of their delicate systems against the interference which the power engineers cannot avoid. The power engineers should be on the lookout for the troubles caused by their systems, and should notify the telephone and telegraph companies whenever power systems are proposed that may interfere with their service. The telephone and telegraph people should present their cases early to the power engineers or interests, and then should co-operate in endeavoring to form plans by which all interests can be served, and the various companies live together with friendly regard for each other's welfare."

* Abstract of paper read at the annual convention of the Association of Railway Telegraph Superintendents, St. Louis, Mo., May 21.

The Western Union Improved Quadruplex.

The Western Union Telegraph Company has just issued a new set of specifications for the installation and operation of the quadruplex, to supersede the former specifications as follows: (See our issues of March 16 and April 1, 1911.)

The quadruplex system of telegraphy provides for the simultaneous transmission of four sendings (two in each direction) over one wire connecting two stations.

The arrangements by which two sendings (one in each direction) are simultaneously transmitted over one wire have been described in detail in Specifications E-21-C, "Installation and Operation of the Bridge Duplex." (See our issues dated December 1 and 16, 1912, and January 1 and 16, and February 1, 1913.) That pamphlet should be carefully studied by all who desire to understand the quadruplex, because the latter system includes all the essential principles of the duplex together with some additional features.

The leading features which are alike in both duplex and quadruplex sets may be briefly summarized as follows:

A pole-changer is used to control the direction of the current sent to the line; generally, this current is negative when a marking signal (i.e., a dot or a dash) is being transmitted, and positive when the spacing signal, which follows each marking signal, is being transmitted.

After leaving the pole-changer, the current, whether positive or negative, splits between two "bridge arms," each having a resistance of 500 ohms. The outer ends of these arms are connected to the main-line wire and to the artificial line respectively. The artificial line, as explained in the earlier specifications, must be so adjusted as to equal, in resistance and capacity, the main-line wire and the apparatus at the distant station.

In addition to their connections with the main and artificial lines, the outer ends of the two 500-ohm bridge arms are joined by a branch circuit termed the "bridge," containing the polar relay. This relay is not affected by the operation of the pole-changer at its own station, but responds to the signals made on the pole-changer at the distant station. That is to say, when the distant pole-changer sends a negative current to line, the armature of the polar relay at the home station will close its local circuit and produce a marking signal on the sounder; but when the distant pole-changer sends a positive current to the line, the polar relay armature will bank against the spacing contact, and the armature of the sounder will be released producing a spacing signal. The paths followed by the current, and other details explaining these actions, are described in the specifications already referred to.

An important fact should now be noted. The armature movement of the polar relay depends entirely upon the direction in which the current flows through the relay windings, and within wide limits such movement is independent of the strength of the current. Provided, therefore, the direction of a current is such as to tend to move the armature in a marking direction, a marking signal will be produced, whether that current be only of the ordinary strength, or several times as strong. It follows also that the "marking" signal so produced will not be interfered with, if the strength of the current producing it be increased from minimum to maximum, or vice versa, provided the direction of the current remains unaltered. The same holds good for "spacing" signals. An alteration of the current strength from minimum to maximum, or vice versa, will not affect a spacing signal, as long as the direction of the current is not changed.

To produce an increase in the strength of the current from the pole-changer, such as that referred to, without altering the direction, is quite an easy matter. A "transmitter" is usually employed for this purpose, operated by a key, like the pole-changer. When the key is depressed the "transmitter" operates, and in so doing, causes the strength of the current from the pole-changer to rise to three or four times its normal value. This increase is effected without altering the direction of whatever current the pole-changer may be sending out at the time, and consequently, whatever signals are being produced on the distant polar relay are not affected by the transmitter at all.

As then, we have a means whereby the pole-changer currents operating the distant polar relay can be increased without affecting the signals of the latter, it follows we could take advantage of it and work quadrulpex, if we only had some other kind of relay in circuit capable only of responding to the increases of current produced by the transmitter. The second instrument should be such that it would work on the increased currents no matter what might be their direction; but, it should also be insensitive enough, not to respond to the ordinary weaker currents sent to line by the pole-changer alone.

Such an instrument is the "Neutral" relay; so called, in contradistinction to the polar relay, because its armature not being polarized by a permanent magnet, it is free to respond to currents of any direction. The armature is provided with a retractile spring which can be so adjusted that ordinary weak currents will not attract it, and it is generally adjusted to operate only on currents of not less than three times the strength of those which actuate the polar relay.

It is evident that, as in the case of the polar relay, the neutral relay must be so connected to the circuit that it will not be affected by the operation of the sending instruments (pole-changer and transmitter) at its own station. This could be accomplished by connecting it in the same branch as the polar relay, i.e., the "bridge" which spans the outer ends of the two bridge arms. While, however, this plan has some advantages, and has been successfully used in many cases, certain unsatisfactory features attending its use led to the adoption of the circuit scheme shown in Fig. 1, in which the neutral relay has two differentially connected windings, one in series with the main line and the other in series with the artificial line.

By "differentially connected," it is meant that currents passing out through the two windings, cause magnetic effects that are opposed to each other. If the two currents are equal, the two magnetic effects are also equal, and being opposite, neutralize each other; as a result, no magnetism appears in the relay. If the two currents are unequal, the resulting magnetism in the relay is due to the amount by which the stronger current preponderates over the weaker, that is, to the difference between the two currents.

The differentially connected neutral relay is not affected by the currents sent out from the pole-changer and transmitter at its own station, because these currents tend to divide equally between the main line and the artificial line, thus neutralizing each other's magnetic effect on the relay. This equal division of the current would really occur, under ideal conditions, if the distant apparatus were connected to ground instead of to an electric generator or battery. The presence of the source of current at the distant station, however, causes unequal cur-

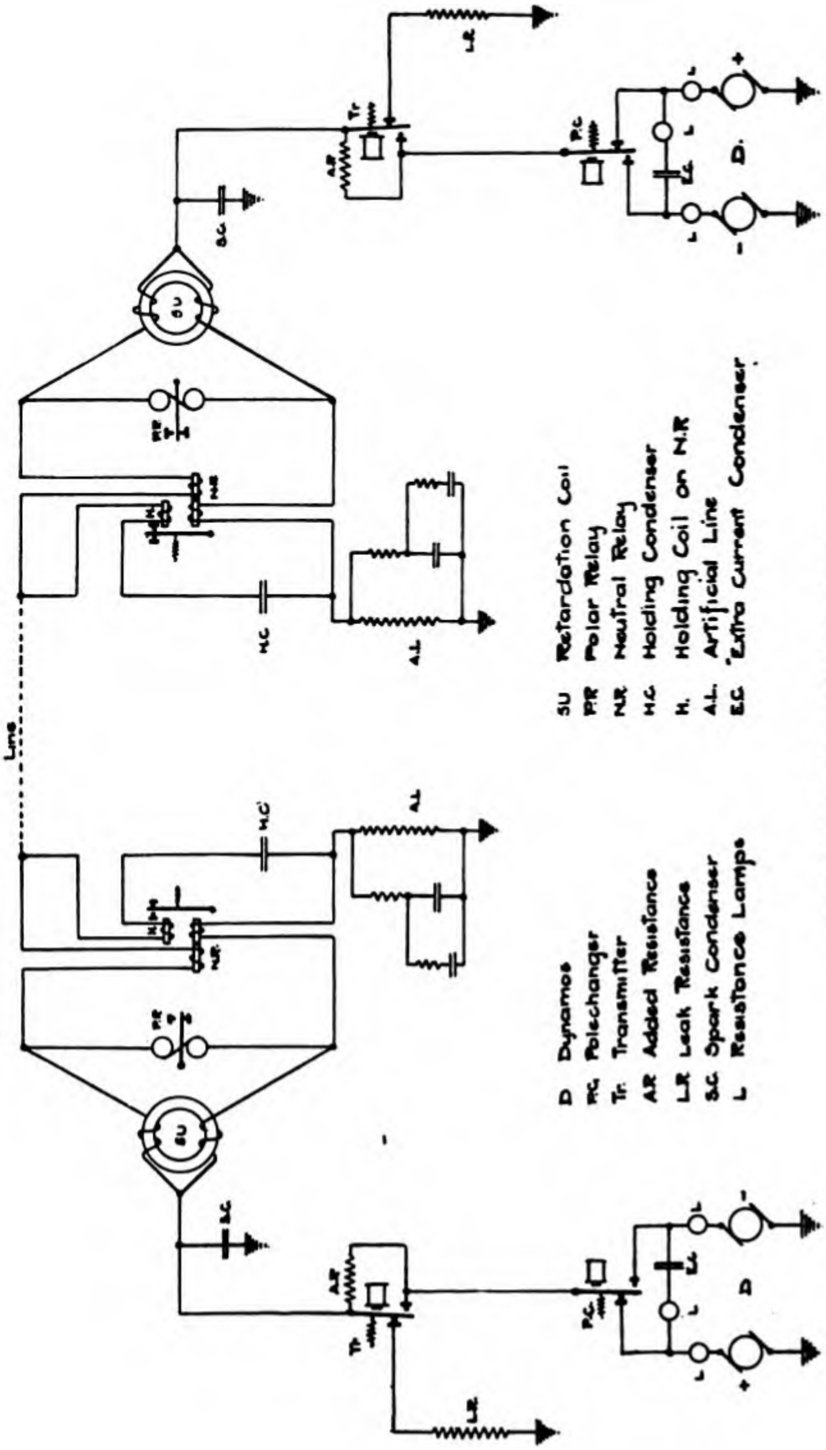


FIG 1—THEORY OF QUADRUPLEX CIRCUIT.

rents to pass through the two windings of the neutral relay. If the inequality is small, due to the distant transmitter sending out a weak (spacing) current, the magnetic effect will not be great enough to attract the relay armature. But if a marking signal is made on the distant transmitter, causing it to send out a strong current, the magnetic effect in the neutral relay will be correspondingly increased, causing attraction of the armature which will operate the sounder.

As stated before, the neutral relay is operated by heavy currents from the distant station, regardless of their direction. Whenever such a current is reversed in direction by the operation of the distant pole-changer, there is a tendency at the moment of reversal for the neutral relay to momentarily release its armature. This is due to the fact that during a fraction of the very short period occupied in the reversal, the strength of the current falls below the amount required to operate the relay. To prevent the release of the armature at the moment referred to, and a break or "kick" at the sounder signal, the neutral relay is fitted with an auxiliary or holding magnet (H), the winding of which is placed in series with a condenser (HC), and connected across the main and artificial lines as shown in Fig. 1. As a rush of current flows into or out of the condenser (HC) whenever the distant pole-changer is operated, it will be readily understood that the holding magnet (H) exerts its maximum effect at the very moment when the principal magnet of the neutral relay tends to release its armature. The armature is therefore held steadily on its front contact throughout the periods when marking signals are being sent by the distant transmitter.

The method by which the transmitter controls the strength of the current sent to the line may be understood by reference to Fig. 1. It will be seen that when the transmitter armature is on its front or marking contact, a direct path of negligible resistance is provided for the current between the pole-changer and the junction of the two bridge arms. The full strength of the current is therefore obtained under this condition. When the transmitter armature rests on its back or spacing contact, the added resistance (AR) is thrown into the circuit, and in addition the leak resistance (LR) is connected to divert part of the current to ground. The combined effect of the added and leak resistances greatly reduces the strength of the outgoing current. As stated before, the usual arrangement of those resistances is such as to give the spacing current (or "short end of the battery," as it is often termed) a value of but one-third that of the marking current (or "long end"). The added and leak resistances, (AR) and (LR), are contained in a single box, known as the proportional rheostat. Plug switches on this rheostat enable the attendant to set the ratio of marking to spacing currents at either 3 to 1, or 4 to 1; but the former ratio is almost exclusively used.

(To be Continued.)

No Age-Limit to Usefulness.

The Pennsylvania Railroad has now among its active employes over 4,000 men who are between sixty and seventy years of age. What does this mean? It means, says the *Binghamton Press*, that to-day is the day of the old men. In business, in the professions, in the factory, on the road, there is no age-limit to a man's usefulness. He may not be as active at fifty as he was at thirty, but he is more reliable. He has been tried. He has proved what he can do. And at that age his habits of work have been formed, and he goes about his task with the precision of long familiarity. And, besides his steady-going methodical habits, he has a thorough knowledge of the business.

The middle-aged salesman or bookkeeper does not impress the "efficiency expert," who wants to put in new blood and drive every department at top speed. But brains and experience count more in many places than youthful hustle; and the man who has spent years with a business house, who knows its methods and is familiar with every detail of its work, can save money for the firm.

But, granting him health and intelligence, the old employe brings to a growing concern one quality that is invaluable—loyalty. He makes the firm's interests his own, and he goes beyond the strict requirements of his position to serve it. And wise employers are beginning to appreciate more and more the value of that sympathy and loyalty which can not be bargained for, but come only with the faithful service of years. The old man who has those qualities can always make good.

Meetings of Associations, Societies, etc., During 1913 and 1914.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, at New Orleans, La., May 19, 1914. Secretary, P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill.

TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION, New York, second Wednesday in March, 1914. Secretary, M. J. O'Leary.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS, at Watertown, N. Y., August 19-22. Secretary, Clarence R. George, city electrician, Houston, Tex.

OLD-TIME TELEGRAPHERS AND HISTORICAL ASSOCIATION AND SOCIETY OF THE UNITED STATES MILITARY TELEGRAPH CORPS, at Detroit, Mich., August 26, 27 and 28. Secretary of the Old-Timers, F. J. Scherrer, 30 Church street, New York; secretary of the Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

TELEPHONE PIONEERS OF AMERICA, at Chicago, Ill., October 16 and 17. Secretary, Henry W. Pope, 15 Dey street, New York.

BRITISH TELEPHONE FACTORY.—The British post-office department is building a factory at Birmingham, England, where about 1,000 men will be employed making telephones and certain telephonic equipment for the English telephone system.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What are the two principal aims desired in the construction of a telegraph line?

Why should the resistance of the conductor be as small as possible, and the resistance of the insulation as great as possible?

What is the effect of imperfect line insulation?

If current escapes from the wires at the insulators, where does it go?

Why does current escape from the wire at the insulators, if the purpose of the insulators is to prevent such leakage?

Why is an imperfectly insulated point of support for a wire like a branch circuit?

If it is desired that the furthest station on a line receive the greatest possible proportion of the entering current, what conditions should be fulfilled in the line?

Under what weather conditions is the escape of current from lines the greatest?

What is the working efficiency of a telegraphic circuit?

What is the rule determining the efficiency of a circuit?

What metals are used for telegraph wires?

What kind of wire is used for interior wiring?

What are the advantages of copper wire over iron wire for outside work?

What is hard-drawn copper wire, and what distinguishes it from soft copper?

Why is hard-drawn copper wire essential for outdoor line work?

What size iron wire was generally used for line building in the United States?

What is the largest size iron wire used in this country, and the smallest?

Are joints in telegraph lines a disadvantage or an advantage?

What is the effect of a loose and poorly made joint?

What joint is in common use in the United States?

How are twist-joints made?

Why are joints in iron wire soldered?

What is the usual number of poles used per mile in the United States?

What are the advantages of using as few poles as possible?

(To be Continued.)

Experiences on the Mexican Border.

BY "ONE OF THE WORKERS."

As a result of the Mexican troubles, Eagle Pass Tex., opposite Piedras Negras, Mex., on February 25, suddenly became the scene of great activity, and the business of the Western Union office at that place increased ten fold.

Over three thousand refugees moved from the Mexican to the American city within twenty-four hours, and the telegraph office became a center of activity. The telegraph offices in Piedras Negras, as well as those in the entire State of Coahuila were closed, and everyone wanted information as to friends and relatives.

Manager H. O. Rawlins, at Eagle Pass, transferred his operators from the junction office on the Mexican side to the Eagle Pass office, put on extra clerks and messengers, and everything moved promptly and without friction.

The business of the delivery department was especially difficult to conduct, as the great number of strangers had no settled place, and, in addition to this, many messages came addressed to Eagle Pass for parties located far in the interior of Mexico; but in almost every case these persons were located and the telegrams sent to them by friendly Americans who were passing to and fro. Three months have passed, and conditions remain unchanged, except that many of the refugees have become settled, and to this extent the delivery has become simplified.

One unfamiliar with conditions on the Mexican border can have no conception of the difficulties encountered in the work. Fully eighty per cent of the telegrams are in Spanish, and more than fifty per cent of our customers cannot speak English; consequently, we must of necessity have a Spanish-speaking office force. Manager Rawlins is the only American employed in the office, but all of the employes speak both English and Spanish and take great pride in their work.

Piedras Negras is the headquarters for the Carranza government, and the latter does all its telegraphing through the Eagle Pass office. The Huerta government has many secret-service men and others in Eagle Pass whose business it is to watch the rebels and gain as much information as possible of their plans and movements, and consequently great care must be exercised to protect the company's patrons and prevent leaks. This so far has been successfully done, but we are all getting very tired of the constant strain under which we are forced to work.

Mr. C. F. Ames, superintendent of the Western Union Telegraph Company, Boston, Mass., writes: "Here is my check for my subscription, as I am sincere in my dealings with our managers when I recommend that they take the Age, and that they cannot afford to miss a single copy."

New Western Union Main Switchboard.

(Concluded from page 333, June 1)

"F"—Spare Battery Tap. These taps (Fig. 9) are used in place of the regular battery taps whenever it is necessary to change the voltage or polarity on a Morse wire. To make such a change a regular patching cord is run from the jack of the desired spare tap to the battery patching jack of the Morse wire; i. e., jack 2 of circuit A or AB, or jack 1 or 9 of circuit AE. The spare battery taps are also used as described under "circuit L," for testing with the Morse testing set.

"G"—Closed Group. This circuit (Fig. 9) provides a means of connecting a number of loops in series with any circuit in which there is but one looping jack available. The patching is accomplished by running a regular patching cord from the looping jack of the main circuit to any one of the jacks of circuit G. The remaining three jacks of circuit G thus become equivalent to looping jacks in the main circuit, and from them regular patching cords may be run to loop jacks as desired.

"H"—Two-Wire Trunk Between Switchboard Sections. This trunk (Fig. 9) corresponds to the "Fly-Cord" of the old style switchboards, and will be used where multiple trunks (circuit J) are undesirable for transferring loops and circuits from one switchboard section to another. It will also be used as an interpanel trunk to avoid the use of long patching cords between parts of the same switchboard section. In using these trunks, a patching cord is required at each end, to connect the trunk with the loop or circuit to be transferred. It should also be noted that when it is undesirable to provide special jacks for circuits H, HA or HB spare loop jacks of circuits A, AB, AD, AE, AI or AJ may be used.

"HA"—One-Wire Trunk. This trunk (Fig. 9) will only be installed in special cases where the trunking is mostly of single-wire circuits, as the two-wire trunk, circuit H, will serve for all purposes and is generally more convenient.

"HB"—Two-Wire Trunk Between Main and Loop Switchboards, with two or more jacks in series at latter. This circuit (Fig. 9) is for use at offices having large loop switchboards and is a modification of circuit H. It will be seen that two or more jacks per trunk, separated so as to ensure convenient connection with any loop, are provided at the loop switchboard.

"I"—Intermediate Machine. In making up combinations of single Morse loops, it is sometimes advantageous to introduce an ungrounded source of current, particularly when two loops are leaky or grounded. Each intermediate machine or battery provided for this purpose is terminated in a jack, from which a regular patching cord may be run to the No. 2 jack of a closed group (Fig. 9), circuit G, in which the loops are connected by regular patching cords to the other jacks (Nos. 1, 3 and 4).

"J"—Two-Wire Multiple Trunk. Circuits of this type (Fig. 10) are used on switchboards having more than two sections to furnish a satisfactory and flexible means of extending loops, sets and other circuits from one section to another. They may also be used, in some cases, between the loop switchboard and the main switchboard. It will be noted that each trunk appears at each section through which it passes in a jack and a busy-test knob. This makes it possible to use any trunk in extending a loop or other circuit from any section to any other section; i. e., it is not necessary to select a trunk from a certain group in order to reach a given section, as in the case of the "Flips" used with old style switchboards. To avoid interference, however, it is necessary to determine that the trunk to be used is not already in use at some other section. For this purpose the busy-test knobs are provided, as shown in Fig. 10. These knobs are "clear" or "open" as long as there are no plugs in any of the jacks connected with that particular trunk, but the insertion of a plug in any trunk jack grounds all the busy-test knobs on that particular trunk by pressing into contact two auxiliary springs mounted on the jack. Before taking a trunk, therefore, the attendant shall tap the busy-test knob above the desired jack with a busy-test plug (circuit K); if the trunk is in use the sounder associated with the busy-test plug will click, and another trunk must then be selected; if no click occurs, however, the trunk is then available and patching cords may be inserted in the jacks as required.

"JA"—One-Wire Series Multiple Trunk. Circuits of this type (Fig. 10) will be installed in special cases only, as explained under the heading of circuit "HA."

"JB"—Two-Wire Series Multiple Trunk. For a group of not more than six switchboard sections this type of trunk (Fig. 10) is sometimes desirable on account of the simplicity of the wiring. It has the disadvantage, however, that the jack connections are transposed at alternate sections.

"K"—Busy-Test Plug for Multiple Trunks. As shown in Fig. 10, the single conductor cord and plug of this circuit is connected through a sounder and resistance lamp to the grounded local battery or generator. The sounder will operate, therefore, whenever the plug is connected to a ground. This circuit is used, as explained under the heading of circuit J, to determine whether or not a multiple trunk (circuit J, JA, or JB, Fig. 10) is in use by having an attendant touch the circuit plug to the busy-test knob of any multiple trunk he desires to use. If the sounder clicks it is an indication that the trunk is being used at some other sections, as under that condition all the busy-test knobs associated with the trunk become grounded. If the sounder does not respond, the busy-test knobs are not grounded and the trunk is evidently idle and available for use.

"L"—Morse Testing Set. This circuit (Fig. 11) is used for testing and listening in on single Morse circuits and loops. The double conductor plug is used in a similar way to the terminal wedge of a single Morse set on an old style switchboard and may be inserted in the Morse cut-in jack of circuit A, AB, AC, AD, AE, AF or AI, or in any available jack of a closed group (circuit G). This

permits the attendant to watch the operation of the circuit and to make quick tests by opening or grounding it at different jacks. For further tests the double conductor plug is discarded and the single conductor plugs are used. One of these plugs may be inserted in a spare battery jack (circuit F) of any desired polarity or voltage. and the other plug in the line jack (No. 6, circuits A.

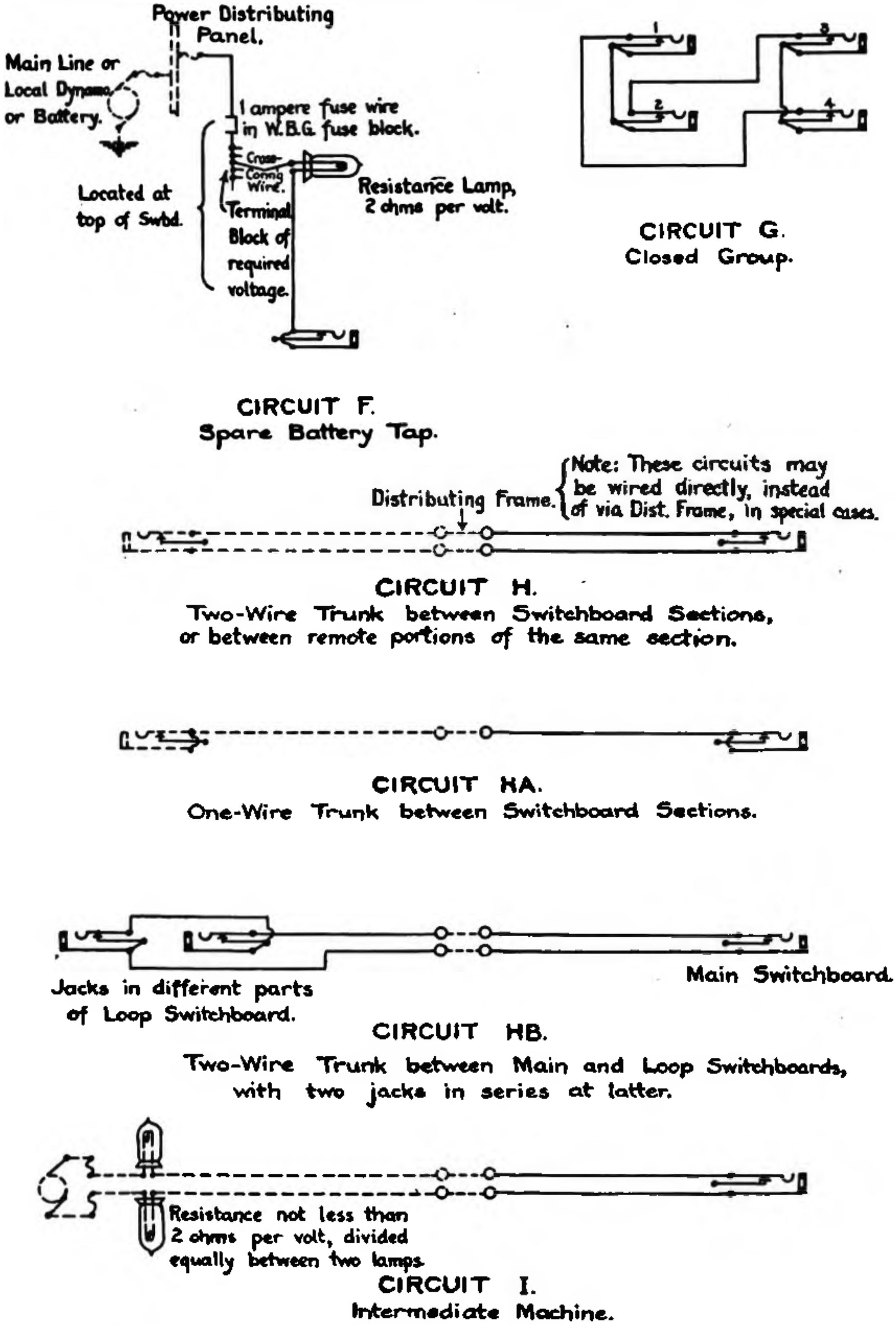
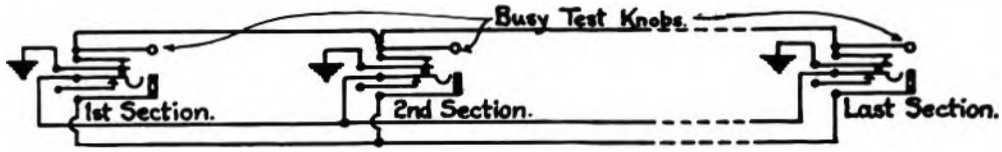


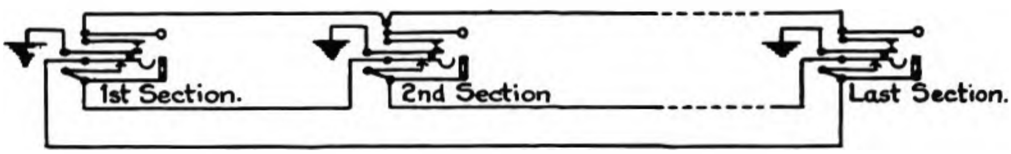
FIG. 9—SWITCHBOARD CIRCUITS F TO I.

AB, etc.), of the wire under test. As this connects the testing set directly between the battery and often desirable to make tests by frequently reversing the battery polarity. This may be accomplished



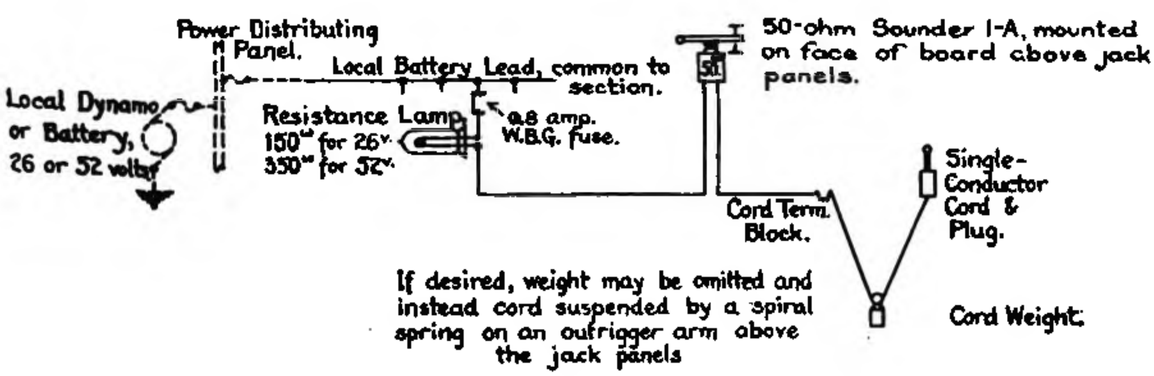
CIRCUIT J.
Two-wire Multiple Trunk.

CIRCUIT JA.
One-wire Multiple Trunk.



CIRCUIT JB.
Two-wire Series-Multiple Trunk.
Not more than six jacks allowable in this circuit.

NOTE: Type WE-203 Jacks used on all Multiple Trunks.
Each Busy Test Knob consists of one #3-48 x 1¼" fillister head brass machine screw, with nut & washer, and one Terminal Punching, Type WE-15-A.

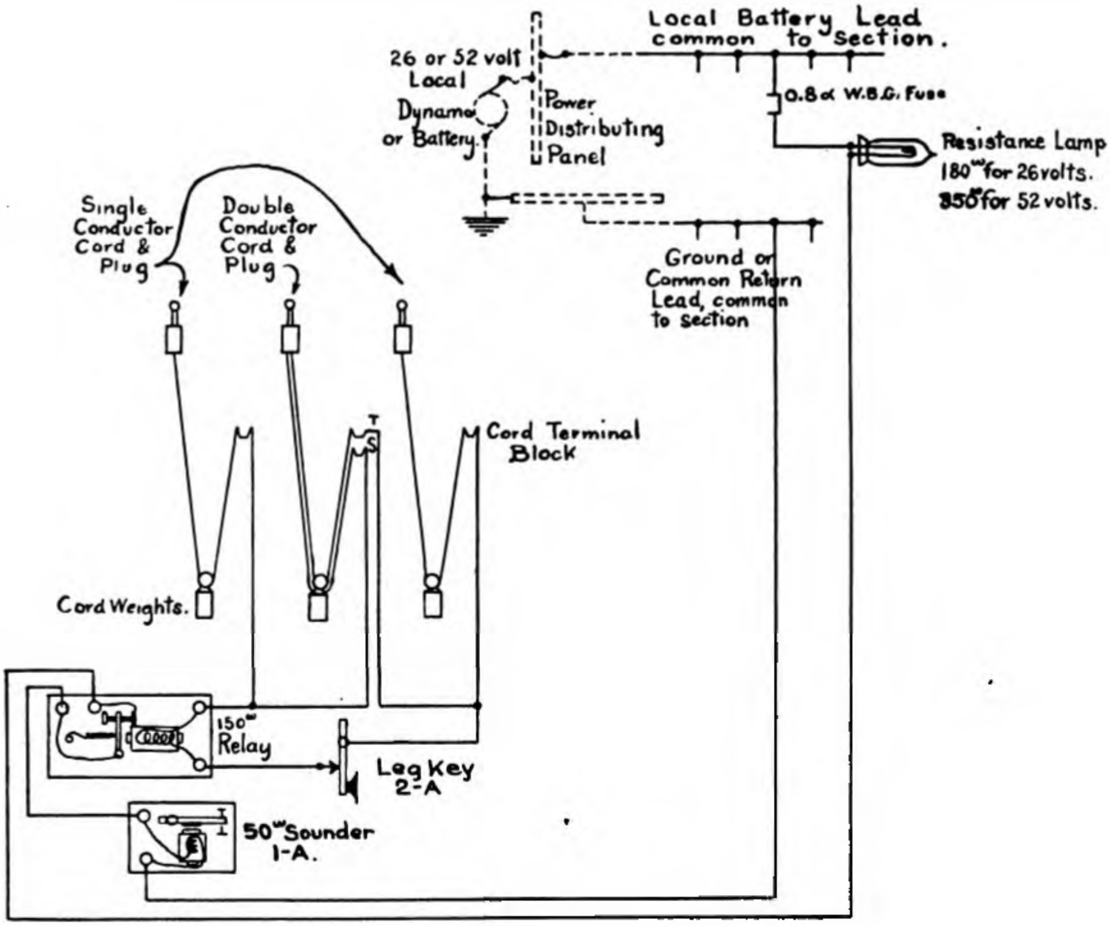


CIRCUIT K.
Busy Test Plug for Multiple Trunks.

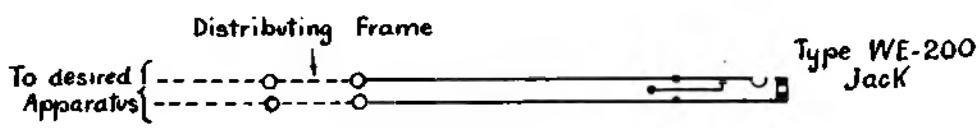
FIG. 10—SWITCHBOARD CIRCUITS J TO K.

line, with all loops and sets thrown off, the best conditions for accurate testing are obtained. It is by placing one of the single conductor plugs in the line jack and tapping the other one alternately on the face nuts of two adjacent spare battery jacks (circuit F) of opposite polarity and equal voltage. When testing on city line switchboards, as noted under the headings of circuit AE, the single conductor

11) constitute the terminals of various circuits, including loops, desk sets, full repeaters, half repeaters and time repeaters, which in old style switchboards terminate on cords and wedges. Spare loop



CIRCUIT L
Morse Testing Set.



CIRCUIT M
Miscellaneous Jacks
1 required for a Morse Loop or Desk,
2 " " " Full Repeater,
2 " " " Half Repeater,
3 " " " Double Loop Repeater.

FIG. 11—SWITCHBOARD CIRCUITS L AND M.

plugs may be similarly used, but in that case the loop, or operating set, is between the testing set and the line.

"M"—Miscellaneous Jacks. These jacks (Fig.

jacks of circuits A, AB, AD, AE and AI may be considered as "M" circuits and used for any of the purposes referred to in the previous sections of this article.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General Offices, 30 Church Street, New York
Western Office, Peoples Gas Building, Chicago

THE RAILROAD.

TELEPHONE DISPATCHING ON JERSEY CENTRAL.—The Central Railroad of New Jersey, of which Mr. F. G. Sherman is superintendent of telegraph, is installing the telephone train-dispatching system on its line between Jersey City and Somerville, N. J., a distance of thirty-six miles.

TRAIN DISPATCHERS' CONVENTION.—The Train Dispatchers' Association of America will hold its annual convention in Los Angeles, Cal., June 17, 18 and 19. The headquarters will be at the Hotel Alexandria. The ladies in attendance will be specially entertained, and there will be a theater party. After the convention excursions will be made to various points of interest. A special train will be run over the Atchison, Topeka and Santa Fe Railroad from Chicago June 12 for the accommodation of delegates and their families.

2,200 Miles More of Telephone Train Dispatching.

The success attending upon the adaptation of the telephone to train dispatching work a little over three years ago may be measured by the fact that at the beginning of 1913 there were about 70,000 miles of road in the United States and Canada using this method of controlling the movements of trains, and the fact that 70,000 miles out of a possible 265,000, or over 30 per cent, have been equipped with telephones in the comparatively short space of four years is indisputable evidence of the good work being done with the new system. Since the beginning of the year, apparatus for a large number of extensions to existing equipments has been ordered, and a number of other railroad systems have placed orders for their first telephone lines.

The Cedar Rapids and Iowa City Railway has ordered telephone train-dispatching apparatus for equipping its entire line, 30 miles long. The train dispatcher will be located at Cedar Rapids.

The Lehigh and New England Railway Company, with a mileage of 120, to be equipped. The remainder of the line will be equipped at a future date. The dispatcher will be at Bethlehem, Pa.

The Seaboard Air Line has placed an order for apparatus to be used in extending its telephone dispatching circuits from Columbia, S. C., to Jacksonville, Fla., a distance of approximately 285 miles. The dispatcher is located at Jacksonville.

Seven circuits are to be equipped on the Missouri, Kansas and Texas Railway, making a total of 1,000 miles of new telephone lines on this road.

Two new telephone train-dispatching circuits have been added to the lines of the New York Central. One circuit extends from Oswego to Rome, N. Y., with a side line bridged on at Richland and extended to Watertown, making a total mileage of 101. The dispatcher is located at Oswego. The other circuit extends from Oswego to Syracuse, N. Y., a distance of 70 miles. The dispatcher for this circuit is also located at Oswego.

Additions to existing circuits are to be made by the Chicago and Northwestern Railway Company. One new telephone dispatching line is to extend from South Pekin to Benld, Ill., a distance of approximately 105 miles. A message circuit for handling telephone traffic other than train dispatching will be installed over the Peoria Division and will extend from Nelson to South Pekin, Ill., a distance of about 85 miles. The dispatchers for each circuit will be located at South Pekin.

The Chicago, Burlington and Quincy is planning to add three new train-dispatching and one message circuit.

The Denver and Rio Grande Railroad has purchased a quantity of composite equipment for use on its lines.

These new installations add a little over 2,200 miles to the present mileage.

ORDER OF RAILROAD TELEGRAPHERS.—The next biennial convention of the Order of Railroad Telegraphers will be held in St. Louis, in 1915. The officers elected at the recent Baltimore convention are as follows: President, H. B. Perham, St. Louis; secretary and treasurer, L. W. Quick, St. Louis; first vice-president, J. A. Newman, Chicago; second vice-president, T. M. Pierson, St. Louis; third vice-president, D. Campbell, Toronto, Ont.; fourth vice-president, J. J. Dermody, Cincinnati, Ohio; fifth vice-president, E. J. Manion, New Haven, Conn. The order has decided to erect a $500,000 office building in St. Louis.

AMBROSE D. THURSTON, aged sixty-one years, founder of the Order of Railroad Telegraphers, died in St. Louis, Mo., on May 21. Mr. Thurston was well known to most of the railroad telegraphers on the American Continent. He studied law and was admitted to the bar, but his health compelled him to give up the practice of his chosen profession. He returned to the telegraph and worked for many railroads as agent and operator. While identified with the Burlington road at La Porte, Iowa, in 1883, he founded the Order of Railroad Telegraphers. He also established the *Railroad Telegrapher*, which is the official journal of that organization. Mr. Thurston was grand chief telegrapher of the order for many years, and in 1886 he was elected mayor of La Porte. He was a native of New York State.

MONEY VALUE OF MENTAL ANGUISH.—Mr. Joseph J. Connelly, of New York, sued one of the telegraph companies for $1,500 damages, alleging failure to deliver a message to his affianced in a reasonable time, which resulted in the breaking of the engagement. The trouble between the pair was subsequently righted, but on account of the humiliation and mental anguish he suffered over the estrangement he calculated that $1,500 would about heal the mental injury. The court gave judgment for fifty cents.

GOVERNMENT OWNERSHIP OF TELEGRAPHS.—A bill was introduced in the House of Representatives at Washington, May 27, empowering the President to ascertain upon what terms and conditions the telegraph companies will dispose of their properties to the government.

Organization for Wire Chiefs and Telephone Inspectors.*

BY J. B. SHELDON, SUPERINTENDENT OF TELEGRAPH, UNION PACIFIC RAILROAD, OMAHA, NEB.

First of all in importance is the upkeep of the lines of poles and wires and equipment. The general practice of allowing pole lines to stand up to the end of their possible life, in many cases far beyond reasonable safety, has been a very serious and seemingly insurmountable drawback, as it has left at the mercy of the elements at all times more or less of the machinery of our establishments. With the new plan evolved by the Western Union Telegraph Company of pole to pole inspections and repairs and replacements as found needed, we welcome the hope that before long our lines may be so uniformly well maintained that extensive troubles will be of rare occurrence.

It is important, too, that wires should not be allowed to remain in service without replacement, especially in the worst spots, when they have become so badly rusted or otherwise defective as to cause excessive trouble. In order to secure the best results the ordinary maintenance of the lines and wires by section linemen must be kept up to a high standard.

It is needless to say that thorough and frequent inspection is necessary—more than a superintendent, with his usually more or less onerous office work and other duties to look after, can conscientiously attend to—hence the necessity on the larger roads for a general outside plant inspector and a general inside plant inspector to properly supervise and care for the property, while on some of the smaller roads the duties of the two positions may be merged under one general plant inspector.

The general outside plant inspector should be a practical telegraph construction man, fitted to lay out and oversee construction and reconstruction work under foremen with gangs, in accordance with specifications applicable thereto, as well as check up the work of section linemen, and see to the proper maintenance of the lines by them.

The general inside plant inspector should, in addition to having a thorough knowledge of modern telegraph equipment, be a telephone expert capable of installing and maintaining telephone train dispatching and other apparatus in the best manner, besides directing and overseeing the work of division telephone inspectors, as well as section linemen in respect to equipment.

Where a single general inspector is employed to look after both the outside and inside plant he should be a combination of outside and inside inspectors.

Next in importance to the keeping of the plant as free from troubles as conditions will permit comes the accurate and prompt location and expeditious removal of troubles that occur. For this particular service skillful and energetic wire chiefs are required. Wire chiefs should be located preferably at principal division points, where many, if not all, of the wires under their charge terminate and receive current for operation.

The managers of terminal offices in many cases act as wire chiefs during their hours of duty, although more modern practice seems to assign the responsibility for the wires to wire chiefs throughout the day and night, leaving the managers free to look out for the general operation of the offices. A difficulty frequently experienced lies in the appointment of managers and wire chiefs at principal terminal points on the seniority plan rather than with regard to their ability to properly and satisfactorily fill the places. Fitness is undeniably the prime element to be considered to secure the best results. The superintendent of telegraph should have a free hand in the selection of such help, favoring the older men in the service, however, to the greatest extent possible.

Comparatively few telegraphers seem to interest themselves in the duties of wire chiefs or endeavor to qualify themselves for such positions in advance. This may be to some extent on account of seemingly slow advancement which causes them to neglect study, or they may be discouraged by the manager or wire chiefs in their efforts to post up on the work. However it may be, the older men are frequently not qualified for these better places when vacancies occur.

The offices at which wire chiefs are located should be under the immediate jurisdiction of the superintendent of telegraph, instead of under the control of division railroad officials. Only by this plan can the through wires as well as the local division circuits receive the attention they require.

The voltmeter is very essential in testing offices, as it is next to impossible to become thoroughly familiar with wire conditions from day to day without this instrument. The mil-ammeter is also quite important, in fact, just as essential as the voltmeter. With it can be determined whether or not the proper amount of current is being furnished to operate the relays on the various circuits. Of course, it is necessary, or at least desirable, to make tests between the various test offices when the line is normal, to determine the flow of current in the circuit with each section cut off. Record should be made of these readings for comparison in case of trouble.

A test panel with voltmeter and mil-ammeter should also be provided at the dispatcher's end of all telephone train-dispatching circuits. With these instruments wire chiefs should make monthly tests of all wires of which they have charge, to determine the insulation resistance, which should approximate 100 megohms per mile, and the strength of current, which, with 150-ohm relays in use, should be maintained at not less than forty milli-amperes for satisfactory results; and where noticeable variations from these standards are evident, report thereof to the superintendent of telegraph should be made for regulation. The importance of trouble being correctly reported to section linemen or division tele-

(Continued on page 389.)

* Extracts from paper read at the convention of the Association of Railway Telegraph Superintendents, St. Louis, Mo., May 22.

An Important Book on Testing.

Every student-telegrapher should have in his library of electrical literature a copy of "Electrical Instruments and Testing," by Norman H. Schneider. The importance of electrical testing cannot be over-estimated, and a practical knowledge of this branch of technical telegraphy is indispensable to those who would progress. This book is the latest on the subject of testing and is clearly written and well illustrated. It is as useful to the telephone man as to the telegrapher, as it contains a good deal of information on testing in telephone exchanges. The work is designed for the practical man and contains only the simpler mathematics. The chapters on the testing of telegraph wires and cables, and the location of faults were written by Mr. Jesse Hargrave, a well known telegraph engineer.

The price of this book is $1.15, postpaid, to any part of the world and orders will be filled by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, on receipt of price.

Book on American Telegraph Practice.

Every student of technical telegraphy should be familiar with modern practice in telegraphy—that is to say the systems and apparatus employed in their operation. The latest book on this subject is McNicol's "American Telegraph Practice." A careful study of this excellent work will give one a comprehensive view of the telegraphic art as practiced in America at the present time and a familiarity with its contents is about all a person need know about the subject to be an expert.

The book constitutes a complete technical course in modern telegraphy, including simultaneous telegraphy and telephony, and contains 498 pages. There are twenty-four chapters on: Electricity and magnetism, primary batteries; generators, motors, motor-generators, dynamotors, voltage and current regulators; storage batteries, current rectifiers, mercury arc and electrolytic; power-board wiring, battery switching systems and accessories, circuits and conductors; single Morse circuits; lightning and lightning arresters; terminal and intermediate switchboards, measuring instruments, testing; speed of signaling; single line repeaters (29 pages); duplex telegraphy; quadruplex telegraphy; balancing duplexes and quadruplexes; duplex and quadruplex "local" circuits, leg-board and loop board connections (12 pages); branch office annunciators; signaling systems, selectors; half-set repeaters (20 pages); the phantoplex; high-speed automatic telegraphy (22 pages); telegraph and telephone circuits as affected by alternating-current lines, transposition of wires; telephony, simultaneous telegraphy and telephony; wire specifications; electrolysis. The book also contains many useful tables and much other matter of direct interest to telegraphers.

The price of the book is $4.00 per copy. Copies may be obtained of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

(Continued from page 388.

phone inspectors by wire chiefs, both as to location and nature, cannot be overestimated.

In the testing and patching of wires it is essential that wire chiefs should have prompt, intelligent and considerate co-operation of employes at wire-testing stations. To further this result, it is desirable that all new employes should be required to pass an examination upon this work. If wire chiefs should find employes at testing stations not qualified for the work at any time, report thereof should be promptly made to the superintendent of telegraph for improvement of service.

There is sometimes a tendency on the part of wire chiefs to become unduly impatient and exacting in their dealings with employes at wire-testing stations, which does not produce harmony or reflect to the good of the service. They should appreciate that the good will of those with whom they come in contact is of inestimable value.

Wire chiefs should keep a comprehensive "log" of wire conditions day by day, showing the time of occurrence of trouble, on what wires, the approximate location and nature of it, as first determined, as well as the exact location and cause.

While there is considerable difference of opinion as to the necessity for division telephone inspectors, some maintaining that the care of telephone train-dispatching apparatus can be properly looked after by section linemen, it is the writer's belief that, under ordinary conditions, separate help, more skilled in this particular work and constantly available for this service, is essential for thoroughly satisfactory results.

An inspector is usually easier to reach than a section lineman, as his work is practically confined to offices, so he may be found either at some office or traveling on some train, while the work of section linemen is generally out on the line, away from ready communciation, so they frequently cannot be reached for quite long periods of time.

The qualifications of a telephone inspector include a thorough knowledge of the equipment, a disposition and the ability to do good substantial work, a desire to have everything in shipshape order and a willingness to keep on the go energetically, as conditions require, for the maintenance of the service to the best advantage. Systematic and thorough inspections over their entire territory should be made at least once a month.

Reports of inspections should be made to the superintendent of telegraph, showing renewals of battery and equipment at the different stations and booths, and giving reference to any conditions for the good of the service that it is considered he should know about.

Public Utilities and Public Policy.

In the *Atlantic Monthly* for March, President Theo. N. Vail, of the American Telephone and Telegraph Company, and of the Western Union Telegraph Company, discusses the fundamental principles of public utilities and public policy, and draws the conclusion that efficiency in the telephone service depends upon one universal system under government control and regulation.

"The net revenue received by a public utility corporation in return for its service or commodity must," says Mr. Vail, "be sufficient to pay a fair return upon the cost of the plant and of the organization and establishing of the business." Although "net revenue can be produced in two ways; by a large percentage of profit on a small business, or a small percentage of profit on a large business," yet "the experience of all industrial and utility enterprises has been that it adds to the permanency and undisturbed enjoyment of a business, as well as to the profits, if the prices are put at such a point as will create a maximum consumption at a small percentage of profit."

The rates whereby a public utility obtains its revenue vary under existing conditions, but "a uniform rate is an advantage to the community as a whole, in that it gives to all equal facilities, as near as may be, at a uniform cost. It is equitable in that the highly developed centers are dependent on the country as a whole, and, therefore, should contribute toward this policy of equal facilities at uniform cost; but it is inequitable if, without remedy, any utility is obliged to furnish service below cost at uniform rates established on an average cost which includes utilities more favorably located.

"The inevitable conclusion is, therefore," Mr. Vail states, "that if uniform rates are to prevail in any utility system, that system must tend to combination and to a single system or monopoly, if you please, if a highly developed, highly efficient, and progressive utility is to be maintained."

Mr. Vail discusses at length the various effects of competition and its causes, among which are a number of legitimate incentives, and also such objects as "to create by destructive and aggressive tactics such a situation as will force a settlement by purchase, combination, or an understanding of some kind, with an established business; or to promote a business upon the reputation and success of others and sell it to innocent investors upon misleading statements, either willful or mistaken.

"The vicious acts associated with aggressive competition are responsible for much, if not all, of the present antagonism in the public mind to business, particularly to large business." Competition is encouraged by the public because they believe they will derive some benefit, which, however, has never come from destructive competition, for "the settlements of competitive wars always affect the public unfavorably.

"Competition can only exist where there are abuses, either in the way of unreasonable profits or of excessive capitalization; and where control and regulation are effective, these abuses cannot exist or continue." Mr. Vail touches on the regulation and control of public utilities by commission, and says that to attain success there must be "a thorough co-operation between the public, the commissions and the corporations, with confidence, deference and dependence, and absolute frankness on every side."

MUNICIPAL ELECTRICIANS.

MR. WILL Y. ELLETT, superintendent of fire telegraphs, Elmira, N. Y., accompanied by his son, Fred S. Ellett, also of Elmira, were New York business visitors on June 7, and made it the occasion to call on numerous friends.

LONDON FIRE ALARMS.—A more modern system of fire alarms than those now in use is to be provided in London, England. An officer of the fire brigade is to visit America for the purpose of inspecting and reporting upon the systems of fire alarms in use in the large American cities.

The Watertown Convention.

Mr. John W. Kelly, jr., president of the International Association of Municipal Electricians, has just returned from an extended trip through the South and Southwest. He combined business with pleasure, and visited the municipal chiefs at Charlotte, N. C., Mobile, Ala., New Orleans, La., Houston, Galveston and Dallas, Tex., Hot Springs and Little Rock, Ark., Chattanooga, Tenn., and Asheville, N. C. His trip will result in the addition of several names to the list of members of the International Association of Municipal Electricians, and the attendance at the Watertown, N. Y., convention, August 19-22, of the chiefs from Charlotte, Mobile, New Orleans, Houston, Dallas and Little Rock. President Kelly met the mayors of several of the cities visited and impressed them with the value to their municipalities of the membership of their electrical chiefs in the International Association of Municipal Electricians and the importance of their attendance at the annual conventions. Mr. Kelly is arranging for a conference on the subject of "Electrolysis" at the Watertown convention, with representatives of the American Water Works Association.

Police Signaling by Telephone.

A police signaling system, in which the telephone furnishes the means for communication between signal station and police headquarters, has been installed at Plymouth, Pa.

The telephone signaling stations are distributed over the business and residential sections of the town in such a way that a police officer is never very far away from one. The station telephones are of the familiar iron box type, and are fastened either to the walls of buildings or to telephone poles. The outer door of each telephone is kept locked and can only be opened by those authorized to carry keys. The opening of the outer door exposes only the talking apparatus. When both doors are closed, the telephones are moisture and dustproof.

The signaling system is operated from a central battery at police headquarters. The line wires from the telephone station boxes are connected at headquarters to a cordless private branch exchange switchboard.

A novel feature of the equipment is the manner in which calls are recorded. The incoming calls are

POLICE SIGNALING BY TELEGRAPH.

recorded on a Bristol recorder. At the headquarter's switchboard there are a number of resistances, no two of which are alike in value. One of these resistances is connected in the circuit of each police telephone box, so that the amount of current supplied to each telephone differs from that supplied to the others. The amount of current required for each of the signal boxes is a fixed known quantity. When the record is made on the Bristol instrument, the amount of current flowing is indicated on the sheet and shows which station has called. The sheets of the recorder give a permanent record of the calls made from each of the telephone stations, and in this way the movements of the police officers may be checked.

The system was furnished by the Western Electric Company, and it has been found that it has produced a higher degree of efficiency in the police department as a result of the increased facilities for supervision.

Combination Metallic "Jumper."

BY J. B. DILLON, WIRE CHIEF, WESTERN UNION TELEGRAPH COMPANY, DALLAS, TEX.

The accompanying diagram shows a simple and efficient jumper devised by the writer for use with the new and improved switchboard of the Western Union Telegraph Company. A perusal of the official specifications shows that all loops to the jack board from multiplex sets will give best results when wired metallic.

If it be desired that the same table space be used as a single Morse line, then the nicety of the jumper shown in the accompanying diagram will be understood.

SK represents the key on the sending side of the jumper, RK the key on the receiving side. These keys are wired in multiple so that quick action is given when used for multiplex jumper.

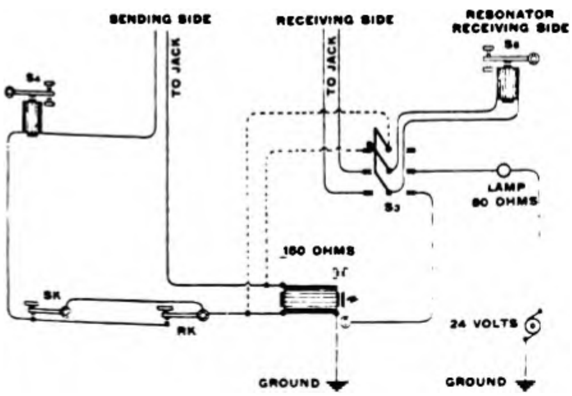
The sounders are all of four ohms, and the local generator is of 24 volts.

The relay for single line is the standard 150-ohm pattern.

S3 is a double-throw, triple-pole switch.

When the switch S3 is thrown to the left, the upper blade shunts the 150-ohm relay and places sounder S4 as a multiplex sending loop from the set to the table back and to the jack board; it also connects sounder S5 as a receiving metallic loop from the set to table and back.

The loop gets its ground either at the back of the jack board or on an outside branch office loop. Throwing the switch S3 to the right removes the shunt from the relay and places keys SK, RK, sounder S4 and the 150-ohm relay in circuit for a single set. The 24-volt local current traverses the middle blade of the switch S3, thence through sounder S5 back to the lower blade of S3 to relay the local posts, thence to ground. The upper blade is not needed when the switch is thrown to the right.



COMBINATION METALLIC "JUMPER."

Mr. M. W. Jones, trainmaster of the Guayaquil and Quito Railway Company, Guayaquil, Ecuador, writes: "TELEGRAPH AND TELEPHONE AGE is indispensable to me, and I could not get along without it."

Telephone Pioneers of America.

G. T. MANSON.

Mr. George T. Manson, general superintendent of The Okonite Company, New York, entered the telephone business in Chelsea, Mass., December, 1879, as general utility man, afterward becoming superintendent of the Suburban Telephone Company.

G. T. MANSON, NEW YORK (1879).

He later received the appointment of purchasing agent for the New England Telephone and Telegraph Company, and on June 1, 1886, resigned that position to accept one with The Okonite Company, with which interests he is still identified.

Mr. Manson is well known in the electrical trade, and while not connected directly with telephone interests he still has more or less close relations with the people engaged in it.

THE PRESENT-DAY MUSIC MACHINE.—An interesting story of the present-day music machine, particularly the graphophone, is told in a pamphlet by Mr. Walter P. Phillips, the well-known old timer and former general manager of the United and Associated Presses. Mr. Phillips traces the attempts to produce a talking machine as far back as 1779, and takes up in succession the work along the same line since that time, including the investigations and developments of Edison, Berliner and others. A valuable and interesting feature of the booklet is the reproduction of various patent specifications and court decrees bearing on the subject.

TELEGRAPHS AND TELEPHONES IN SALVADOR.—We are in receipt of a copy of the annual report of Mr. R. Posada, director general, telegraphs and telephones of the Republic of Salvador, San Salvador. It is a very complete document and goes into every detail of the service.

Waterproof Transmitter at the St. Louis Convention.

One of the most interesting exhibits at the convention of the Association of Railway Telegraph Superintendents in St. Louis, Mo., May 20-24, was that of the Gottschalk Waterproof Sanitary Transmitter Company, of New York. Mr. W. J. Lowrie, jr., secretary of the company, practically demonstrated the waterproof qualities of the instrument in an interesting manner, and the superintendents who witnessed the severe test to which it was subjected were surprised to know that such a transmitter was on the market.

Although their attention was called to it at the last hours of the convention, those who saw it were deeply interested in its performance.

It will interest railroad superintendents to carefully read the company's advertisement on another page, which gives an account of the test of the instrument at the convention.

THE GENERAL ORDER COMPANY of Chicago whose advertisement appears in another column, has as its president and general manager, Mr. F. W. Conger, a well-known former telegraph official. Mr. Conger has been identified with telegraph interests for so many years that his wide experience in executive work eminently qualifies him for his new line of business. He will be very glad no doubt to hear from his old friends, and we hope that the merits of the offer of the General Order Company will be looked into.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

F. Wilcoxson, of this office, died at Bellevue Hospital, June 7. The remains were interred at Seneca Falls, N. Y.

Mr. J. V. Riddick, of this office, was married to Miss Irene Hannigan, of the bookkeeping department, on June 1. Mr. Riddick received many presents from his numerous friends in this office, among them being a handsome silver tea set. The bride also received beautiful presents. Mr. Harry Tepe, of this office, was the best man.

Senator W. L. Ives, of this office, is visiting his old military comrade, Mr. Albert W. Orton, at Rome, N. Y. The two gentlemen were associates in the war department at Washington during the Civil War.

Mr. Martin Durivan, of this office, has again resumed his position as chief operator at West End, Long Branch, N. J., for the summer season. Mr. P. J. Casey, of New York, will assume the management of the office on June 16, as has been his custom for the past thirty years.

CHARLESTON WESTERN UNION

This office has recently been thoroughly renovated and new equipment installed, and is now one of the neatest offices in the South. The commercial department is covered by Mr. E. Johnson, manager, assisted by J. B. Jay, cashier, and W. J. Fleming, local solicitor. The plant and traffic departments are in charge of Mr. A. R. Lucas, chief operator, assisted by Mr. H. W. Hughes, traffic supervisor and Mr. C. W. Myers, repeater chief.

Important Telegraph Engineering Articles.

Among the important telegraph engineering articles which have appeared recently in our paper, and which ought to be in the hands of every student member of the profession, is the description of the new quadruplex system of the Postal Telegraph-Cable Company described in the December 1, 1912, issue. The bridge duplex adopted by the Western Union Telegraph Company was described in our issues of December 1 and 16, 1912, January 1 and 16, and February 1, this year. These articles were fully illustrated, and copies can be obtained at ten cents each.

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Telegraph and Telephone Age

No. 13. NEW YORK, JULY 1, 1913 Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

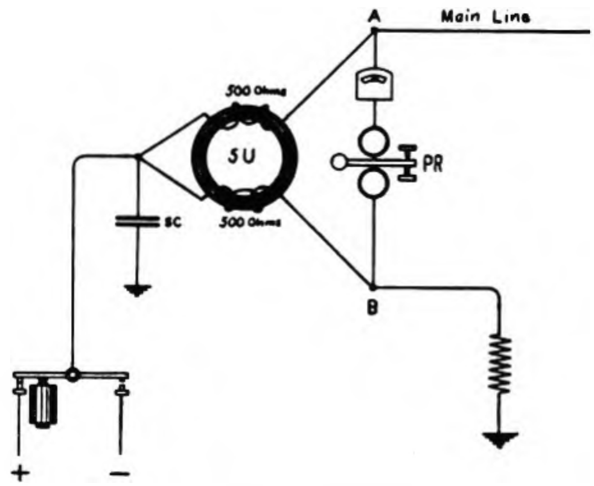
BY WILLIS H. JONES.

The "Habits" of an Electric Current—Bug Traps.

Perhaps the word habit is not exactly the proper term to use in reference to the actions of an electric current, but the regularity and persistency with which it always acts in the same manner under like conditions suggests the thought that it possesses certain characteristic traits analogous to long-formed habits. At any rate, for "ways that are dark and tricks that are vain" an electric current has the best of Bret Harte's "Heathen Chinee." Laymen can find no better method of studying telegraph engineering than by learning about these "habits" and observing the manner in which electrical apparatus are constructed, with due allowance therefor. There was a time when Mr. Thomas A. Edison was credited with being the sole inventor and owner of the "bug-trap," and whenever the term was used one's thoughts immediately recalled his repeating sounder in connection with quadruplex operation; but to-day nearly every important instrument employed in the telegraph service is itself more or less an electric "bug" catcher. At least, its construction is designed to either combat or encourage some special action of the current, as the condition may require. Take some of our modern apparatus for illustration.

THE 5 U. RETARDATION COIL.

This device is an electric "trap" set to catch the incoming current just as it reaches one terminal of the polar relay and then compelling it to work with increased energy for a fraction of a second, while endeavoring to extricate itself. This is accomplished in the following manner: By referring to the accompanying illustration, it will be seen that the 5 U coil consists of a ring of soft iron having two parallel windings of 500 ohms each, which constitute two arms of a bridge, between the outer terminals A and B, across which the polar relay is connected. One winding is connected to the main line and the other to the artificial line. Now the conventional explanation of the operation of the incoming current is that, on account of the great impedance the



5 U. RETARDATION COIL.

coil offers, the current is suddenly checked in its course at the point of entrance and thereby momentarily "banks up" in greater volume; consequently, a greater proportion of it is forced through the bridged relay circuit than would otherwise result. The student should not be misled, however, by this explanation, as there is really no such thing as a "banked" current in the sense meant when referring to the sudden checking of the flow of a stream of water by a dam. The reason the relay gets a greater current at that moment is that the e.m.f. of the line battery is temporarily increased in value at the point where the relay is connected. The bridge circuit receives currents governed solely by the value of the e.m.f. at the outer terminals of the 5 U coils.

What really happens is this: When an incoming current reaches the outer terminal of one arm of the 5 U coil, the initial voltage of the distant battery has not yet dropped to zero, because there still remains in circuit the joint resistance of the duplex set and battery lamp. The value of the e.m.f. at the coil terminals, however, is the factor which governs the current that flows through the polar relay, because it is at those points the bridge circuit is connected. Now, if the amount of resistance between the connecting point and the home battery is increased, the e.m.f. at that point will also be increased, because the drop in voltage will then not be so great. The duty of the 5 U coil is to insert the necessary additional resistance for a fraction of a second, so that the polar relay may be more strongly energized, while the initial current flows through its coils, owing to the resulting temporary increase of e.m.f at that point.

The extra resistance temporarily inserted by the coil is in the form of "impedance," caused by the counter electromotive force developed in the coil, but which only remains in action for a fraction of a second, while the current is traversing the convolutions. The impedance resistance is often greater than the ohmic resistance of the coil itself. The total effective resistance of the coil at such times is, therefore, equal to the sum of the impedance and the ohmic resistances. The outgoing current is not retarded to any great extent, as it divides equally between the two parallel windings and thus neutralizes retarding influences.

Incidentally, the 5 U coil partially frustrates the current's natural tendency to create electrical disturbances in adjacent parallel wires by preventing its too sudden rise and fall. The check to its rise and fall occurs during the brief period of time the counter electromotive force in the coils is effective.

It will thus be seen that the 5 U coil is an electrical "bug-trap" that catches and governs the current, both incoming and outgoing.

(To be Continued.)

Telegraph and Telephone Patents.

ISSUED JUNE 3.

1,063,193. Combined Telegraph and Signaling System. To E. R. Gill, Yonkers, N. Y.

1,063,361. Telephone System. To O. M. Leich, Genoa, Ill.

1,063,396. Means for Increasing the Speed of Transmission of Signals over Telegraph and Cable Lines. To G. Seibt, New York, N. Y.

1,063,599. Telephone Register and Lock-out Device. To C. V. Richey, Washington, D. C.

1,063,601. Antiseptic Mouthpiece for Telephones and Similar Instruments. To M. Rosenwald and J. C. Doran, New York, N. Y.

ISSUED JUNE 10.

1,064,049. Apparatus for Recording Calls Made by Telephone. To E. H. Bridge, Spotswood, Victoria, Australia.

1,064,373. Telegraph Transmitter. To E. C. Phillips and T. Rhodus, Chicago, Ill.

1,064,433. Method of Reducing Telephonic Disturbances. To O. B. Blackwell and G. A. Anderegg, Maplewood, N. J., and Oak Park, Ill.

1,064,471. Thermotelephone or the Like. To B. Gwozdz, Berlin, Germany.

1,064,492. Muffler Attachment for Telephones. To G. Kracker, Philadelphia, Pa.

1,064,599. Telephone Attachment. To W. Bimson, Philadelphia, Pa.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, June 25:

American Telephone and Telegraph Co.	128½
Mackay Companies	77
Mackay Companies, preferred	64½
Western Union Telegraph Co.	61

PERSONAL.

Mr. W. H. Sawyer, an old-time telegrapher, of Providence, R. I., who has spent the winter months in Pasadena, Cal., has returned to Weekapaug, R. I., for the summer months.

Mr. Gerard Swope, vice-president and general sales manager of the Western Electric Company, New York, is on a three months' trip to the European branches of the company.

Mr. Nakayama Ryuji, an engineer attached to the Japanese Department of Communications, has been appointed Advisor of Telegraphs and Telephones in the Chinese Department of Communications.

Mr. Thomas Ewing, Jr., a son of the former governor of Ohio, and for a long time an active legal practitioner in procuring and litigating patents, has been nominated by President Wilson for the office of commissioner of patents. His appointment will undoubtedly meet with universal approbation. It will be recalled that Mr. Ewing was the attorney for Professor Pupin in the matter of loading coil inventions, and the interference proceedings following. Mr. Ewing is a friend of the patent system as it has existed for years, and it is not expected that he will view with favor any attack upon the existing laws.

Inductive Interference in California.—The joint committee on Inductive Interference of the California Railroad Commission is now investigating the interference of electric power transmission lines with telegraph and telephone lines. The committee is composed of engineers representing the transmission and communication companies. At a recent session of the committee in Los Angeles, among those representing the interests concerned were A. H. Griswold, chief plant engineer, Pacific States Telephone and Telegraph Company; C. H. Temple, chief engineer, United States Long-Distance Telephone and Telegraph Company; V. V. Stevenson, division electrical engineer, Postal Telegraph-Cable Company, San Francisco; R. W. Gray, division plant superintendent, Western Union Telegraph Company, San Francisco.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. CLARENCE H. MACKAY, president, sailed for Europe on June 25, on the steamer "Imperator." He was accompanied by his three children.

MR. EDWARD REYNOLDS, first vice-president and general manager of the company, accompanied by Mrs. Reynolds, spent Saturday and Sunday, June 21 and 22, with relatives at Catskill, N. Y., which is Mr. Reynolds' native town.

MR. E. J. NALLY, vice-president and assistant to the president of this company, who has been visiting London for the past six weeks, sailed from Liverpool on the steamer "Baltic" on June 26. Mr. Nally has been greatly benefited in health by his vacation.

MR. W. I. CAPEN, vice-president of the company, has returned from a trip to Boston.

MR. G. H. USHER, general superintendent of the Southern Division, Atlanta, Ga., who has been in Europe for the past month, accompanied by his wife, is expected to arrive at New York on July 4.

MR. F. J. KERNAN, acting auditor of the company, was recently in Philadelphia on company business.

MR. H. W. HETZEL, traveling auditor of the company, is making a trip of inspection throughout the New England States in the interests of the service.

AMONG recent executive office visitors was Mr. H. H. Hall, of Ashtabula, Ohio, who has been identified with the telegraph service for the past sixty years.

THE father of Mr. H. Scrivens, superintendent at Pittsburgh, Pa., died at his home in Brooklyn, N. Y., on June 17.

MISS MAUD HARRIS, an attaché of the general manager's office, New York, was married to Mr. Lynn Whitaker, at Flushing, L. I., June 24.

MR. J. LEONARD FLOOD, of the Mackay Telegraph and Cable Company, Shreveport, La., was an executive office visitor, June 26.

MR. T. J. HOWLETT, who has conducted this company's restaurant in the main office, New York, for the past six years, and previously in Chicago, has sold his interests to Mr. Frank Sullivan, who will conduct the business hereafter. Mr. Howlett has gone to Europe.

POSTAL ELECTRICAL SOCIETY.—As a result of the recent examinations in the Postal Telegraph Electrical Society, of New York (which is described and illustrated on another page in this issue) the following prizes were awarded: First, one copy of D. McNicol's book, "American Telephone Practice," to Mr. W. H. Schlaeffer, of the main office; second, one copy of TELEGRAPH AND TELEPHONE AGE for one year, to W. Redlefsen, of the Sixty-sixth Street and Broadway office. These two gentlemen showed great proficiency in their studies and practice work. Many other members of the class were commended for excellence in studies.

HOW TO FIND JUDGE ISAAC SMITH QUICKLY.—The publisher of TELEGRAPH AND TELEPHONE AGE, together with two telegraph friends on an automobile trip, found themselves stalled for a few minutes at Little Falls, N. J. Remembering that this was the home of Judge Isaac Smith, superintendent of tariffs of the Postal Telegraph-Cable Company, New York, and justice of the peace at Little Falls, a passing colored man was asked if he could tell how Judge Smith could be quickly reached. He thoughtfully replied: "Le' me see. After you ile up your machine, just speed a little and let that man standing on the corner see you do it. He is the constable and will take you before Jedge Smith quickly."

Western Union Telegraph Company.

EXECUTIVE OFFICES.

PRESIDENT THEO. N. VAIL is again at his office in better physical condition than for some years past.

MR. G. W. E. ATKINS, vice-president of the company, is again at his desk, after a vacation devoted to fishing in the lakes of the North Carolina mountains.

MR. M. C. RORTY, commercial engineer of the American Telephone and Telegraph Company, New York, has been appointed manager joint telephone arrangements of this company, with headquarters at 195 Broadway.

THE OFFICE of Mr. F. T. Albert, secretary of the pension department, has been removed from 195 Broadway to 191 Broadway. The office vacated on the sixth floor by Mr. Albert will be occupied by Mr. M. C. Rorty, the newly appointed manager joint telephone arrangements.

MR. S. M. CUSTER, district commercial manager, Baltimore, Md., was a recent executive office visitor.

MR. J. F. WILSON has been appointed manager at Savannah, Ga., vice W. T. Austin, resigned.

MR. W. T. STEAD has been appointed manager of the Birmingham, Ala., office, vice G. R. Calvert, resigned, to enter the legal profession.

MR. S. G. SMITH, of Scranton, Pa., has been appointed manager of the Youngstown, Ohio, office, vice C. W. Garver, resigned, to return to Ashland, Ohio. The Youngstown *Vindicator*, refers in complimentary terms to Mr. Garver's career in Youngstown. It says: "C. W. Garver, for the past two years manager of the local branch of the Western Union Telegraph Company, has resigned, and will return to Ashland, Ohio, where for seventeen years he was manager for the same company. Mr. Garver states that sickness in his family, as yet located in Ashland, and unable to come to this city on that account, is responsible for his determination to return. During the two years that Mr. Garver was in Youngstown, the Western Union office, largely through his efforts, was moved from its former inadequate quarters in the southeast corner of Central Square to the commodious room that it now occupies in the Stambaugh Building. It is stated that during the same time the business in the local Western Union office increased 60 per cent—a testimonial both of the growth of the city and the efficient management of Mr. Garver."

THE CABLE.

MR. OSCAR MOLL, general manager of the Deutsche Atlantische Telegraphengesellschaft, Cöln, Germany, arrived in New York on the steamer "America," on June 14. Mr. Moll is likely to remain in the United States at least three weeks. His trip is one of business and pleasure combined. Prior to his assuming general managership of the German cables in 1899, he was manager of the Direct Cable Company, at London, England, for the previous twenty-five years. Mr. Moll is well known to the cable officials in this country, as well as in Europe. Under Mr. Moll's management, the German cables have proven very successful, largely aided by the able assistance of the Commercial Cable system. The company has paid dividends during the past ten years and at the same time has accumulated a reserve fund.

MR. J. C. DENISON-PENDER, a grandson of the late Sir John Pender, of cable fame, and a director of the Eastern and other telegraph companies, London, England, was recently elected to a seat in Parliament. Mr. C. G. C. Hamilton, another well-known English electrical engineer, has also been elected to Parliament.

MR. T. C. LECKEY, manager of the Isles of Shoals Telephone and Telegraph Company, Portsmouth, N. H., reports that the cable between Isles of Shoals and Portsmouth is working well, both as to telephone and telegraph transmission. The navy yard at Portsmouth is connected with this cable.

CUBA CABLE REPAIRED.—The Commercial Cable Company's steamer, "Mackay-Bennett" on June 22 completed the repair of the Cuba cable, which was interrupted near Havana harbor.

AN ENLARGED and permanent cable station will be erected at Bay Roberts, N. F., by the Western Union Telegraph Company, to accommodate its transatlantic cables. Spacious and modern dwellings will be erected to accommodate the staff of employes.

CABLES AND TRAWLERS.—An international conference was recently held in London to consider what steps can be taken to protect submarine cables from damage due to trawling.

CABLE FROM FORMOSA TO HONG-KONG.—The Formosan Government is considering the question of laying a submarine cable between the Island of Formosa and Hong-Kong.

THE MEXICAN TELEGRAPH COMPANY'S steamer "Relay" sailed from New York June 21 for the Gulf of Mexico to repair a fault in the company's 1881 Galveston-Vera Cruz cable, caused by a schooner anchoring in the vicinity of the cable during a storm. The "Relay" has just been overhauled, having had a new deck laid and other improvements, including the installation of a Marconi wireless telegraph set.

THE TELEPHONE.

MR. J. H. HONS, recently appointed auditor of the Bell Telephone Company of Pennsylvania, and Associated Companies, has had a long telegraph and telephone experience. He started as a messenger at 195 Broadway, New York, and became an operator in due time. He worked for the Postal Telegraph-Cable Company, and on June 10, 1895, entered the service of the New York and New Jersey Telephone Company, in Brooklyn, N. Y., as assistant voucher clerk. He advanced through various positions, and when the closer union of the companies of the Eastern group was effected, in March, 1911, Mr. Hons was appointed division auditor of receipts, with headquarters at Philadelphia, where, as auditor, he still remains. Mr. Hons is a native of New York City.

MR. FRANK W. JACKSON, of the American Telephone and Telegraph Company, Cleveland, Ohio, has been appointed district traffic chief, with headquarters at Harrisburg, Pa.

MR. G. H. MERRILL, manager of traffic inspection, New York Telephone Company, New York, has been appointed division superintendent of traffic, New Jersey, vice J. C. Lynch, resigned.

MR. J. C. LYNCH, division superintendent of traffic, New Jersey, New York Telephone Company, has resigned to accept the position of general superintendent of traffic of the Bell Telephone Company of Pennsylvania and Associated Companies.

MR. O. L. TURNER, of the Western Union Telegraph Company, Dallas, Tex., has been appointed manager for the Missouri District Telegraph Company, at Kansas City, Mo.

TELEPHONE BOOTHS IN NEW YORK SUBWAY.—Public telephone booths are to be placed at certain stations of the Subway as an experiment.

MUNICIPAL TELEPHONE PLANT.—At a special election held at Mitchell, S. D., on June 11, $60,000 was voted for a municipal telephone plant.

TELEPHONE IN AUSTRALIA.—Recent tests in Melbourne, Australia, show that out of 338 calls from subscribers' premises, eighty per cent were answered within ten seconds; only seventeen took over half a minute.

TELEPHONE STOCKHOLDERS. — The American Telephone and Telegraph Company now has the largest list of stockholders in its history, the total being not far from 54,000, as compared with 50,000 on January 1, and 47,000 at the beginning of 1912.

EXAMINATIONS FOR GOVERNMENT TELEPHONE OPERATORS.—An open competitive examination for telephone operators will be held by the United States Civil Service Commission at various places throughout the country on July 16 for the purpose of securing eligibles from which to fill vacancies, as they may occur in the position of telephone switchboard operator in the departmental service at Washington, D. C. The examination will be open to both men and women. The salaries range from $660 to $720 a year.

Central-Battery System.—Mr. Victor J. Baumann describes in *Elektrotechnische Zeitschrift*, of Berlin, Germany, a new central-battery telephone system, in which, when a subscriber calls up an exchange, an automatic device at the exchange connects him with any one of the operators who may, at that moment, be free. By this method the work is distributed among the different operators so that they are kept uniformly busy. It is claimed that this system effects a saving in operating costs of from thirteen to fourteen per cent.

Texas Telephone Conference.—A conference of managers of the Southwestern Telegraph and Telephone Company, in the territory between Yoakum and Brownsville, Tex., was held in Corpus Christi, Tex., June 12 and 13. Among those present were district manager H. P. King, general commercial superintendent P. B. Baker, commercial engineer D. C. Rosser, superintendent of directories G. H. Yetman, all of Dallas, and division commercial superintendent W. W. Vaughan and chief clerk J. D. Malone, of San Antonio, and district plant chief H. A. Van Cleave.

A Sea Telephone Station.—The Platte Fougére lighthouse, which is situated on a rock one and one-quarter miles from the mainland at Guernsey, France, is fitted with a unique telephone station. The apparatus is installed on a platform outside of the lighthouse tower, and by climbing a ladder any local pilot can make use of the telephone to call up the keepers ashore, who can then connect through to the exchange system at Guernsey. The lighthouse tower is unattended, the keepers living on shore, from which point the lighthouse machinery is driven by means of electric power transmitted by a heavily armored submarine cable. The telephone station is designated a "call office," and the idea originated with Mr. Edwin O. Catford.

Chicago Meeting of Telephone Pioneers.—The third annual meeting of the Telephone Pioneers of America, at Chicago, October 16 and 17, will be addressed by Mr. N. C. Kingsbury, vice-president of the American Telephone and Telegraph Company, New York, Mr. M. J. Carney, of the Central Group of Companies, at Chicago, and Mr. Thomas B. Doolittle, retired, of Branford, Conn. Mr. B. E. Sunny, president of the Chicago Company, is expected to make the welcoming address. The Plan and Scope Committee, in charge of the entertainment features, consists of Messrs. B. E. Sunny, A. S. Hibbard and Frank E. Ketcham.

Dispatching Elevators by Telephone.—In the fifty-five story Woolworth Building, in New York, there is a total of twenty-eight passenger elevators, the operation of which, it was found, could not be controlled in the ordinary manner. A dispatching system by telephone was therefore devised. The dispatcher's station is located on the mezzanine floor, just above, but in view of the main group of elevators on the ground floor, and his sole duty is to start the cars and to make them conform to a given schedule as nearly as possible, so as to have the cars start at regular intervals from the ground floor, and to keep them a uniform distance apart throughout their travel. For this purpose the dispatcher's station is provided with a lamp annunciator, which shows instantaneously the position of each car, and a telephone switchboard, which enables him to communicate with each of the operators, and also a push-button, which rings a bell or buzzer in the car. A number of other controlling and signaling devices have been provided at the dispatcher's station for starting and regulating the movement of the cars.

Metropolitan Telephone and Telegraph Company.

The Metropolitan Telephone and Telegraph Company filed papers of incorporation at Trenton, N. J., on May 23, with a capital of $10,000. It will have an office at 47 Montgomery street, Jersey City. Its officers are: H. Lee Sellers, president; Butler Jack, secretary and treasurer, and Lee Lemon, general manager. Mr. H. Lee Sellers, president, makes the following statement.

"This company is a subsidiary of a company of the same name incorporated in Delaware last year. It is now building the western section of its New York-Chicago trunk line.

"The name of this company was chosen because it so appropriately described the purpose for which it was formed, which is, to build lines for telephone and telegraph service between New York, the metropolis of the East, and Chicago, the metropolis of the West.

"After the name was chosen it was learned that it was the same as that of one of the pioneer Bell telephone companies. As the former company had been voluntarily dissolved and its charter surrendered in 1896, it was not thought that there could be any confusion between the new company and the old one some sixteen years out of existence.

"Objection to the name having been made by the New York Telephone Company the new company has on its letter-head the following statement:

"This Company has no connection with The "Metropolitan Telephone & Telegraph Company, "organized in 1880 and merged into the New "York Telephone Company, in 1896, or with any "other company directly or indirectly connected "with the New York Telephone Company or other "Bell Telephone interests or with the Western "Union or Postal Telegraph Companies. It is "distinctly independent and competitive."

RADIO TELEGRAPHY.

Mr. William Marconi, who is now in this country, accompanied by Mrs. Marconi, states that all of the European business intended for the United States will come through the Belmar, N. J., station when the plant is completed. The distance from the Belmar station to that at Carnavon, Wales, is 3,000 miles. The Glace Bay, N. S., station will, Mr. Marconi says, be reserved for Canadian and

Pacific wireless business. A speed of sixty words per minute will be attained between Carnavon and Belmar.

ROBERT WHITE, aged thirty-five years, chief wireless operator of the navy yard at Portsmouth, N. H., shot and killed himself on June 13.

GENERATOR FOR WIRELESS TELEPHONY.—Mr. W. P. Durtnall, an English electrical engineer, is stated to have invented a high-frequency generator which is especially adapted for wireless telephony.

MARCONI MARINE COMPANY.—The report of the Marconi International Marine Communication Company, issued in London, June 12, shows net profits for the year of 1912, of $122,000, as compared with $75,000 in the preceding year. A dividend of 10 per cent will be declared. The number of stations owned and operated on ships by the company was 580 in 1912, as compared with 350 in 1911, and 250 in 1910. About 1700 vessels, exclusive of warships, are fitted with Marconi equipment.

WIRELESS STATION WITHOUT GROUND CONNECTION.—The new station of the Marconi Wireless Telegraph Company at Fremantle, Australia, is operated without ordinary ground connection. An insulated counterpoise is employed instead, constituting the lower element of the electrically vibrating circuit, of which the antenna is the upper element. The counterpoise consists of about 100 insulated wires radiating from the antenna tower, and joined and supported by three concentric circles of wire. The web thus formed is supported on poles, which are higher toward the center and lower at the outer edge, making a flattened cone-shaped network, which gives an open shape to the vibratory circuit, insuring satisfactory radiation, and an outward reflection of the waves from the counterpoise.

Important Wireless Litigation—Marconi Company vs. National Electric Signaling Company.

The case of the Marconi Company against the National Electric Signaling Company, of Pittsburgh, Pa., on Marconi patent reissue No. 11,913, the patent of Sir Oliver Lodge, No. 11,914, being also included, is being heard before Judge Veeder in the United States Court in Brooklyn. The case was delayed, awaiting the arrival of Mr. Marconi, who was detained by the Parliamentary inquiry into the matter of the distribution of Marconi stock to officials in Great Britain. The point involved, generally speaking, is the tuning of various elementary parts of the wireless circuit at both the transmitting and receiving stations so that they are attuned to each other in such a manner as to secure the maximum effect from any given series of impulses. The matter of tuning so as to secure uniformity of signaling is more or less involved in this. The part which Sir Oliver Lodge performed was the use of an inductance coil. The defendent seems to think that the scientific literature and the experimental work of scientists of the rank of Hertz, Lodge and a host of others who were making laboratory experiments for some years following the experiments and disclosures made by Hertz had pointed out the way so clearly that the continuation sought to be monopolized by Marconi was simply the application of another means to attain a known result, that is to say, they came to a realization of the fact that it was desirable to prolong the effect of a train of Hertzian waves in the receiving circuit. The inductance coil was ready to hand and was a known means for attaining that result. The complainant strongly combats this suggestion. The question of the identity of the coherer, which is a receiving device consisting of a tube containing a small quantity of metal filings, which filings, under the influence of the Hertzian waves of a local circuit, caused a change in the resistance of the local circuit, probably due to a rearrangement of the filings and a variation in the intimacy of physical contact on the one hand, and other forms of device performing satisfactorily the same result, such, for instance, as the crystal detector, which has the property of more or less rectifying alternating impulses. Of course there is a great deal in this that while the results attained are fully appreciated, the exact physical losses involved in the operation are not thoroughly understood even by the scientific investigators. The case is still pending.

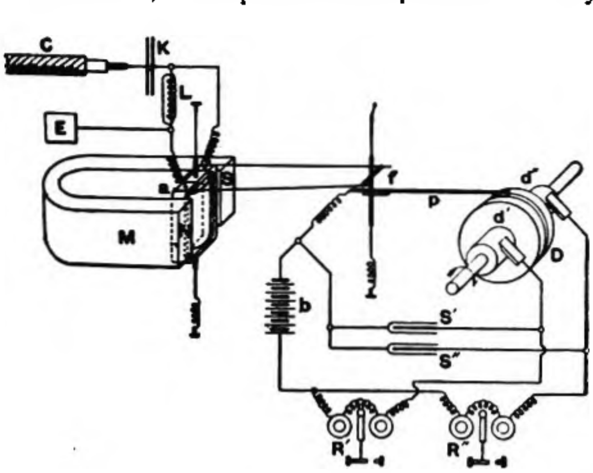
Mr. Marconi makes a very good witness. He was examined on questions of fact only. Mrs. Marconi was present at the hearing extending over many days and apparently took great interest in the machinery of the American courts and in the subject-matter of the discussion. If the Marconi Company sustained the claims as issued in this case, it will monopolize the whole art of wireless telegraphy for the remainder of the life of the patent in suit, which is one or two years. It is understood that immediately following this effort other patents owned and controlled by the Marconi Company will be put at issue and the limited life of this is considerably greater than that of those first considered.

THE ENGLISH MARCONI CONTRACT INVESTIGATION.—The report of the Parliamentary committee which investigated the charges regarding the contract between the British Government and the Marconi Company for a chain of wireless stations, was issued June 13. It asserts that there is no foundation for any of the charges made against Attorney-General Sir Rufus D. Isaacs, Chancellor David Lloyd-George, or Postmaster-General Herbert L. Samuel. The committee finds that all the Ministers concerned acted throughout in the sincere belief that there was nothing in their action which would conflict with their duty as Ministers of the Crown. The report further says that no evidence was given showing that any member of the British Government exercised any influence in order to procure the contract for the English Marconi company, or in any way acted contrary to the best interests of the country.

Cable Relays.

Ever since the invention of the cable siphon recorder efforts have been made to turn it into a relay, but two difficulties had to be faced. The extreme feebleness of the received signaling currents was such that the latter were incapable of opening and closing a battery circuit so as to do useful work in that circuit, and the second difficulty was the want of definition in the signals received to operate a relay; they were too ill-defined, and the zero line wandered too greatly to insure that a relay with a fixed mechanical zero would work satisfactorily. These two difficulties were overcome by the invention of the "drum" cable relay and the magnetic shunt by Mr. S. G. Brown, of London, England.

The drum cable relay, shown in the illustration, is very similar to the siphon recorder. It is the same so far as the suspended coil and connecting fibers are concerned, but in place of the siphon tube a relay



CONNECTIONS OF DRUM CABLE RELAY.

contact arm is provided. The end of this arm is arranged to press upon the surface of a revolving drum. The outer drum surface of gold or silver is divided into three parts: A central insulated portion, upon which the end of the contact arm normally rests when no signals are received, and portions one on each side of the central one. These outer divisions are included in the circuit of a local battery, and two relays.

When the relay arm is deflected to one side or the other, upon the receipt of the signal, it slides or skates into contact with one or other of the outer portions of the drum, and thus closes the circuit of the battery through one or other of the relays. This second relay is thus operated and in turn works a "sounder" key to retransmit the signal into a second cable.

To reduce the electrical resistance that is found to exist in the contact between the relay pointer and the revolving drum, and to allow a large current to pass, condensers are placed across to short-circuit the contact. The operation of the relay throughout is automatic and reliable, and no supervision is necessary.

The relay has two properties that peculiarly fit it for cable work.

1. The relay contact is always made, because the contact arm never leaves the surface of the drum.

2. By the rotation of the drum the friction between the arm to side motion and the surface of the drum is greatly reduced, so that the arm may be moved by the extremely feeble forces received at the end of the cables.

The relay has a fixed mechanical zero, the center of the insulated portion to which the end of the arm must return after every signal or group of signals, and the zero of the electrical signals has been made by electrical adjustment to coincide with the mechanical zero. If there were not this coincidence there would be mutilation of the retransmitted signals.

A condenser is included in the suspended coil circuit. The object of this condenser is to exclude the possibility of interference from earth currents, which sometimes flow along the cable. These earth currents, if allowed to flow through the suspended coil, would produce deflections that would interfere with the proper working of the relay.

The magnetic shunt which is always placed across the coil, shunts the earth current to a very great extent, but does not always get rid of it, and so to make matters sure, the "unshunted" series, or Varley condenser, is included in the system.

The relay produces the signals and combination of signals in its local circuit precisely the same as the signals or combination sent through the cable that work it and are at the same time causing the variable zero. Current is, therefore, taken from the local circuit and passed through an electrical retarding device, which is called the "local correction circuit," consisting of a series of inductances and shunting resistances.

The local circuit is so adjusted in its value, that the current at the far end rises exactly as there is a drop in the received signaling current through the series condenser. The correction current is passed through a separate winding on the suspended coil of the relay, and produces an effect on the coil exactly opposite to that produced on the main winding by the variable zero itself; that is to say, two variable zeros of equal strength but of opposite directions are superimposed on the suspended coil, and thus neutralize one another. The variable zero of the signals themselves is thus eliminated.

Another cable relay that has recently come into prominence is that invented by Mr. John Gott, also of London. This instrument was fully described and illustrated in our issue dated April 16. In this invention every unit of each letter is formed by a reversed current, and at the receiving end these reversed units are transformed so that the alphabet comes out in Morse characters, and are, therefore, easy to read and transcribe.

To obtain the reversal of polarity, Mr. Gott makes use of the discharge of current from the cable itself, which, having considerable energy, is able to act upon a polarized relay and cause the desired change of direction for the following signal. Another method of effecting the reversal of the polarized relay consists of a transformer provided with primary and secondary coils, the primary being placed in the earth circuit of the split or double battery. Currents are induced in the secondary, which is connected to and actuates the polarized relay. The induced currents in the secondary coil are reversed according to the polarity of the last current sent into the cable and these reversals take place in regular sequence, assuring that no two successive currents are sent of the same polarity.

Where it is desired to send messages automatically the message is prepared on a perforated slip and the Wheatstone transmitter takes the place of the key, the reversing polarized relay being connected in circuit as for hand keying with the ordinary and well-known Wheatstone transmitter. The two upper contacts of the vibrating contact arm are used to take the place of the key. So also, where the system is applied for translation from a land line or short connecting cable, the usual receiving relay is connected to the reversing polarized relay and the received Morse signals are translated into the cable in the form of a "reversed current alphabet" or alternating-current alphabet devised by Mr. Gott. Also the relay referred to may work a sounder-relay in a local circuit, which, being connected in place of the single Morse key, translates the signals from the short connecting lines or cables into the main cable.

An English Pioneer Telegrapher Passes Away.

In our issue for June 1, we published an article under the title "The Passing of the Astor House," in which was recorded many important and interesting events in the telegraphic career of Mr. John W. Lewis, manager of the Western Union Telegraph office in that hotel. Mr. Lewis, as was there pointed out, occupied the office for over fifty-nine years, and holds the record of being the operator longest in continuous service in the United States.

An equally interesting character, John F. Costello, recently passed away at Dover, England, at the age of eighty-one years. Mr. Costello was one of the pioneer English telegraphers. He began his service with the telegraph department of the South Eastern Railway in 1847, and remained with that company continuously for 62 years, retiring from active work in 1909. His record was particularly remarkable by reason of the fact that he was never absent during his long service on account of illness, nor annual leave.

He transmitted the first press message in England of which there is any record, and, like many innovations, was the result of an accident. During the late 50's the large London dailies kept individual correspondents at Dover. Their principal duties were to receive the Continental dispatches from Europe brought over by the boats (there was no cable then), examine them hurriedly, and if they contained news of sufficient importance, to "pool" interests, hire a special engine, and rush the dispatches off to London. One morning one of the correspondents overslept (the boat arrived at 3 a. m.), and after the special engine had departed with his rival's news, his quandary was desperate. In his distress he appealed to Mr. Costello, who inquired as to the number of words he wished to send. The information was given, arrangements made with the office at London, and soon the first telegraphic "press" was on the wires. The result was that the paper getting the telegraphed news appeared on the streets of London a full hour and a half before those trusting to the special engine. Arrangements were soon entered into between the newspapers and the railway companies for the transmission of especially important news.

Mr. Costello also assisted in the introduction of the cable, as assistant to Mr. C. V. Walker, in his experiments between a boat fitted with apparatus, first with the shore, and later with the London office. He assisted, too, in the introduction of the system of electrical communication between passengers, guards and drivers, and during the later 60's participated in a submarine explosion in the straits by means of electricity.

E. B. McNairn.

Mr. Edgar B. McNairn, an old-time military telegrapher, whose experiences during the civil war formed an interesting chapter in the history of that great crisis, is now conducting a hotel in Mendocino, Cal. Mr. McNairn was born in Canada, September 25, 1842, and entered the telegraph service in 1858 on the Grand Trunk Railway of Canada. He enlisted in the United States Military Telegraph service in 1863, and left it May 1, 1865, returning to the telegraph, in which he continued for a few years afterwards. He has now been out of the telegraph business for forty years.

During his military telegraph career Mr. McNairn was captured at Union City and taken to Jackson, Miss. While en route, he and other prisoners lagged behind. Colonel Wilson, who was commanding the guard, made a pass at him with a sword. McNairn thereupon seized a gun, and it was by a mere chance that both were not killed. After a long and circuitous march the prisoners reached Anderson, Ga., where they were lodged in prison with thousands of other Federal soldiers. In the many plots formed to effect an escape, McNairn converted a case-knife into a saw, and after six days patient toiling, cut through a plank floor and dug an underground passage through which three prisoners, including himself, escaped. They rubbed their boots with onions to prevent being tracked by hounds. After many hardships Mr. McNairn and his comrades finally fell in among friends and were conveyed to a Federal frigate lying off Pensacola. Mr. McNairn reached Memphis 101 days following his capture, after traveling nearly 3,000 miles, 2,000 through the heart of the Confederacy and about 700 on foot. When he reached Memphis he was reduced in weight from 150 pounds to ninety-nine pounds.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, JULY 1, 1913.

Sending Machines.

The extent to which sending machines are used in the United States is a revelation to old-time telegraphers, now out of the business, but who keep more or less in touch with developments in their former vocation.

By sending machines we mean those devices which are used in the place of the time-honored hand key. In the earlier days there were no such machines; all sending had to be done by hand, and those who could transmit rapidly and accurately were ranked masters of the art. The glories of hand transmission, however, have no attractions for the average modern operator. He is a machine man; he sends by machine and he receives by machine, and he hardly knows how to appreciate the beauties of hand sending by an artist.

So great a hold has the sending machine obtained in modern telegraphy that many chief operators have stated that if the use of the machine were to be discontinued there would be very few good hand senders left to transact the business. This emphasizes the fact that the sending machine has become a necessary and indispensable part of the equipment of a modern telegraph office, and while its use has probably never been recognized officially by the telegraph companies, it has never been discouraged.

Many believe that sending machines are a more important part of the telegraph equipment than are typewriters, but this can be questioned. We think that both are equally important. The transmitting machine is bringing about a more uniform style of sending, and yet it is possible to inject into the sending a personal style, which was so characteristic of hand sending.

Complaints are occasionally made about the difficulty of machine signals not carrying through to their destination. This, of course, is not the fault of the machine, but of the one who operates it. The same complaint used to be made of hand sending. The sending operator must use judgment in either case. Machines of any kind can be misused, but in most cases the fault is due to ignorance of the underlying principles and the functions of the machine. We have had considerable to say on this subject in the past, and are glad to note that our advice is evidently being heeded, since there has been manifest improvement, much to the gratification of all concerned.

The officials of the telegraph companies recognize the fact that sending machines cannot now well be dispensed with. The machines prolong the useful life of the operators, since the latter are, by their use, practically free from attack of telegraphers' cramp, which has incapacitated so many excellent operators in the past. This being true, the companies receive the benefit of the ripe experience of their older employes for a longer time. It has been asserted that if operators were required to give up the sending machine, or the typewriter, and go back to the old method, they would forego the latter, because the average operator considers that telegraphers' cramp is more likely to affect his ability as a sender than as a pen receiver. However, both instruments have become very important adjuncts to the successful conduct of the telegraph business, and there is no danger of losing either until something better is offered.

The adjustment of transmitting machines should be made a part of the duties of some responsible employe, qualified to keep them in order. They should be standardized as to their transmitting functions, and otherwise kept in the highest state of efficiency; then the best results can be expected of them, when used with judgment.

By the availability of transmitting machines and the typewriter, many old operators who could not send on an ordinary key or copy with a pen, are enabled to re-enter the service with advantage to themselves and the employing companies. This is a matter of more than passing interest, and means a great deal to the companies, since it gives them the advantage of the services of old and trustworthy employes who could not meet the demands of the present-day service under the old conditions were they still in vogue.

Thirtieth Anniversary of the Great Telegraph Strike.

July 19 will be the thirtieth anniversary of the great telegraphers' strike, which took place on that date in 1883. It lasted for one month. It was the result of carrying into effect a few years previously the so-called sliding scale reduction in wages by the Western Union Telegraph Company. This so-called sliding scale reduction originated in the mind of Mr. H. McK. Twombly, a son-in-law of Mr.

W. H. Vanderbilt, who then controlled the Western Union Telegraph Company. Mr. Twombly, although knowing nothing about the telegraph, was made a vice-president of the Western Union, and his reduction ideas were not shared by other officers of the company. Before the strike occurred, Mr. Vanderbilt sold the Western Union property to Mr. Jay Gould. The result of the strike was that many of those engaged in the service left it to seek employment in other lines of business, and never returned to the key. This publication was then in its infancy and it found itself and its supporters engulfed in a strike of national proportions. After the strike had progressed a short time, General Thomas T. Eckert, who was then general manager of the Western Union Telegraph Company, in an interview with the publisher of this publication, stated his position to the effect that he had been ordered by the board of directors to fight the strike to a finish, no matter what the cost might be, and, as he was an old solider, he would obey the orders of his directors, who would not meet again until September.

Under these circumstances there was no hope for the success of the strike on the part of the operators, nor even a chance for a compromise, and when the directors gave General Eckert his instruction as to how to deal with the situation they knew the nature of the man. He had been a soldier and he knew how to obey orders, and he did. The men were defeated after a courageous fight, but the reform they contended for was afterwards granted under more peaceful conditions. It was a costly fight for both sides, but it taught some valuable lessons, and, as one looks back and notes what has been accomplished since that time, it does not seem that the effort and money wasted had been spent in vain.

Three Important and Valuable Electrical Books for Study.

"Electrical Instruments and Testing," by Norman H. Schneider, is the latest work on this important subject, and has been brought up to date. It is an extremely practical book, and every telegrapher who is preparing himself to fill positions in the engineering branch of the service should make a copy of this work his text-book in testing. It is thoroughly reliable, and was written by a practical engineer. The section on the testing of telegraph wires and cables was written by Mr. Jesse Hargrave, a well-known telegraph engineer, and the illustrations, of which there are many, are very clear and understandable. The price of this book is $1.15 per copy.

"American Telegraph Practice," by Donald McNicol, is the other book to which we desire to call especial attention. This book contains the latest information and descriptions of telegraph apparatus and systems, and it constitutes a complete course in telegraph engineering. It is well illustrated and a careful study of its contents will give the student an immense advantage in the line of promotion. The more a man knows of it, the more will he be sought when a vacancy occurs. The book deals with every detail of the telegraph engineering and construction services and is written in so clear English that anyone with average intelligence can readily grasp the facts set forth. The telephone in its relation to telegraph operation is also covered to a liberal extent. It is a book that gives one a desire to know it from beginning to end, and, with patient effort, this result can be easily attained. The price of this book is $4.00.

"Handy Electrical Dictionary," by W. L. Weber. This little book, which is of vest-pocket size, is a necessary companion of the two books referred to, as it supplies the key which unlocks the meaning of the technical terms met with in these volumes. To the beginner this little dictionary is really indispensable. It will remove all doubt as to the meaning of technical words and phrases and is a guide post in the study of electricity. Progress in study is much more satisfactory and really enjoyable when one knows that he is on the right road and thoroughly understands what he is reading. This book is a library in itself, and is complete, concise and convenient. The price is 25 cents per copy for cloth binding, and 50 cents for leather binding.

Copies of these three books can be purchased of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Meetings of Associations, Societies, etc., During 1913 and 1914.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, at New Orleans, La., May 19, 1914. Secretary, P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS, at Watertown, N. Y., August 19-22. Secretary, Clarence R. George, city electrician, Houston, Tex.

OLD-TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION AND SOCIETY OF THE UNITED STATES MILITARY TELEGRAPH CORPS, at Detroit. Mich., August 26, 27 and 28. Secretary of the Old-Timers, F. J. Scherrer, 30 Church street, New York; secretary of the Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

TELEPHONE PIONEERS OF AMERICA, at Chicago, Ill., October 16 and 17. Secretary, Henry W. Pope, 15 Dey street, New York.

TELEGRAPH AND TELEPHONE EXTENSION IN GREECE.—An appropriation has been asked in the Greek parliament for the extension of telegraph and telephone lines.

MR. W. I. CAPEN, fourth vice-president of the Postal Telegraph-Cable Company, New York, writes: "I am pleased to forward another year's subscription for your publication. I consider it would be impossible to get as much valuable information for many times the money, through any other source."

Course of Instruction in the Elements of Technical Telegraphy—XLII.

(Copyrighted.)

(Continued from page 371, June 16.)

[We began in our issue for October 16, 1911, the publication of a course of instruction in technical telegraphy. The course, which was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, is published for the benefit of those of our readers who desire to fit themselves for better positions in their vocation. It is elementary throughout and is divided into chapters, following one another in logical order.

The course has received the hearty commendation of telegraph officials and experts for its scope and accuracy and its sound practicability. In each chapter examples are presented in order to illustrate the application of the rules to practical cases, and each chapter is followed by a series of questions pertaining to the subject of the chapter, to be worked out by the student in order to review his progress. Back numbers containing these valuable articles can be obtained on application, at 10 cents per copy.]

Automatic Repeaters.—The Neilson Shunt.

The function of an automatic repeater is to relay the signals from one wire to another automatically.

As the insulation resistance of a wire decreases with its length, it becomes necessary on long circuits, in order to obtain a current of sufficient strength at points remote from the battery, to either divide the circuit at some intermediate station, or to obtain a fresh current by use of an automatic repeater.

Perhaps the most successful form of automatic repeater in present use is the Neilson shunt, a diagram of which is shown in Fig. 50.

R and R¹ are the main line relays on the east and west sections. ST and ST¹ are transmitters with four-ohm coils, worked by the locals of the line relays. S and S¹ are contact springs, through which the east and west circuits are completed, the former via R¹, S T and M B; the latter via R, ST¹ contact spring and M B¹.

Neglecting for the present the repeating sounders R S and R S¹ and their connections, let us see what takes place when the western key is opened: The circuit of M B¹ is now interrupted, causing R to open and with it the local circuit of L B. ST therefore opens, breaking the eastern wire at S, and causing the local circuit of R¹ to be broken, owing to the armature of that relay moving over to its back stop. S T¹ consequently opens the western wire at S¹ and the western station finds, on closing his key, that he is unable to close the circuit.

To avoid this false break on the part of the repeater, some device must be used to prevent S T¹ from responding to the opening of R¹, and we will see how, by means of the repeating sounders, this is effected.

The coils of the repeating sounder R S are wound with fine wire to a resistance of about forty ohms and disposed as a shunt around the local points of line relay R, so that with the western key open, the local circuit of L B is not completely broken, but still completed through the coils of the sounder. As there are comparatively few convolutions in the coils of S T, owing to the coarse wire employed, the magnetizing force developed in them must be due chiefly to the large current derived from the local battery, and, obviously, any reduction in this current strength will seriously affect the ampere-turns and consequently the working of the transmitter. With R closed, R S is shunted out of the local circuit, the current taking the shorter path through the relay points, and as the external resistance is now only four ohms, the current is sufficient to work S T satisfactorily. With R open, however, the current from L B is reduced to such an extent by the added resistance of R S that the magnetizing force developed in S T coils is insufficient to effect the attraction of the armature against its antagonistic spring, so that it responds to the working of

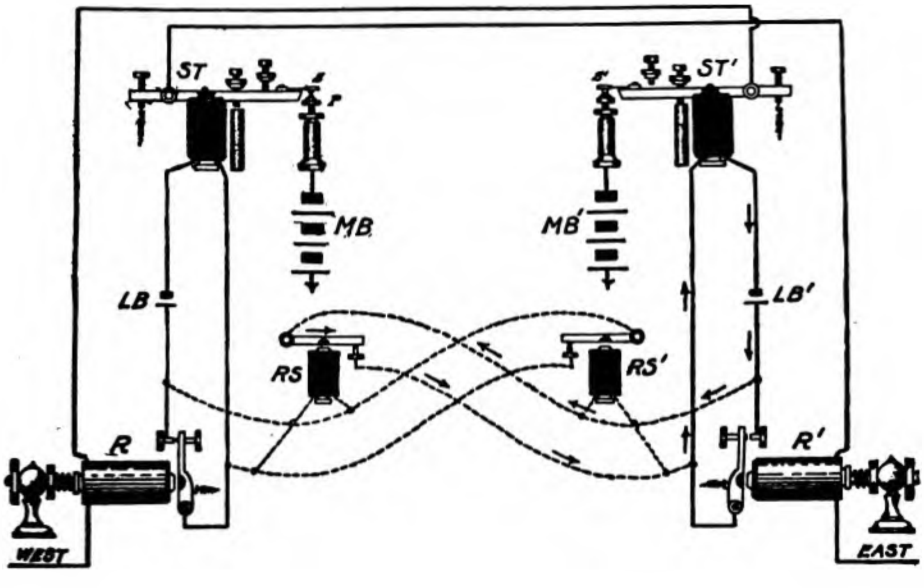


FIG. 50—NEILSON SHUNT REPEATER

R, as if the local circuit were in reality broken every time R opened.

R S, on the contrary, having a larger number of convolutions develops sufficient magnetism to attract its armature when R opens, and by doing so shunts R S^1 out of the local circuit of L B^1, thus enabling S T^1 to be energized by the full current strength of its local battery and causing its armature to remain closed.

We see, then, that by shunting the points of R by the high resistance coils of R S, the desired result has been attained; namely, the continuity of the western circuit at S^1 with R^1 open.

Should the eastern operator "break"—which he can only do when the western line is closed and R S shunted by the shorter path through the closed points of R—R^1 and S T^1 both open, but R S^1 being now energized by the current from L B^1, closes, and prevents S T from breaking the eastern line at its contact point by affording another path for its local battery.

It is of the utmost importance that the repeating sounders operate before their corresponding transmitters have time to open and break the main line circuit. To insure this the armatures of R S and R S^1 are made light to enable them to respond promptly to the opening of R and R^1, while the transmitters, by means of their contact springs, retard the opening of the opposite relays. The possibility of kicks thus becomes very remote, for immediately R opens, R S closes, shunting R S^1 out of L B^1 local circuit before the contact spring S on S T has time to leave the battery post P.

The principal feature of the Neilson shunt repeater is the entire separation of the local apparatus from the main line, thus rendering the former independent of line changes in bad weather.

(To be Continued.)

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What size of copper wire is generally used for interior wiring?

In dry locations, what insulating material on the wires is sufficient?

In damp places what grades of insulated wire are preferred?

How is the tensile strength of copper wire increased?

What are the advantages possessed by copper wires for outside lines?

What is meant by hard-drawn copper wire?

Why is copper wire preferable to iron wire for telegraph lines?

How are telegraph and telephone lines carried through the country?

Are wooden poles the only means of support used for wires? If not, name other means of support.

What is the distance allowed between poles, and how many poles are usually set to the mile?

How are the line wires attached to the poles?

What are cross-arms?

Why are cross-arms used on poles?

What is the purpose of an insulator?

Are the non-conducting properties of insulators the same in wet weather as in dry?

Of what material are telegraph line insulators generally made?

How are the wires attached to the insulators?

Is glass the best material for insulators?

What causes leakage of current at the insulators?

If moisture is a poor conductor, as we are told, why is it that the moist surface of the insulators cause so great a leakage of current on long lines?

What is meant by "insulating surface" with reference to insulators?

What is the objection to hard-rubber insulators, and what are the advantages of such insulators?

What are the advantages of porcelain insulators?

What is the most serious difficulty to be met in the construction of telegraph lines?

In the improvement in the efficiency of lines, to what has the gain been mostly attributed?

Why does dust and moisture affect the insulating qualities of insulators?

What is the effect of free coal gas upon glass insulators?

Why do insulators on country lines offer a greater resistance than do those in the cities?

(To be Continued.)

New Officers of the A. I. E. E.—At the annual meeting of the American Institute of Electrical Engineers, held in New York recently, the following officers were elected for the year beginning August 1. President, C. O. Mailloux, New York; vice-presidents, H. H. Barnes, jr., New York; J. A. Lighthipe, Los Angeles, Cal., and Charles E. Scribner, New York; managers, B. A. Behrend, Boston, Mass.; Peter Junkersfeld, Chicago, Ill.; H. A. Lardner, San Francisco, Cal., and Lewis T. Robinson, Schenectady, N. Y.; and treasurer, George A. Hamilton.

Mr. F. A. Bardwell, of Springfield, Mass., formerly manager of the Western Union office at that point, but now in other lines of business, writes: "Kindly renew my subscription to the Age. I cannot get along without it now, so I have got to keep it coming somehow."

The Creed Automatic Printing Telegraph System.

BY R. J. YOUNG, LONDON, ENGLAND.

In view of the introduction of the Creed high-speed telegraph printing system in the United States and Canada, it has been suggested that a brief description might be of interest to the readers of TELEGRAPH AND TELEPHONE AGE.

Mr. F. G. Creed, the inventor, is a Nova Scotian. He began experiments as far back as the nineties. It was only after a number of years of struggling existence, however, that some of the large telegraph and cable companies operating in England finally showed their appreciation of the worth of his inventions by placing substantial orders for apparatus with the firm; and, when in 1910 the Eastern Telegraph Company ordered instruments to the value of about $60,000 for its home and foreign stations, it became evident that this system had come to stay.

The entire system consists of a keyboard perforator used for preparing Wheatstone perforated tape; a Wheatstone transmitter; a receiving perforator capable of reperforating Wheatstone slip at 200 words or 1,000 letters per minute; and a printer, which, under the control of Wheatstone tape, prints in large Roman capitals at a maximum speed of 775 letters per minute. This instrument completes the system, by means of which a message prepared at double the speed of hand working is transmitted at from five to eight times hand speed, and printed on a tape which is pasted on a form ready for delivery. The Wheatstone signal from the line passes through a relay (an ordinary English post-office standard for land-line work and a Gulstad for subterranean and submarine). This line relay works in the ordinary way a second relay contained in the perforating receiver, and this relay brings into action the greater power of compressed air, by means of which a Wheatstone tape corresponding to the line signals is perforated. The highest speed ever obtained on one of these machines was 225 words per minute.

There is another perforating receiver, the invention of H. Billé, of the firm of Creed, Billé & Company, Ltd., Croydon, England. This instrument does not require compressed air, the perforations being done by a small electric motor. The highest speed on this machine has, up to the present, been 240 words per minute.

The speeds mentioned are only obtainable when lines are short and free from disturbances. Ordinarily, when working wires of considerable length, the relay receiving signals from the line will fix the speed limit.

The system includes a translator used in connection with cable work, whose function is to translate the received perforated tape into perforated cable tape. This translator works satisfactorily up to ninety words per minute.

Among others, the Creed system is now working on the following circuits, and is giving entire satisfaction in every case.

The Anglo-American, London-Valentia circuit, 650 miles in length, consisting of an aerial line and a short cable between England and Ireland, with two repeaters, is worked at a normal speed of 100 words or 500 letters per minute, duplex.

The Eastern Telegraph Company's lines from London to Porthcurno (360 miles), consisting of two underground loops and working direct at a normal speed of 100 words per minute, duplex.

The Great Northern Telegraph Company, of Denmark, works this system direct on one underground loop and two overhead wires between London and Newcastle, a distance of 340 miles, at a normal speed of ninety words per minute, duplex. It is also worked on its cables between Newcastle and Gothenburg, Sweden, distance 520 nautical miles. There is a stretch of twenty-one miles of land line on one end and twenty-five on the other, but even with these drawbacks a speed of ninety words per minute, simplex, or from fifty to sixty-five words, duplex, is maintained without repeaters.

The British Post-Office London-Edinburgh circuit is worked duplex at the same speeds as the Anglo-American and Eastern circuits. The receiver is used for retransmission purposes at various stations throughout the kingdom. The Danish State Telegraph works Creed between Copenhagen and Fredericia on a mixed circuit of about seventy-five miles, at ninety words per minute, duplex.

The Indo-European Telegraph Company uses the Creed receiver at Odessa, Russia, by means of which it has been able to get a greatly increased efficiency from its circuit of 5,000 miles from London to Karrachee, India.

This system has also been successfully adapted for newspaper work. It has been installed for nearly a year in the Manchester office of the London *Daily Mail*, where the receiver perforates direct from the line at a normal speed of about 8,000 five-letter words per hour, simplex. All the news goes in one direction, that is, from London to Manchester, but if necessary this wire would work duplex without any appreciable difference in speed. This speed is maintained over an aerial iron wire, the distance being about 200 miles. The entire contents of the *Daily Mail* are telegraphed every night from London to Manchester, a labor involving the highest speed and great accuracy. Under the severest tests the Creed system reproduces automatically in printed words the entire contents of the newspaper. The "copy" is clearer and easier for sub-editors and compositors, and the machine never tires nor makes mistakes of its own.

The Creed system has recently been installed on the Western Union Telegraph Company's circuit between 16 Broad street, New York, and its cable station at North Sydney, N. S. At the New York end the printer is used in connection with the Creed receiver, while at Sydney the received perforated tape is passed directly into the translator which automatically produces the perforated cable tape. A number of sets are being installed at 195 Broadway, New York, with the object of receiving the entire Chicago traffic.

This telegraph printing system has also recently been introduced in Australia, the initial order for apparatus being intended to equip the Adelaide office. So far, these installations have both proved quite satisfactory.

In the near future the Western Union Telegraph Company's London and Penzance stations will be equipped with the Creed system, while the South African Government will soon have a number of installations working at its principal stations. Installations have also been ordered for Russia, China, India, as well as for various stations of the Eastern Telegraph and the Great Northern systems.

From the foregoing it will be seen that the Creed system is now working successfully at high speeds, over a great variety of circuits, including overhead, underground and submarine wires, and in some cases a mixture of all three; handling the most important and highly paid telegraph traffic, as well as ordinary news matter, accurately, reliably and expeditiously.

The various administrations which have used the Creed apparatus for long periods express in unqualified terms their entire satisfaction with the system. For example, the president of the Great Northern Telegraph Company, of Denmark, says: "I have much pleasure in stating that the Creed system of high speed automatic printing telegraphy, which for some years has been in use in our company's stations in London and Newcastle, works quickly and reliably, at the same time allowing of a considerable reduction of staff.

"The duplex speed on the lines between London and Newcastle has, day by day, been ninety words per minute in each direction, and so far there has been no case of serious instrumental disorder necessitating our reverting to the old style of working.

"In order to test the reliability of these instruments we have from time to time compared the printed slip—letter by letter—with the control slip, and we have not yet discovered any mistakes which could be attributed to faulty construction of the instruments.

"It is our intention in the near future to introduce the system in others of our stations in Europe and the Far East."

It is claimed for this system not only that trunk line traffic may be moved more expeditiously, accurately and economically than by other methods, but that its adoption by any telegraph administration using the ordinary Morse hand methods of working would ensure an entirely homogeneous system on the common basis of a code already in universal use. This is a more important feature than at first appears, because until now the various printing telegraph systems introduced, differing as they have both in principle and in operation from the existing Morse methods, have been more or less isolated from the rest of the system, demanding for their efficient working the creation and maintenance of a specially trained staff. By the extension of the Wheatstone-Morse system proposed by the mere addition of the Creed apparatus, it will be possible not only to handle the heavy traffic between large centers, with the utmost speed, accuracy and economy, but by utilizing the unique facilities for retransmission afforded by the perforating receiver, even the smallest stations could advantageously transmit and receive messages to and from the remote parts of the system without manual translation at any point.

A technical description of the Creed receiver, printer and translator follows:

THE CREED RECEIVING PERFORATOR.

This perforating receiver reproduces, at a rate of about 200 words per minute as a maximum, an exact replica of the Wheatstone perforated tape prepared at the sending end of the circuit. The mechanism for accomplishing this provides for:

(*a*) Actuating punches under the control of, and in correspondence with, the line signals from the tape at the sending station;

(*b*) Moving the receiving tape past the punches

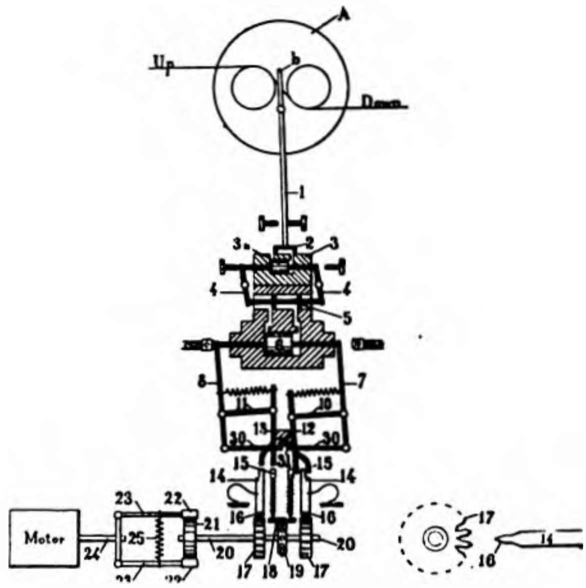


FIG. 1—DIAGRAM OF RECEIVING PERFORATOR.

at a uniform speed approximating to that of the transmitter;

(*c*) Momentarily arresting and holding the tape before and during the act of punching, and then releasing it promptly.

In order to accomplish (*a*) and (*c*), compressed air is employed; and for (*b*) a friction drive for the tape is used in conjunction with holding and releasing devices described later.

Fig. 1 shows in diagrammatic form the construction of the apparatus. "A" represents a standard relay of the British Post-Office standard pattern. This relay has no electrical contacts, but its armature *b* is provided with a light tongue 1, to the free end of which is attached an exceedingly light balanced slide valve 2; this is adapted to control the supply of air to the small relay engine 3, the piston 3*a* of which is thus moved from side to side, in accordance with the line signals which actuate the relay tongue. The movements of the piston 3*a* are transmitted by means of the rocking levers 4 to the piston-valve 5 of the main engine, thus controlling the double-acting piston 6. From each side of this piston a rod projects through the cylinder cover and thrusts in either direction the adjacent arms of the three-armed bell-crank levers 7 and 8. Upon the arms 10 and 11 are hard steel strikers 12 and 13, the free ends of which are bifurcated for the purpose of thrusting against the adjacent heads of the rods 14 and punches 15. These rods and punches are mounted and guided in a separate block, with the die plates and the feed wheel spindle. The correcting rods 14 have flattened points 16, terminating in a V-shape (shown separately), and when thrust forward are adapted to enter the slots in the correcting wheels 17. Retracting springs are provided, as shown, to restore the rods and punches to their normal position against stops. The paper strip 18, which is previously center-holed, is led up between the die plates, past the punches, and engages with the feed wheel 19, mounted upon the spindle 20, to which the correcting wheels 17 are also fixed. When the points 16 of any correcting rod 14, are thrust by the striker between the teeth of the wheel 17, the rod adjusts and holds the latter, as well as the feed wheel 19, and the tape, in such a position that the corresponding punch 15 will perforate the paper exactly opposite the feed holes. Mounted upon an extension of spindle 20 is a friction disk 21, driven by the friction blocks 22, fixed upon the pivotted arms 23, which are attached to the motor-driven spindle 24. This spindle rotates the feed wheel 19 at approximately the same rate as the feed wheel of the transmitter. For adjusting the driving tension the spring 25 is arranged to slide longitudinally on the rods 23.

The action of the machine is as follows: A line "marking" current in the relay coils moves the armature *b* to the right, causing the tongue 1 to move the valve sharply to the left. The piston 3*a* of the relay engine is thus caused to move to the right, and the valve of the main engine in the opposite direction. This causes the main piston to be driven to the right. The movement is transmitted by means of the bell-crank 7 and the link 30 to the bell-crank 8, which in turn causes the left-hand striker 13 to thrust the tooth of rod 14 between the teeth of the wheel 17, adjusting, if necessary, the position of the feed wheel, and forcing the corresponding punch 15 through the tape 18. The tappet piece 31 formed on the link 30 now comes in contact with the striker, forcing it from the rod and punch, and permitting them to spring back to their normal position. On the reversal of the line current the relay tongue is moved in the opposite direction causing a reversal of the engine, when another operation similar to that described is performed by the right-hand striker 12 upon the right-hand correcting rod and punch.

As the complete operation of thrusting and releasing the punches occupies only the three hundredth part of a second, the time during which the feed-wheel is arrested is practically negligible, and the difference between dots and dashes in the tape depends entirely, therefore, upon the time-interval between successive spacing and marking contacts during which the tape is allowed to run on. Even between the marking and spacing currents for a dot, there is an appreciable interval during which the slip has travelled a little. The right-hand punch and the corresponding correcting wheel are given

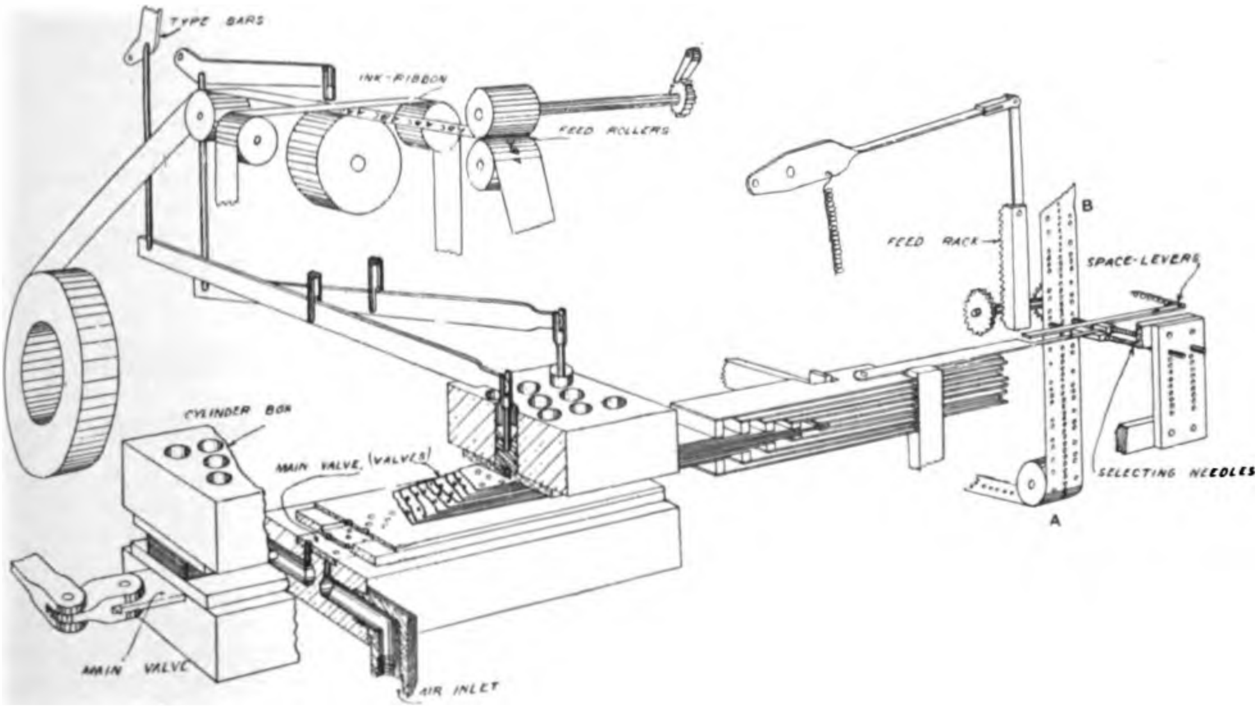


FIG. 2—DIAGRAM SHOWING ACTION OF PRINTER.

a lead, so that, although the spacing punch is actuated later, the spacing perforation appears opposite the same center-hole as the marking perforation.

THE CREED PRINTER

A diagrammatic explanation of the action of the printer is given in Fig. 2.

The received perforated slip is passed into the machine at A and out at B; while the slip on which the printing takes place is drawn by a pair of feed-rollers from the roll on the upper left-hand side, between the connecting rods of the type-bars and over the printing platen.

The perforated tape is fed forward letter by letter in a guide-way in front of a series of ten pairs of selecting needles, one needle of each pair being mechanically connected to a series of ten slide-valve plates. Each of these valve plates can be made to occupy one of two positions, thus providing a number of different combinations, every one of which opens one complete and particular passage through the ten slide-valve plates. Air under pressure can thus be admitted to any one of a number of small cylinders, each containing a piston acting on the end of a lever connected to a type-bar.

The perforated slip is fed forward by a star wheel fitted to a spindle carrying a toothed wheel, which is rotated as required by the movement of a rack. The rack is given a vertical motion for feeding purposes, and a sidewise motion for acting on any slide valves that may have been selected. Its movement is obtained from the cam-shaft of the machine, which is belt-driven from a small electric motor. The extent of the vertical movement is limited by the distance to the first space signal, that is to say, the length of a letter. To provide for this limit there is a group of ten space levers normally in the path of the rack, and preventing its downward movement. Each space-lever is also in the path of one pair of selecting needles, and when either needle of a pair passes through a perforation, that particular space-lever is moved out of the path of the rack. Hence, with any letter or figure of the International Morse code there is a clear downward path for the feed-rack until it reaches a space signal. A sidewise movement is then given to the rack, putting it in gear with the toothed wheel. Next, the rack is given an upward motion, causing the toothed wheel to turn and the perforated tape to be fed upward by the amount of the particular letter that has just passed. The rack is then moved sideways again, clear of the toothed wheel, ready to descend as far as the next space signal.

The slide valves made of thin sheet-steel have each a hinged extension whose further end is arranged to take up the movement of the corresponding selecting needle in its motion to and from the perforated tape. At the same time, the extension is free to move in a direction at right angles to the needle. Each valve-extension is provided with a shoulder which comes into the sidewise path of the feed rack when that particular extension has been selected. At the correct moment, determined by the position of a cam on the main spindle, the rack is moved sidewise, and engaging with the shoulders of the valve-extensions which have been selected, moves the corresponding slide-valves into their second position. Another cam opens a main valve, admitting air under pressure to the slide-valve chamber, whence it passes through the ten valve plates by the one hole available in that particular setting of the valves, forces up the particular piston and prints the corresponding letter. Another main valve is then opened to allow the air to escape, and the selected slide-valves are returned to their normal positions.

Although more than the required number of selecting needles for any particular letter may pass through the tape, only the proper number of slide-valves are acted upon by the rack, on account of the spacing lever preventing the rack descending beyond the required amount.

It will be observed that there are twenty selecting needles, but only the ten acting on the lower row of holes in the perforated slip are attached to valves; the other row of needles is not necessary for selecting purposes, but is required for shifting the spacing levers for the first portion of a dash signal.

The machine prints satisfactorily at any speed up to 125 words per minute; but this is not the maximum, it being considered possible to reach 150 with the present form of machine, and this will probably be increased with improvements in details.

The chief claim for this system of telegraph printing is the undoubted advantage obtained by using the well-known Morse code entailing no alteration of existing telegraphic apparatus nor need for operators to learn a new code. Intermediate stations, such as repeater stations or testing points, can check the passage of the signals without any knowledge of the Creed system, and can make all necessary adjustments without reference to the terminal stations. The system, being an addition to the Wheatstone system, can be introduced gradually without disarranging any of the present Morse methods.

THE CREED TRANSLATOR.

This instrument is used in conjunction with the Creed receiving perforator for automatically producing another slip perforated with signals as used for automatic transmission on cable circuits. For instance, the letters A B C are received from the Creed receiving perforator on a tape as shown at X, Fig. 3. This slip passes directly into and controls the Creed translator, which perforates a second tape, as shown at Y.

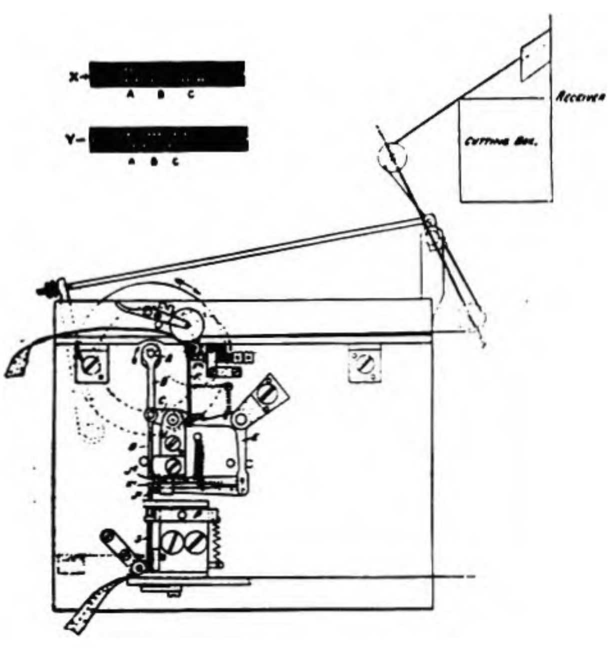
The utility of such an instrument is, of course, at a cable station, where the one or more land-line feeders are worked with the unequal dot and dash system, and the cable circuit with the equal positive and negative impulses.

A front view of the mechanism of the instrument is shown in Fig. 4, a side view of the punches, etc., in Fig. 5, and a back view of the feed for the cable slip in Fig. 6.

A small electric motor is used to give the required motion to the star-wheel spindle in the upper part of the instrument for driving forward the received perforated slip, and to provide the power necessary to actuate the striking bar which operates the punches. Geared to the star-wheel spindle is another spindle fitted at its front end with an eccentric pin A, which gives an upward and downward motion to the connecting-rod B, and the striking-bar D; also a rocking movement to the lever C. Situated to the right of C are two bell-crank levers E, each carrying at the end of its upper arm a selecting needle F. The lower arms are fitted with rods whose left-hand extremities, when required, take up a position in the path of the striking-bar D, which is then enabled to actuate the punching and spacing rods 1, 2 and 3.

The ends of the rods connected to the bell-crank levers are shown at J^1, J^2, K^1 and K^2. The first two extremities are connected to the front bell-crank lever, and consequently are controlled by the needle which passes through the lower row of holes in the received perforated slip; the other two extremities are fitted to one rod, and are controlled by the other selecting needle. It should be observed that K^2, is attached to K^1, and it may, therefore, be considered that a portion of K^1 is always in position over the first punching rod.

When a dot signal is in position both selecting needles pass through the slip at the same instant, causing J^1, J^2 and K^2 to pass into the path of the striker, while K^1 is removed. Hence, the striker D in its downward movement finds J^2, K^2, and a portion of K^1 over the first punch, while K^1 has moved clear of punch 2 and rod 3. Hence, punch 1 alone



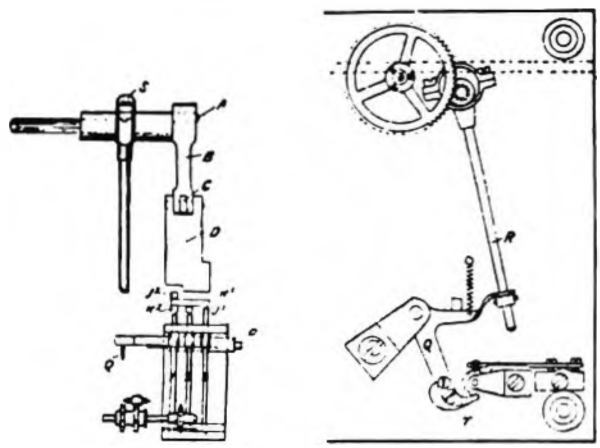
FIGS. 3 AND 4—PERFORATED TAPE, AND ELEVATION OF PERFORATOR.

is actuated, producing a single hole in the upper portion of the cable slip corresponding to a dot signal. The depression of any one of the three punching rods feeds forward the cable slip by one center hole.

When the first portion of a dash signal is to be translated K^1 and K^2 are moved, and although K^2 comes into line, punch 1 is not actuated because J^2 is not in line; neither is punch 2 nor rod 3 actuated, as K^1 has been moved clear.

When the second portion of the dash signal is in position J^1 and J^2 are moved; hence punch 2 is actuated as J^1 and K^1 are in line. Punch 1 is not actuated, as K^2 is not in line.

For a space signal neither of the selecting needles



FIGS. 5 AND 6—SIDE VIEW OF PUNCHES, AND REAR VIEW OF FEED.

pass through the slip, hence the striker D finds K^1 only in its path, causing rod 3 to be actuated, thus feeding forward a blank portion of slip.

The feeding lever P extends backward into the instrument and limits the upward movement of a bell-crank lever Q, Fig. 6. Hence, a depression of lever P, by either of the punching or spacing rods, causes the pawl T on the lower end of Q to move one space to the left. Rod R rises, and in drawing Q with it, causes T to feed forward the cable slip one tooth of the star-wheel.

The translator is set to run at a slightly higher speed than the receiving perforator, thus keeping the slip always in tension, and thereby producing more or less friction on the drum of the driving spindle. By this means the speed of the translator is reduced to that of the receiver.

Inductive Disturbances on Telegraph and Telephone Lines.

At the St. Louis convention of the Association of Railway Telegraph Superintendents, May 20, Mr. P. J. Howe, of the general plant department of the Western Union Telegraph Company, New York, read an instructive and interesting paper, entitled "Inductive Disturbances as Affecting Telephone and Telegraph Lines." In our issue, dated June 16, was printed an outline of the paper, in which it was pointed out that the most satisfactory manner of dealing with the problems arising from the interference of high-tension lines with the operation of telephone and telegraph circuits was for the interests affected to co-operate with a view to minimizing the cause of the trouble.

The introduction to Mr. Howe's paper constitutes a very lucid description of the nature and effects of electromagnetic and electrostatic induction.

Induction, the author states, is the phenomenon by which an electric current or potential in a conductor will cause an electromotive force to be established in a neighboring conductor. The energy is transmitted through the surrounding medium, which is stressed or energized by the originating current. For this reason, induction, in some form, is interlinked with all electrical circuits. Theoretically, every energized conductor will induce an electromotive force in every paralleling wire. The induced voltage, however, rapidly diminishes at increasing distances; it also depends on and is proportional to the energy transmitted. Therefore, the greatest inductive effects occur on wires which closely parallel circuits that transmit a large amount of energy.

Inductive disturbances may be defined as inductive effects which interfere with the normal operation of circuits. The small, weak currents in a telephone or telegraph circuit will induce voltages in a power wire, just as surely as the power circuit will induce voltages in it. But on account of the small energy in the signaling circuit, the induction from it will be small and infinitesimal compared with the large energy of the power circuit. The effect of the power circuit, however, may be very considerable, and may be large in comparison with the small currents and sensitive apparatus used for the telephone and telegraph.

Inductive disturbances are the result of two different phenomena, electromagnetic and electrostatic induction. Both effects may be present on a circuit and nearly equal, although it is more usual to find one effect stronger than the other.

ELECTOMAGNETIC INDUCTION

When an electric current flows in a conductor there is set up a magnetic flux or field in the region surrounding the conductor. This field is considered as composed of circular lines of force surrounding the wire. These lines change with every change of current, expanding when the current increases and contracting when it decreases. If a second conductor is placed in parallel relation with the energized circuit, every change in the field of the first conductor will cause the field to cut across the second conductor. It is this cutting of a conductor by magnetic lines of force that induces an electromotive force in it and gives rise to electromagnetic induction. The more intense the magnetic field and the more rapid its rate of change, just that much greater will be its effect on other conductors.

The strength of the magnetic field surrounding a conductor is directly proportional to the current. When the current is alternating, the field goes through a complete cycle of changes with every cycle of current. The rate of change of the field intensity is proportional to the frequency, and is affected, to a certain extent, by the wave form. The strength or density of a magnetic field is greatest at the surface of a conductor, and at more distant points varies inversely as the distance from the center of the conductor. The voltage induced in a paralleling wire depends upon the field strength, which is proportional to the current, and upon the frequency, the length of exposure and the separation. The effect of separation varies with the logarithm of the distance.

When there are two disturbing wires carrying equal currents, but in opposite directions, the magnetic field surrounding one of the wires will be in the opposite direction to that surrounding the other. These opposing fields result in more or less neutralization of the induction in other wires, the neutralization being more complete as the two conductors come closer together. In this way, there is always a certain amount of neutralization of the induction from metallic alternating-current circuits.

ELECTROSTATIC INDUCTION.

Considered electrically, any two wires which are supported in the air and insulated from each other and the earth may be regarded as two plates of a condenser. Air is the dielectric or insulating medium. Similarly, each wire forms one side of a condenser, of which the ground forms the other side. When, therefore, an electromotive force is applied to one of several wires, the difference in potential between the wire and ground will cause an electrostatic charge to be induced on the other wires. If the source of energy changes, or reverses, as in the case of an alternating-current, the charges induced in the other wires will change accordingly. Every reversal of the disturbing voltage will cause a similar reversal in sign of the induced charges. It is the flow of current resulting from these changes in static charges that gives rise to what is called a charging current, the cause of electrostatic disturbances.

The electrostatic charge on a conductor varies directly with the voltage applied to the disturbing wire. The potential of the charge depends on the ratio of the wire's respective capacities to the disturbing wire and to earth. The magnitude of the charging currents, however, depends on this potential, and also on the magnitude of these capacities or condensers. By reason of these facts, the static potential induced in a conductor is independent of the length of exposure, assuming perfect insulation, while the charging currents, and therefore the disturbances, vary directly with the length of exposure. Static disturbances also vary with the frequency of the disturbing source, being much greater when the applied voltage is of high frequency or contains several high-frequency components.

Just as magnetic induction is neutralized by equal and opposite currents in wires that are near together, so is static induction neutralized when there are two disturbing wires having equal but opposite potentials to earth. In this case, the charge induced by one wire is opposite to that induced by the other, the completeness of the neutralization depending on the closeness together of the disturbing wires compared with their separation from the disturbed wires.

It has been shown that electrostatic induction depends largely on the capacities which conductors have to each other and to ground. Every conductor, however, has a capacity to every other conductor and structure. Therefore the capacity between any two wires, or between any wire and ground, depends to a certain extent on the other conductors in the near vicinity. Thus the addition or removal of a wire on a line, or the grounding of a circuit, may have an effect on the capacities of certain other wires. As a result of these conditions, it is very difficult to determine in advance of actual operation how much static interference will be caused by any particular power installation. It may be stated, however, that the presence of grounded telegraph circuits on a line will tend to reduce the static disturbances on the other wires. Static disturbances on wires of a line carrying many conductors will also be less than on wires which have only a few neighboring conductors. In the case of a heavy line, the static charges are probably distributed among the several conductors.

COMPARISON OF ELECTROSTATIC AND ELECTROMAGNETIC DISTURBANCES.

From a consideration of the foregoing it is possible to draw the following conclusions regarding the characteristics of electrostatic and electromagnetic induction, and their differences:

Electromagnetic induction varies with the current and therefore with the load; electrostatic induction is practically independent of the load.

Electrostatic induction is proportional to the voltage; electromagnetic induction is unaffected by the voltage.

Both magnetic and static disturbances vary with the frequency and wave form.

Voltages induced by magnetic effects are proportional to the length of exposure; static "potentials" are independent of length.

Static "disturbances" are proportional to the length of exposure; magnetic effects vary practically with the length of the exposure, except when the impedance of the exposed section of a circuit is a large part of its total impedance. In the latter case, both the induced voltage and the line impedance will vary with the length, and the induced "current" will be largely independent of length of exposure.

Current from magnetic induction is practically the same in all parts of an exposed circuit; current from static induction is different in different parts.

Static disturbances are less when there are many wires on the disturbed line, and may be entirely prevented by shielding with a grounded sheath; magnetic effects are practically unaffected by the near presence of other conductors.

Earth Currents.

EDITOR TELEGRAPH AND TELEPHONE AGE:

From 1891 to 1899, the period of my service with the Postal Telegraph-Cable Company, as wire chief at St. Louis, there existed a difference of potential between St. Louis and Chicago, and St. Louis and Kansas City, of more than ten volts, rising at times to twenty, but seldom falling below ten. A wire grounded at Chicago and St. Louis would show a ground current of ten volts, or more, flowing from Chicago to St. Louis, and in a St. Louis-Kansas City wire the direction was toward St. Louis. The same was true of American Telephone and Telegraph wires up to a comparatively recent period, but this difference has now fallen to from two to six volts, seldom exceeding the latter value. I think the observations of Postal and Western Union wire chiefs on this subject would be of interest, and also any explanation you may suggest as to the change in difference of potential between different points. Has increased efficiency in methods of bonding or otherwise providing for the "return current" by street railway, electric light and power companies anything to do with it?

D. B. GRANDY.

ST. LOUIS, MO.

[These differences of potential between distant points of the earth are quite common in these days of electric railways, and are due almost entirely to insufficient provision to return the current to its source. Telegraph and telephone lines in areas covered by electric railways are always sure to suffer more or less from interference of this nature in proportion to the extent of the area and the congestion of traffic. The electric potential at any one point is the resultant of many potentials, and where the traffic is dense the potential of the earth would naturally be higher at that point than at a locality where there were fewer electric roads in operation, or none at all. The same effects may be noticeable between cities, as in the cases mentioned by Mr. Grandy. Until the electric railway companies improve their methods of bonding or otherwise provide means to get the current back to the power-house without escape into the ground, differences of potential will exist. These troubles prevail in a greater or less degree all over the country, but they can be compensated to a large extent, because they are, in a given area, fairly steady in their power to disturb the operation of telegraph and telephone lines. We would like to hear from others who have had experiences of this nature.—EDITOR.]

The Western Union Improved Quadruplex.

(Continued from page 377, June 16)

LOCAL CIRCUITS. For the sake of clearness, no local circuits are shown in Fig. 1. It will be understood, however, that the magnets of the pole-changer and transmitter, and the contacts of the polar and neutral relays are included in such local circuits. The arrangement permits the sending and receiving of signals on both polar and neutral sides of the quadruplex to be done at operating tables more or less remote from the actual quadruplex apparatus. The keys on such tables control the movements of the pole-changer and transmitter, which are reproduced on the "sending" sounders, while the "receiving" sounders on the same tables respond to the incoming signals received by the polar and neutral relays. Full details of the wiring of the local circuits are shown in Figs. 2, 3 and 4. It will be seen that the connections or loops between the quadruplex sets and the operating tables are usually made at a loop switchboard. This method facilitates interchanging the various operating units among such quadruplex sets and circuits as will best meet the traffic conditions at any time.

BRIDGE COILS. The two 500-ohm bridge arms mentioned in preceding paragraphs are not ordinary non-inductive resistances. On the contrary, each arm is a coil of wire wound upon a ring-shaped core of soft iron wires, the entire 1,000-ohm combination being known as a WE-5-U retardation coil. This coil possesses a very high inductance value because of its closed magnetic circuit, and therefore offers great impedance to any varying current passing through it from one outer terminal to the other. Consequently, when a current comes in over the main line, it at first meets with great opposition in its attempt to flow through the highly inductive bridge arm, and as a result almost all of the first part of the incoming current rushes into the polar relay. This effect lasts only for a small fraction of a second, until the current has risen to its steady value, when the bridge arms get their share of the current exactly as if they were non-inductive resistances. The brief initial rush of current through the polar relay, however, is sufficent to throw the armature of that instrument over, with a speed and precision out of all proportion to the smaller steady current which passes through the relay during the remainder of the signal.

To outgoing currents, however, the impedance of the WE-5-U retardation coil is quite small, because in this case the magnetic effects of the currents in the two windings are opposed to each other. The neutralization is not complete, however, and the result is that the outgoing current is so graduated in its rise and fall, that inductive effects on neighboring lines are greatly reduced.

In the foregoing descriptions and explanations, only the fundamental principles of the quadruplex have been considered. Additional features necessary to obtain the best results in practice, together with instructions for the actual handling of apparatus, are referred to under other headings.

The apparatus associated with the polar relay and pole-changer at each end of the circuit, constitute what is known as the "No. 1" or "polar" side of the quadruplex. The neutral relay, with the transmitter, and other associated apparatus are termed the "No. 2," or "common" side.

OPERATION.

THE POLE-CHANGER. The object of this instrument, as its name indicates, is to reverse the direction of the current as may be required for sending signals. Almost any relay having an armature playing between two contacts might be used as a pole-changer, the electromagnet being connected in a local circuit with the sending operator's key, and the contact points connected to the positive and negative generators as shown in Fig. 1. It is necessary, however, that the interval during which the pole-changer armature passes from one contact to the other shall be as brief as possible. In addition to making the space through which the armature travels at this time as small as practicable, it is also desirable that the speed of travel shall be very high.

In the 3-B pole-changer, as illustrated in Fig. 5, this is accomplished as follows: Two electromagnets are provided, one on each side of the armature, and both are connected in series in the local circuit. The cores of the front magnet are carefully laminated, which makes that magnet "quick-acting," while solid cores, surrounded by copper sleeves, are used in the rear magnet to make it slow acting. A light retractile spring is attached to the armature to hold it firmly on the back contact when the local circuit is open. When the local circuit is closed by the operator depressing his key, current flows through both the magnets of the pole-changer. The front magnet, however, exerts its attraction slightly in advance of the rear magnet and overcomes the force of the light retractile spring, thus pulling up the armature to the front contact. Soon afterward, the rear magnet becomes fully energized; but it cannot pull back the armature, because the latter is now much closer to the front magnet. When the local circuit is opened, however, the magnetism in the front magnet falls very rapidly, while that in the rear magnet dies away quite gradually; as a result, the front magnet releases the armature while the rear magnet, still capable of pulling it back, acts in conjunction with the retractile spring, and the armature is pulled over to its back contact much more swiftly than if the retractile spring alone were depended upon for this action. In adjusting this instrument, an air-gap of about 1/64 inch should be left between the armature and the front magnet cores when the former is in the closed position. The rear magnet is arranged to move backward and forward under the control of a thumb-screw, and should be adjusted to such a point that, with current in the magnets, the armature will have a slight bias toward the front contact when centered by the finger. The retractile spring will still prevent any shivering of the armature lever on its back contact when it has been pulled over there by the opening of the local circuit. The play of the armature lever between its contact points should be as small as practicable. It should be noted that, because of the construction of this type of pole-changer, the firmness of the contact between the ature back, the attraction of the rear magnet assists in the attempt, and this sometimes gives the false impression that the marking signals are not being firmly made.

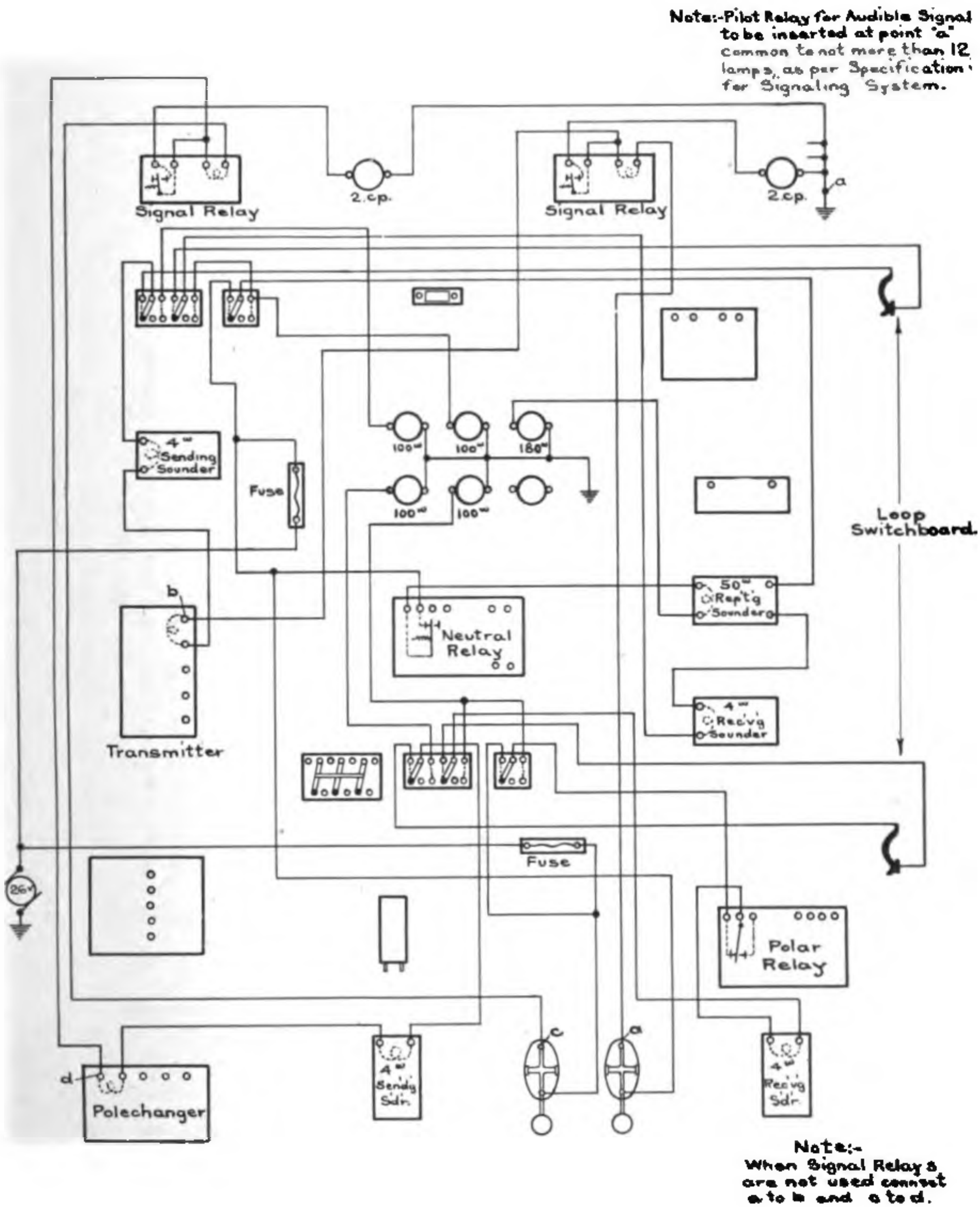


FIG. 2—WIRING OF QUADRUPLEX LOCAL CIRCUITS.

armature lever and its front stop cannot be as easily gauged by the finger as with some other types; for when an attempt is made to pull the arm-

THE TRANSMITTER. This instrument is of exactly the same construction as the pole-changer just described, and is operated by the key in its local circuit in the same way as the pole-changer. The connections of the transmitter armature and contacts with the main circuit, as previously out-

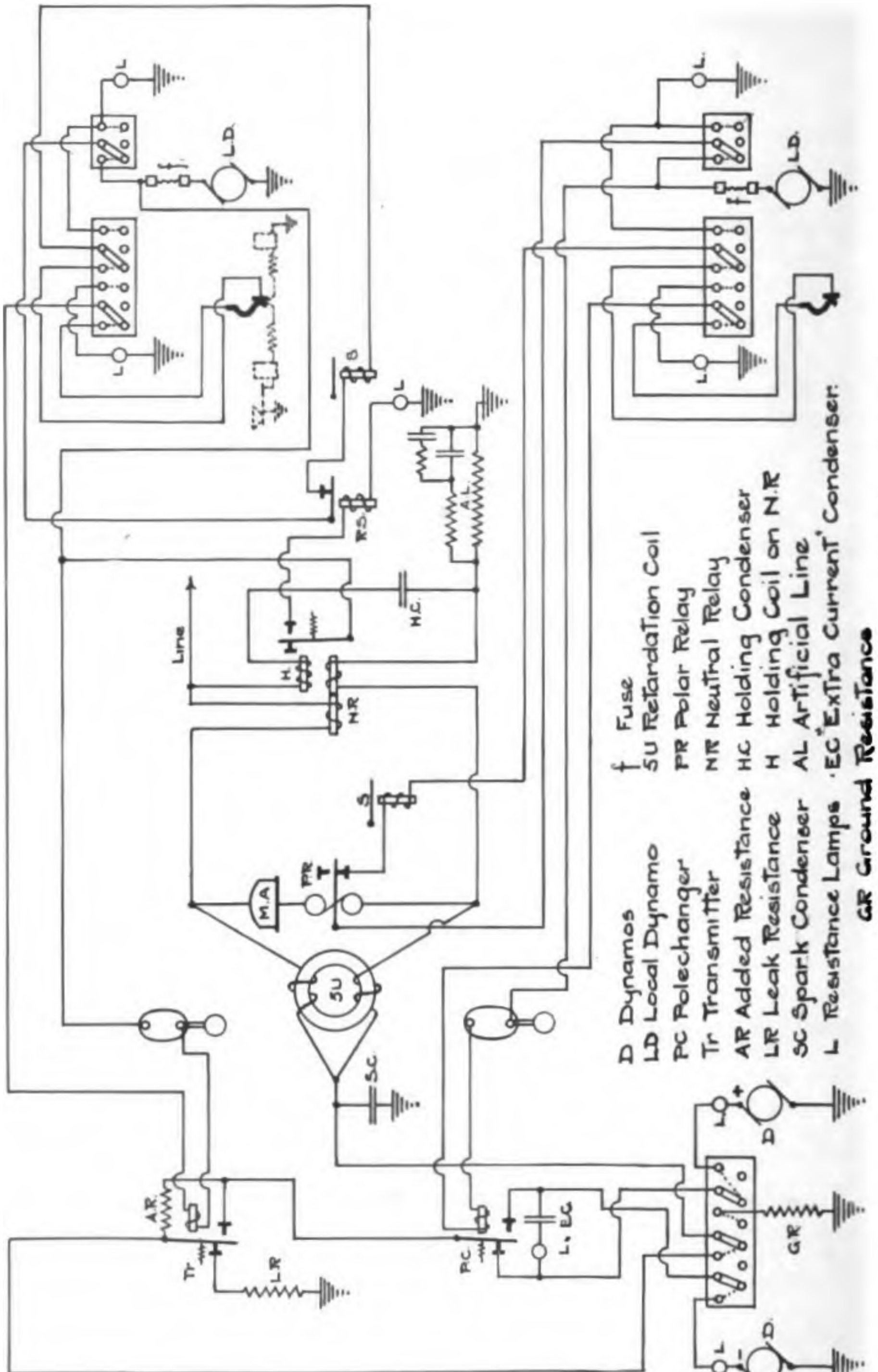


FIG. 3—THEORY OF QUADRUPLEX (SHOWING MAIN AND LOCAL CONNECTIONS).

lined, are such as to control the strength of the current sent out from the pole-changer by putting into, or cutting out of the circuit, the resistances contained in the proportional rheostat.

(To be Continued.)

NOTE—Owing to space limitations, Figs. 4 and 5 referred to in this instalment, have been omitted. They will appear in the next instalment.

MR. J. A. LARKIN, of the American Telephone and Telegraph Company, Harrisburg, Pa., writes to one of our Philadelphia agents, Mr. M. Ruberg, as follows: "Enclosed is check for $2.00, covering my subscription to the most instructive and interesting paper that I have ever read and I look forward with eagerness to its semi-monthly visits."

THE RAILROAD.

Mr. W. F. Williams, superintendent of telegraph of the Seaboard Air Line, Portsmouth, Va., and Mr. W. P. Cline, superintendent of telegraph of the Atlantic Coast Line, Wilmington, N. C., accompanied by Mrs. Cline, were recent New York business visitors.

Mr. J. M. Walker, superintendent of telegraph, Denver & Rio Grande Railroad, Denver, Col., accompanied by Mrs. Walker, has been in New York City for the past week. He left for home a few days ago.

Telephone Dispatching on the Seaboard Air Line.—Mr. W. F. Williams, superintendent of telegraph, Seaboard Air Line Railway, Portsmouth, Va., states that the extension of the telephone-dispatching circuit from Columbia, S. C., to Jacksonville, Fla., was completed and put into operation March 1. This gives the road continuous telephone train dispatching from Richmond and Portsmouth, Va., to Venice, Fla., a total of 1519 miles. Mr. Williams has placed an order for an additional circuit between Monroe and Atlanta, which will add 272 more miles to the total. This circuit will be completed as soon as the wire can be strung and the instruments installed.

Death of W. W. Ashald.—W. W. Ashald, aged 57 years, superintendent of telegraph, Grand Trunk Railway System, Montreal, Que., died suddenly on June 18, of heart failure. Mr. Ashald was a member of the Association of Railway Telegraph Superintendents, and attended the recent St. Louis convention, appearing then to be in his usual good health. He caught cold while on his way home from the convention, and it is thought that the effects of it hastened his death. Deceased was a native of Garrettsville, Ohio, to which place the remains were taken for burial. Mr. Ashald had been in the service of the Grand Trunk Railway for fourteen years, the last six of which as superintendent of telegraph.

Colonel George M. Dugan, aged 78 years, an old-time and Confederate military telegrapher, died at his home at Tip Top, Ky., June 12. Mr. Dugan was a native of Ohio, being born on Christmas Day, 1835. He learned telegraphy in 1850, and was later engaged in the river steamboat business. In 1853 he returned to the telegraph at Sommerville, Tenn., for the Memphis and Nashville Telegraph Company. During the civil war he was taken prisoner, in 1862, and confined in a Northern prison. He returned South in 1863 and resumed work for the Mississippi Central Railroad (now part of the Illinois Central), and at the close of the war he reconstructed telegraph lines. In 1876 he was appointed superintendent of telegraph of what is now the Illinois Central Railroad, with headquarters first at Jackson, Tenn., and afterwards at Chicago. Deceased retired some years ago and took up his residence at Tip Top, Ky. He was president of the Association of Railway Telegraph Superintendents in 1896-97. He was a prominent figure at most all of the annual reunions of the Old Time Telegraphers' and Historical Association.

OBITUARY.

Mrs. Frederick Pearce, wife of Frederick Pearce, a well-known electrical manufacturer of New York, died at her home in Summit, N. J., on June 17. Mrs. Pearce was known to the old-time telegraphers, being a frequent attendant, together with her husband, at the annual gatherings of the Old-Time Telegraphers' Association.

Alfred Winder, aged seventy-nine years, a well-known old-time and military telegrapher, died at his residence in New York, June 11, after an illness which confined him to his bed for six months. He worked at the key sixty years and in all that time lost but about a week on account of illness. Deceased was in the Western Union service in New York at the time he retired, on pension, in 1911. He was a military telegrapher in West Virginia, when he was captured January 3, 1864, and taken to Castle Thunder and afterwards to Libby Prison, where he was confined about three months before he was exchanged. On the consolidation of the American Union and Western Union Telegraph Companies he was appointed chief operator at Williamsport, Pa., and later filled a like position at Indianapolis, Ind. He subsequently came to New York, where he remained until his death.

Wireless Telegraphy and Telephony.

Although there are many books on the subject of wireless telegraphy, one of the most comprehensive and practical is Mr. A. Frederick Collins' "Manual of Wireless Telegraphy and Telephony," the third edition of which is now on the market. Mr. Collins is a well-known wireless expert, inventor and author, and has kept ahead of wireless development from its earliest days; he is, therefore, qualified to write intelligently and clearly on this interesting subject.

In his latest book Mr. Collins treats wireless telegraphy and wireless telephony in considerable detail, and by the aid of clearly drawn illustrations and views of apparatus, he has succeeded in treating the subject in so clear a manner that the novice will readily grasp the information and the expert receive new light.

The contents by chapters are: A Simple Wireless Telegraph System; Elementary Theory; Apparatus of a Commercial Station; The Aerial Wire System; Wiring Diagrams for Transmitters; Wiring Diagrams for Receptors; The Apparatus in Action; Adjusting and Operating the Instruments; Different Makes of Equipment; Suggestion to Operators; Wireless Telephony. The appendix gives a list of books on wireless and a glossary of terms, words and phrases. The book covers much ground and will be of great value as a text-book in study and for reference.

The price is $1.50 per copy, and copies can be had of Telegraph and Telephone Age, 253 Broadway, New York.

Protection Against Lightning and High-Tension Currents.

Mr. M. H. Clapp, superintendent of telegraph of the Northern Pacific Railway, St. Paul, Minn., recently made a canvass among the telegraph superintendents of the largest railway systems in the United States and Canada to ascertain their experiences with different kinds and types of protectors. The results of the investigation were embodied in a paper read by Mr. Clapp at the convention in St. Louis of the Association of Railway Telegraph Superintendents, May 20-24.

There was a considerable number and variety of arresters and combinations reported in use. The O'Connell arrester, now known as W. E. No. 86-A, is used quite generally, and apparently is giving good results. The Chapman arrester is used to less extent. In connection with these two kinds of arresters, ½, 8/10, 7 and 10-ampere fuses are being used, some being placed on the line side of the arresters, others on the apparatus side. The Western Electric Company's 58-A and B and 60-A are used more or less. One superintendent uses the Homer-Roberts arresters without fuses, apparently with good results. The Vac-M arrester has given good satisfaction in some instances; other superintendents report poor results. The Argus arrester appears to have been satisfactory in connection with telegraph circuits, but not in all cases in telephone circuits. The Brach carborundum arresters have given good satisfaction in some cases; in other cases apparently they have failed to protect. Ordinary carbon and mica arresters with fuses are considered generally unsatisfactory, except, possibly, on short lines, on account of their being too sensitive and requiring too much attention. It was reported that the use of metal blocks gives better results than when carbon blocks are used. The Siemens-Halske vacuum arrester is apparently satisfactory on a telephone circuit on which there is no telegraph current.

A few of the superintendents have tried the vacuum type of lightning arresters and found the results not entirely satisfactory, and some have tried them and are very much in favor of their use. The principal trouble in connection with the vacuum arresters appears to be the difficulty of maintaining the vacuum.

Two or three of the superintendents use two sets of fuses, one of high-carrying capacity on the line side of the open space cut-outs and one of low-carrying capacity on the apparatus side of the open space cut-outs. Quite a few are using 8/10 and ½-ampere fuses on the apparatus side only of the open space cut-outs.

Very few of the superintendents reported any experience with the use of choke coils in combination with the open space cut-outs and fuses of low-carrying capacity. Those that have used them, appear, in general, to believe that they help materially in obtaining better action of the open space cut-outs and keeping intact the fuses between these coils and the apparatus.

About five of the superintendents reported using retardation coils in series with the line relays of the selectors and think that these coils help materially in protecting the selector windings.

The protection used by the American Telephone and Telegraph Company for a long time consisted of three parts; a high carrying capacity fuse, an open space cut-out and a heat coil. The high capacity fuse was rated at seven amperes, the open space cut-out, consisting of carbon blocks and micas, was designed to operate at 350 volts; the heat coil was designed to operate at a current of about 2/10 of an ampere, maintained for one-half minute. This protection, generally speaking, was reasonably satisfactory, although burn-outs in the apparatus did occur, principally from lightning discharges. These burn-outs usually occurred in the cables or apparatus between the open space cut-outs and the heat coils. Also there was always trouble from noisy lines after an electrical storm, due to grounds, either partial or absolute, at the open space cut-outs.

In order, if possible, to correct these faults, the telephone company some five years ago began placing a second heat coil in each wire next to the open space cut-out and between the open space cut-out and the apparatus. This heat coil had a carrying capacity of four amperes for about three minutes and was intended to protect the apparatus and cables between the open space cut-out and the heat coil already in circuit next to the various electromagnet windings, telephone receivers, resistance, etc. This additional heat coil in the circuit has, it is stated, given very good results. Also, about three years ago the company began a series of experiments with the fuse of metallic blocks instead of carbon blocks in the open space cut-outs and the use of choke coils of the Argus type placed in the line on the apparatus side of the open space cut-outs. It was found that there is considerably less trouble from partial grounding of the line by the use of metallic blocks, and the author assumed that the use of choke coils had been of some benefit.

New York Electrical Society Among the Clouds.

The New York Electrical Society held its annual meeting in the Woolworth Building, Broadway, New York, in the early evening of June 12. The following officers were elected for 1913-14: President, H. H. Barnes, jr.; vice-presidents, S. S. Edmands, A. H. Lawton, Carl Schwartz; secretary, George H. Guy; treasurer, H. J. Hoeltge.

Mr. C. E. Knox, consulting engineer in charge of the electrical installation and elevator equipment of the building, made an informal address, describing the electrical features of this great edifice, after which the members, over 200 in number, inspected the electric-generating plant and later were conveyed to the observation gallery on top of the tower, 750 feet above the street, from which point a magnificent view of the city and its environments was obtained.

TELEGRAPH AND TELEPHONE AGE

253 BROADWAY, NEW YORK

J. B. TALTAVALL, *Publisher*

Established 1883

Issued on the 1st and 16th of each month. *PRICE, $2.00 PER YEAR*

DEAR SIR: —

Suppose you could afford to employ a man to devote his entire attention to the collection of news relating to your profession; to report to you all of the transfers and changes in official personnel; to inform you of all the improvements in apparatus and methods; to collect and write, for your perusal, special papers instructing you in the technical portions of your work; and to coach you constantly on ways and means for increasing your chances for promotion and an increase in salary; and suppose this brainy individual would suddenly propose to devote his entire time to this work for you at a salary of 10 cents for two weeks, would you hire him and glad of the chance? Most of us would. Well, then, you can have the services of this man at this price by subscribing for TELEGRAPH AND TELEPHONE AGE at a cost of $2.00 per year of twenty-four issues.

The series of articles entitled "Some Points on Electricity" (now running in the paper) by Mr. Willis H. Jones, are alone worth the price of subscription. These articles explain in simple language the duplex, the quadruplex, how to install and balance them, the subjects of batteries, generating machinery, the condenser, the galvanometer, electrical testing, switchboard testing, management of switchboards, and the various repeaters. All possible combinations that the expert is asked to solve receive painstaking and careful attention. The writings of Mr. Jon are largely used by telegraph students and form the basis of study of many of the electrical clubs which have been established among telegraph, telephone, cable and railroad employes.

A highly successful educational feature, which has appeared regularly in ample installments in our paper during the past year and has received much favorable comment, is a course in the elements of technical telegraphy, written by one of the foremost experts in the country. This series of lessons which was originally intended as a $50 correspondence school course, has called forth the highest commendation from telegraph officials and engineers, who unreservedly recommend its study to all those who wish to increase their knowledge and efficiency.

We would like to add your name to our list of subscribers. A year's subscription represents about 1000 pages of interesting telegraph and telephone history and valuable educational matter.

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Telephone Pioneers of America.

N. W. BROWN.

Mr. N. Warren Brown, district plant chief of the Southern New England Telephone Company, at Hartford, Conn., entered the telephone service on November 22, 1882, as night operator at New London, Conn. He soon became a lineman, and from that position advanced to that of foreman, afterwards becoming general foreman. After serving in the latter capacity for some time, he was promoted to be assistant superintendent of construction, and later became district plant chief, which position he now holds. Mr. Brown has had a wide experience in the construction department, and is familiar with every detail in this branch of the work.

N. W. BROWN, HARTFORD, CONN. (1882).

The First Public Telegraph Office.

A bronze tablet, sixteen by thirty inches, designed by Henry Bacon, the eminent New York architect, to mark the site of the first public telegraph office in the United States, has been placed on the wall of the old Post Office Department building, on Seventh Street, N. W., between E and F, in Washington, D. C., and will be dedicated, with suitable ceremonies, at three p. m., July 4. Representatives of Congress, the Treasury Department, Post Office Department, and of the District Government, will take part, and appropriate addresses will be made.

The inscription on the tablet reads:

"Samuel F. B. Morse, artist and inventor, opened and operated on this site, under the direction of the Post Office Department, the first public telegraph office in the United States, April 1st, 1845. 'What hath God wrought.'"

On the same day there will be dedicated a similar tablet, placed on the south side of the same building, which was the location of Blodget's Hotel, where Congress convened in 1814.

The erection of these tablets is in pursuance of a plan adopted fifteen or twenty years ago for marking important historic sites in the District of Columbia. It has been the custom, on the occasion of presidential inaugurations, to place temporary markers on many points of interest, and this has been followed by permanently marking a few of the most important points.

This year five tablets, including those mentioned, are to be set up.

The selection of these sites and the preparation of the tablets have been under the direction of Senator George P. Wetmore, chairman of the Senate Library Committee, which has a small annual appropriation to pay the cost of the tablets.

The unveiling ceremonies will be conducted by Mr. William V. Cox, chairman of a committee appointed by the Commissioners of the District of Columbia. All persons interested are invited to attend.

Mr. George C. Maynard, of Washington, the well-known old-time telegrapher, and now connected with the Smithsonian Institution, will take a prominent part in the carrying out of the exercises.

Portland Messenger Captures First Prize in Motor-Cycle Parade.

One of the attractions of the Rose Festival at Portland, Ore., was the parade, on June 10, of the telegraph messengers mounted on motorcycles. The first prize was awarded to Thomas Colton, of the Western Union Telegraph Company. He was fully uniformed, as shown in the accompanying illustration, and the judges were unanimous in awarding him the first place. There were twenty-one entries, and Mr. W. A. Robb, manager of the Western Union office, is proud of Colton's good fortune.

MESSENGER COLTON WHO TOOK FIRST PRIZE AT PORTLAND, ORE.

MUNICIPAL ELECTRICIANS.

Watertown Convention.

The International Association of Municipal Electricians will meet at Watertown, N. Y., August 19, to 22, for which an extensive and interesting programme is being arranged. The headquarters will be at the new Woodruff Hotel, and the meetings and exhibits will be held in the Odd Fellows' Temple, which is near the hotel.

A liberal entertainment programme will be provided, especially for the ladies of the party, and the visitors will be kept in action during their stay.

The business part of the convention will, according to the present outlook, be of much importance and interest to the members. Some practical papers will be read, and arrangements are being made for a thorough discussion. The duties of the members are vastly more extensive now than they were when the association was first organized, in 1896. Municipal electricians of to-day, besides having charge of fire-alarm and police signaling, have, in many places, other important interests to look after in an advisory or active capacity, such as electrical inspection, municipal lighting, joint use of poles, permissible voltages on overhead wires in cities, etc. All of these subjects will receive consideration at the Watertown convention.

President J. W. Kelly, jr., Camden, N. J., is giving much time to the work of advancing the interests of the association, and, through his efforts, the membership is materially increasing.

Mr. Clarence R. George, Houston, Tex., is secretary of the Association.

Underground Fire System in Albany.—The common council of Albany, N. Y., is considering an appropriation of $20,000 to be expended in placing the fire-alarm system in the business section of the city in underground conduits.

Reunion of Old-Time Telegraphers.

The reunion of the Old-Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps will be held at Detroit, Mich., August 26, 27 and 28, the headquarters being at the Hotel Cadillac. There is good reason to believe that this will be one of the most largely attended and enthusiastic gatherings ever held by these two bodies, and preparations are being made with that expectation in view. The business meetings will be held on August 26, and they will consume the forenoon. The rest of the time during the reunion will be spent in pleasure, in various forms, such as steamboat rides, trolley rides, ferry rides and automobile rides, winding up with a banquet at the hotel in the evening of August 28. It is important that hotel reservations be made as early as possible.

In our June 16 issue we gave the programme in full, together with the names of the members of the various committees.

Bound Volumes of Telegraph and Telephone Age.

For those of our readers who desire to have the past year's issue of Telegraph and Telephone Age in a form in which they can readily preserve all of the copies for future reference we would recommend a bound volume. We are now able to supply these containing the twenty-four issues of 1912 for the nominal price of $3.50. There are several features in one of these volumes, which comprises nearly 900 pages of reading matter, which are alone worth much more than the amount asked. The most important series of articles during the year was the "Course of Instruction in the Elements of Technical Telegraphy," which is widely studied and highly commended. These articles, together with the series by Mr. Willis H. Jones entitled, "Some Points on Electricity," are worth many times the price of the book. We have also published articles by the best-informed authors upon the developments in wireless telegraphy, and, in fact, there will be found recorded in this book all of the important improvements in the wireless art during the past year. The use of the telephone for train dispatching has largely increased since January, 1912, and we have kept pace with its development by presenting to our readers many articles upon this subject, written by some of the best-posted men in the railway and telephone world. Those interested in any branch of the telegraphic industry will find much valuable information in one of these bound volumes. A copy of this work will be sent to any address, upon receipt of price, $3.50, by J. B. Taltavall, Telegraph and Telephone Age, 253 Broadway, New York.

The Postal Telegraph Electrical Society of New York.

On the evening of October 7, 1912, a number of the members of the Postal Electrical Class of 1910-1911, together with several of the employes of the Postal Telegraph-Cable Company, met at 253 Broadway, New York, and reorganized the class for 1912-1913, under the name of The Postal Telegraph Electrical Society.

The society being duly organized, with a total membership of seventy-six, officers were elected as follows: Rex G. Post, president; A. B. Minard, vice-president; Henry L. Stern, secretary. A constitution and by-laws were adopted providing for the election of an executive board of fifteen members, a regular meeting every Tuesday evening at 5:45 o'clock for members working days, and every Wednesday afternoon at 3:30 for members working nights, and a fee of ten cents per month from each member, to be used for the purchase of stationery and such material as would be required in experimental work.

It was decided that a class button would be appropriate, and such a button was designed by President Post from suggestions made by Mr. J. Whalen, manager of the main operating department. The button was adopted and purchased by the members of the society.

FIG. 1—SWITCHBOARDS, QUADRUPLEX AND REPEATER SETS.

As soon as the installation of the apparatus in the classroom would permit, lectures were given on different subjects best suited to the elementary work of the society by Mr. M. M. Davis, electrical engineer, Mr. J. F. Skirrow, associate electrical engineer, and Messrs. D. McNicol and Mr. A. J. Eaves, of the electrical engineer's staff.

At the close of these lectures a course of instruction was decided upon, comprising the course of 1910-1911, Swoope's Practical Electricity, and the Columbia University course given by Mr. D. McNicol, which includes demonstrations on the various subjects under consideration.

Mr. A. B. Minard, vice-president, offered his services as instructor, which were accepted, and the course, as outlined, was started.

On March 20, 1913, Mr. Minard resigned as vice-president and instructor, and President Post took up the work, appointing Mr. C. B. Obst vice-president for the remainder of the term.

The Postal Telegraph-Cable Company permits the society to temporarily use apparatus not immediately needed, and the members, under the direction of President Post, have set up single Morse sets, repeaters, quadruplexes, etc., and have been instructed in the wiring of generator switchboards, loop boards, main switchboards and terminal frames. They have also been shown how office cables are run, pigtailed, taped and fused.

FIG. 2—PATCHING FRAME, POWER BOARD, ETC.

Recently, a member of the society, Mr. William H. Schlaeffer, an amateur photographer, volunteered his services, the result being three excellent pictures, which accompany this article.

The members of the society are doing much earnest work, and there is good reason to believe that all of them will add to their knowledge and usefulness by taking advantage of this opportunity to obtain instruction. The instructors, particularly Mr. R. G. Post and Mr. A. B. Minard, have unselfishly given much time and thought to the work of the society.

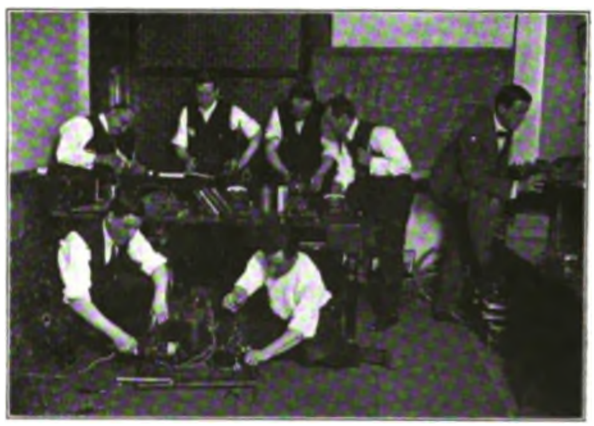


FIG. 3—MEMBERS AT WORK.

The society now has a membership of 125, and everyone is full of enthusiasm in the work. Examinations are held and prizes are awarded to those who excel in their studies and work.

New York Telegraphers' Aid Society.

The statement of the New York Telegraphers' Aid Society, for the quarter ended June 6, is as follows:

Balance on hand March 6		$26,881.27
Receipts		1,895.00
Total		$28,776.27
Disbursements:		
Death benefits	$600.00	
Sick benefits	1,524.58	
Expenses	202.85	2,327.43
Balance on hand June 6		26,448.84
Total		$28,776.27

RELIEF FUND.

Balance on hand March 6	$6,360.02
Receipts	191.40
Total	$6,551.42
Disbursements	$205.00
Balance on hand June 6	6,346.42
Total	$6,551.42

TELEGRAPHING FROM THE BOTTOM OF THE PACIFIC.—Mr. Guy Hoopengarner, an operator for the Cage Submarine Company, remained under water for thirty-six hours in the submarine "Cage," at Long Beach, Cal., June 10-11. During this time he telegraphed to the world above 1,000 messages and bulletins from the cabin, reporting the conditions attending this record-breaking submergence. He did not sleep during the time the craft was under water.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

Mr. John Morison, assistant general traffic chief, has been made chief of the force. Mr. Morison is one of the best-known old-timers in the office, and his long service eminently qualifies him for the duties of his new position.

W. W. Shone, an old-time telegrapher of this office, died at his home in Philadelphia, June 19.

Mr. Fred T. Bishop, traffic supervisor of the Eastern Division, was married to Miss Margaret Mahoney, of this office, on June 25.

Miss Gertie McMullen and Mrs. Gray, of this office, have been assigned to the Saranac Lake, N. Y., and Squirrel Island, Me., offices, respectively, for the summer. Miss Jennie Powell and Mrs. Marie McIntosh have been transferred to Saratoga, N. Y.

Mr. Gardner Irving, superintendent of the Commercial News Service, has been elected a trustee of the New York Telegraphers' Aid Society vice John K. Calvert, deceased.

Mr. Stanley Gross, of this office, was married on June 11 to Miss Anna L. Fenton, of Boston, Mass.

PHILADELPHIA POSTAL.

Among recent visitors at this office were Messrs. A. J. Eaves, of the electrical engineers' office, New York, and C. F. Troeller, manager at Atlantic City, N. J.

Messrs. E. W. Miller and F. P. McElroy have been elected members of the finance committee of the Mutual Investment Association, of Philadelphia, in place of J. R. Denniston and A. E. Zintl.

PHILADELPHIA WESTERN UNION.

Mr. Thomas J. Hamilton, manager of the branch office at Kensington, was married on June 17 to Miss Margaret Mary Weldon, of this city.

T. M. B. A. ASSESSMENTS.—Assessment No. 554 has been levied by the Telegraphers' Mutual Benefit Association to meet the claims arising from the deaths of Franklin L. Jacobs, at Chicago, Ill.; John G. Seabrook, at Atlanta, Ga.; John K. Calvert, at New York; Stephen D. Field, at Stockbridge, Mass.; William McConnell, at Brooklyn, N. Y.; Arthur Ramseur, at Central, S. C.

MR. J. M. BARNES, manager of the Canadian Pacific Railway Company's Telegraphs, St. John, N. B. writes: "In renewing my subscription to TELEGRAPH AND TELEPHONE AGE, I do so with a great deal of pleasure, and wish to compliment you upon the attractive and instructive reading matter with which the paper is filled."

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Telegraph and Telephone Age

No. 14 NEW YORK, JULY 16, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

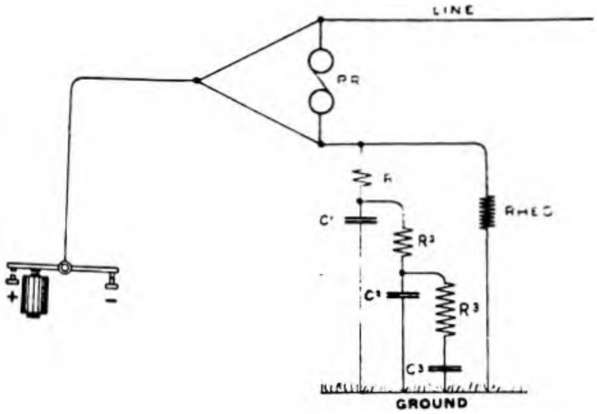
Bug-Catchers—(*Continued*).

As stated in the preceding installment of this article, nearly every modern type of electrical apparatus is, in one sense, a bug-catcher, inasmuch as it is constructed in some special manner intended to either frustrate the undesirable actions of an electric current, or stimulate them, if it is desired to put them to profitable use. This assertion, however, does not apply solely to the construction of the apparatus. In some cases the desired result depends principally upon their arrangement in circuit. Take, for example, the resistance coils placed in series with condensers.

RETARDING RESISTANCE COILS.

Students at first probably wonder why two or more resistance coils and as many condensers are required to eliminate line static from a multiplex circuit, when, as a rule, each separate coil, with one condenser alone, contains as great, and often a greater total capacity than is usually required. If he will examine the condensers and retarding resistance coils on any duplex or quadruplex set, he will find that about half of the holes are not filled with plugs. If he possess an observing eye he will also notice that, although each condenser and set of resistance coils may possess an identical total capacity, the percentage of capacity and resistance plugged in the first differs from that in the second. There are usually only two condensers and two retarding coils necessary for Morse duplex and quadruplex operation, but for high-speed automatic operation three sets are usually required. In this case, the amounts inserted in the third coil and condenser circuit must, in turn, be different from that of the others. In other words, the effective operations of the condensers and resistance coils depend almost entirely upon the manner in which they are relatively arranged in the circuit. In fact, high-speed, automatic operation is impossible without a correct arrangement of the condenser circuits, as will be readily understood by studying the action of the line static they are expected to neutralize. This action is as follows:

When a current of electricity is caused to flow through a wire, a portion of it becomes condensed on the surface. This portion is called the static



COMPENSATING APPARATUS FOR HIGH-SPEED AUTOMATIC PRINTER CIRCUIT.

charge. When the battery contact is broken and the line is put to a ground this charge rushes out of the conductor in the form of a feeble return current, but which usually has sufficient strength to cause a momentary "kick" in the relay as it passes through its coils.

Now, in order to neutralize an electrical effect of any kind, it is first necessary to know just how and when the current which produces it acts, because the compensating devices employed must invariably be arranged to create an exact duplicate of such effect; otherwise one charge cannot completely offset the effect of the other. Let us see what happens when the line static discharges. The moment a break occurs it is obvious that the first outward rush will begin with the maximum strength of the charge, while the remainder will follow in gradually diminishing volume in a manner similar to water flowing out of a full pipe after the pressure has been removed. It is also evident that the first portion of the current discharged, being nearest the relay, will become effective before that which follows. Hence time becomes a factor which must be considered in regulating the amount of retarding resistance to be inserted in the compensating circuit.

The compensating apparatus required for a high-speed automatic printer circuit consists of three adjustable condensers and three sets of adjustable resistance coils. The condensers are used to accumulate an electric charge equal to that of the "static," or main-line charge, while the resistance coils are used to regulate and time the discharges of the condensers, so as to correspond with the actual conditions existing in the line circuit. The relative arrangement of resistance and condenser capacities required to reproduce practically identical conditions in both line and condenser circuits, as shown in the accompanying illustration, is as follows:

The first condenser, C^1, should have the greatest capacity cut in, in order to effectively meet the first and strongest portion of the line discharge, while the retarding resistance inserted in series therewith should be less than that inserted in either the second or the third condenser circuits, so as to be the first to act.

The second condenser, C^2, should have a somewhat less capacity than the first, but more resistance inserted in series with it, so that its discharge may be retarded, and thus timed to meet the second portion of the line's discharge a fraction of a second later. In like manner, the third condenser C^3, should be so arranged that it will have still less capacity and more retarding resistance than either of its companions.

Attendants who handle multiplex apparatus of any description should early realize the importance of this relative order of arranging resistance and capacity when more than one compensating circuit is used. Unless this plan is followed, the static cannot always be sufficiently eliminated to prevent it manifesting itself the moment high speed is attained.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, July 9:

American Telephone and Telegraph Co.	126⅝
Mackay Companies	76
Mackay Companies, preferred	64
Western Union Telegraph Co.	60

Telegraph and Telephone Patents.

ISSUED JUNE 17.

1,064,719. Telephone Trunking System. To E. D. Fales, La Grange, Ill.

1,064,805. System of Telegraphy. To G. Wood, Kansas City, Mo.

1,064,819. Telegraph Key. To H. C. Dauphinais, Fargo, N. D.

1,064,997. Signaling System. To H. O. Rugh, Sandwich, Ill.

1,065,068. Protector for Telegraph and Telephone Cross-arms and Pins. To H. G. Newell, Le Raysville, Pa.

ISSUED JUNE 24.

1,065,478. Repeating Transmitter for Fire-alarm Telegraph Systems. To N. H. Suren, Needham, Mass.

1,065,570. Telephone-Receiver Support. To C. D. Wightman, Glenwood Springs, Col.

1,065,628. Signal-Sending Device. To H. O. Rugh, Sandwich, Ill.

1,065,653. Municipal Lighting and Police Signaling System. To J. P. Barrett, Chicago, Ill.

1,065,805. Telephone Attachment. To S. J. Heimbuecher, jr., Pittsburgh, Pa.

PERSONAL.

PROF. ALEXANDER GRAHAM BELL has received the honorary degree of Doctor of Laws from Dartmouth College in recognition of his invention of the telephone.

DR. E. A. KENNELLY, professor of electrical engineering, Harvard University, and a former telegrapher, sailed from Boston on June 24 for Europe. Dr. Kennelly will remain abroad for about two months.

MR. W. D. WEAVER, former editor-in-chief of the *Electrical World*, New York, has been elected a member of the Chamber of Commerce, Charlottesville, Va., where he now resides, and appointed a member of the committee on transportation and vice-chairman of the committee on electric lighting.

MR. P. J. HOWE, the author of the paper on "Inductive Disturbances on Telegraph and Telephone Lines," which was published in part in the July 1 issue, is construction engineer in the plant engineer's department of the Western Union Telegraph Company, New York, and is one of the rising young engineers. The masterly manner in which he handled his subject shows that he has a wide grasp of the fundamental principles of electrical phenomena, and has, besides, the faculty of expressing his thoughts and knowledge in language that can be easily understood by the novice.

MR. DANIEL S. ROBESON, a former well-known general superintendent of construction of telegraph property, was a New York visitor on July 9, and made it the occasion to call on many of his old friends. Mr. Robeson enjoys the reputation of having constructed more telegraph line than the average superintendent of construction. He became a prominent figure in the telegraphic world, and, during the exciting telegraph-construction period, from 1875 to 1895, was prominent in the competitive achievements of the day as a contractor and general superintendent of construction with the American Rapid Telegraph Company, Mutual Union Telegraph Company, West Shore Railroad Telegraph Lines, New England Telegraph Company (land line of the Commercial Cable Company), and general superintendent of the Pacific Postal-Telegraph Company. He also built the original lines of the Postal Telegraph-Cable Company south of the Potomac and Ohio rivers. He was noted for executive ability, perseverance and resourcefulness in overcoming the difficulties constantly arising in construction work in the old days. Of late years Mr. Robeson has been connected with the Robeson Process Company, a well-known manufacturing concern of Ausable Forks, N. Y., and Covington, Va.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. CLARENCE H. MACKAY, president of this company, who is now in Europe, gave a complimentary dinner to Justice James W. Gerard, the new American ambassador to Germany, on the new steamer "Imperator," while at sea on June 30.

MR. GEORGE H. USHER, general superintendent of this company, at Atlanta, Ga., accompanied by Mrs. Usher, arrived at New York from Europe on the steamer "George Washington" on July 7. After visiting the executive offices, Mr. Usher returned to Atlanta.

MR. G. W. HOLT, manager at Denver, Col., has been transferred to Spokane, Wash., as manager, in place of Mr. A. J. Vogus, resigned. Before going to Denver, Mr. Holt was with this company at Los Angeles and San Francisco, Cal. He was with the Western Union Company for two years in the bookkeeping department at Los Angeles, and later went to Riverside, as operator. He has a wide acquaintance on the Pacific Coast.

MR. R. H. HAWKINS, chief clerk to superintendent W. C. Black, Denver, Col., has been appointed manager of the Denver office, vice G. W. Holt, transferred to Spokane.

MR. C. L. SUTLIFF, from Scranton, Pa., has been made manager at Catskill, N. Y., vice Mr. A. D. Wilbur, deceased.

MR. EDWARD B. TAYLOR, manager of the Holland, Mich., office, performed an heroic act in rescuing two girls from drowning at Ottawa Beach on June 29. The two girls and their brother stepped into a deep hole. Mr. Taylor swam to them and rescued the girls, the man being saved by a boat.

THIS COMPANY has moved its office in Saratoga, N. Y., to Nos. 3 and 4 Division Street. The former stores were remodeled for the telegraph company. The office is a commodious one and presents a very attractive appearance. Mr. S. W. Smith is the manager.

How to Succeed.

BY EDWARD REYNOLDS, VICE-PRESIDENT AND GENERAL MANAGER POSTAL TELEGRAPH-CABLE COMPANY, NEW YORK.

(In New York Sunday World.)

Work intelligently. A boy must develop a liking for work after he enters the business world, if he has not done so before. Be willing to submit to the discipline of modern business methods and by that discipline acquire a faculty for self-control if you ever hope to exercise authority over others.

Think and reason for yourself. Anticipate the demands of your superiors. It is because of the fact that most men are willing to serve and not to lead that makes it possible for the one who has initiative and courage to act upon his impulses to rise above his fellows. It requires knowledge and experience to do creative work, and that is the only kind of work that commands recognition.

Become master of your work. Be able to see what is going on about you; study conditions that govern in your particular line of business; by observation and study prepare for the time when your own knowledge and experience will be of value to your concern.

Cultivate individuality. Initiative and common sense, backed up by the moral courage to do the thing that should be done at the time, is more valuable now than ever. The call comes to those who have demonstrated their ability to do things.

Have a definite end in view. Aim for an ideal. A boy, by losing himself for the time being in his work, and by concentrating his mind on problems before him, may deliver the results expected of him. If he has no vision at all except the pay envelope at the end of the month, he won't travel very far on the road to success.

Develop character. It is one of the greatest assets that a boy, or young man, may possess, either in the business or social world. Without character, there cannot be and there should not be what we call success.

Be enthusiastic. More battles have been won by enthusiasm than by any other one thing.

Shun flattery. The boy, or young man, who devotes his time and energies to the successful accomplishment of his plans is sometimes led to believe that flattery is an easier road to favor, but permanent success is rarely attained in that way. We may not like the candid friend, but we need him.

Read and study. This will enable you to absorb more of the information that flows to you in business and make it possible to acquire the knowledge and ability to do the work assigned to you.

Remember quality counts. You will find a way to success in the business world to-day by paying more attention to the quality of the work turned out than the remuneration you receive for it. The higher quality of your work is more apt to win recognition and remuneration.

Recognition must follow merit. A business concern that does not recognize merit is bound to fail sooner or later.

Have faith in sentiment. It is my opinion that a business conducted without some sentiment in dealing with its staff is a business which is doomed to failure. A large business concern indifferent to the joys and sorrows of those in its employ will find that the employes will not manifest any more interest in the concern than the concern does in them.

JOINT SERVICE IN KANSAS.—An order providing for joint telephone and telegraph service in Kansas was handed down June 16 by the public utilities commission of that State. The commission further ordered that all telephone companies that have rates filed with the utilities commission, upon request of the telegraph companies, must enter into contract for joint service.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

Mr. E. Y. Gallaher, comptroller of the company, has called together the division auditors, who met in conference in New York on July 14. Systems and methods and the handing of telephoned telegrams will be discussed; also, the pending interstate commerce commission classification of accounts, and other important matters will be disposed of. The conference will last about a week, and will be concluded with a dinner, and Mr. Theo. N. Vail and Mr. Newcomb Carlton, it is thought, will be present to give brief talks to the visitors. Among those present, besides Mr. Gallaher, were: Mr. H. W. Ladd, auditor; H. K. Huntington, auditor of disbursements; C. McKay, auditor of receipts; L. Roth, special agent, and division auditors Matthew Quinlan, New York; W. McD. Milne, Chicago; J. J. Hoefman, Atlanta; C. A. Rhodes, San Francisco; C. W. Carver, Denver; J. Q. Pipkin, Dallas.

Mr. A. G. Saylor, general manager Eastern Division, New York, spent the first week of this month on a vacation in Maine.

Mr. H. C. Worthen, general manager, Southern Division, Atlanta, Ga., was a recent executive office visitor.

Mr. A. C. Cronkhite, district commercial superintendent, Indianapolis, Ind., announces the following changes in his district: Mr. I. Defenbaugh has been appointed manager at Greenfield, Ind., vice Mr. R. A. Bartholomew, transferred to the traffic department at Marion, Ind. Mr. D. D. Roche has been transferred from Pana, Ill., to the managership at the office at Granite City, Ill. Mr. R. Orttell, of Columbus, Ind., is acting as temporary manager at Pana, vice Mr. Roche. Mr. George O. Brown, manager at Hartford City, Ind., is taking a well-deserved vacation. He has been relieved temporarily by acting manager F. D. Walker.

Mr. M. W. Deutsche, district commercial manager, Chicago, was married to Miss Ella Blaul, of the same place, on July 9. The bride was presented with a silver tea service by Mr. Deutsche's associates.

Mr. J. Levin, special agent, Atlanta, Ga., has been retired on account of ill health.

Mr. C. H. Mulford has been appointed manager at Memphis, Tenn., vice W. A. Logan, resigned.

Edward Lamont, identified with the office of division plant superintendent, Chicago, died June 5.

A "Stationery Committee" has been appointed for the purpose of standardizing stationery forms, stationery supplies and office furniture and equipment for clerical use. The personnel of the committee is as follows: J. C. Nelson, representing the commercial department; L. M. McKisick, the traffic department; G. Green, plant; L. Roth, accounting; J. B. Odell, Western Electric Company. Mr. W. G. Higgins is the chairman of the committee.

Western Union Tariff Book.—Tariff Book No. 58, of the Western Union Telegraph Company, dated July, 1913, has just been issued. It contains 870 pages of information and indexes, and several pages of maps, showing the cable systems throughout the world. Among the contents of the book are the company's rules, rules and rates for press dispatches, cable rules and rates, cable index, deferred cable services, wireless telegraph service, tolls for day and night messages and letters. The work is well prepared and executed, and reflects great credit upon Mr. Wm. Holmes, superintendent of the tariff bureau, and his staff.

M. C. Rorty, Manager Joint Telephone Arrangements, Western Union Telegraph Company, New York.

Mr. Malcolm Churchill Rorty, whose appointment as manager joint telephone arrangements, Western Union Telegraph Company, was announced in our issue dated July 1, was born in Paterson, N. J., May 1, 1875. While he is essentially a telephone man, his experience during the past two years has brought him into close relations with the Western Union officials in New York, and he, therefore, enters the field with a knowledge of telegraph affairs that fits him for his new duties.

Prior to his entry into the telephone business Mr. Rorty was, for a short time, employed by the well-known engineering firm of J. G. White and Company, of New York, on construction work in

M. C. RORTY, MANAGER JOINT TELEPHONE ARRANGEMENTS, NEW YORK.

connection with the first Niagara Falls power transmission line to Buffalo. He entered the service of the New York Telephone Company in 1897, as instrument installer, afterwards becoming wire chief. In 1899 he was appointed to a position in the engineering department of the American Bell Telephone Company, in Boston, and was engaged, first on circuit work and switchboard specifications. Later, he occupied a position in the Chicago shops of the Western Electric Company inspecting telephone apparatus, and afterwards became traffic engineer in Boston.

In 1903 Mr. Rorty was appointed superintendent of traffic of the Central District and Printing Telegraph Company, at Pittsburgh, Pa., and later was advanced to the position of general superintendent of the same company. After the administrative consolidation of that company with the Bell Telephone Company of Pennsylvania, Mr. Rorty was appointed division manager in charge of commercial work, and in 1910 became commercial engineer for the American Telephone and Telegraph Company, New York, which position he held at the time of his latest appointment.

Mr. Rorty is a man of pleasing personality, which, together with his wide experience, will combine to work a potential influence in the relations of the telephone and telegraph interests.

THE CABLE.

Mr. Oscar Moll, general manager of the Deutsche Atlantische Telegraphengesellschaft, Cöln, Germany, who is spending a few weeks in this country, made a ten-day trip through the West early in July, taking in the Yellowstone Park.

Mr. J. R. White, western representative of the French Cable Company, with headquarters at Chicago, is in New York on business and pleasure. Mr. White is accompanied by Mrs. White. After visiting his brother in Boston, Mr. White will return to Chicago July 19.

New Cable in Greece.—The Greek administration has laid a cable between the islands of Shios and Mitylene.

Portugal-Panama Cable. — The Portuguese Parliament, on July 1, passed a bill authorizing the construction of a submarine cable to Panama. It is stated that a French syndicate is back of this undertaking. The scheme includes the laying of a cable from Portugal to Porto Santo, the Madeira Islands, and thence to the West India Islands and Panama.

New Cable to Hongkong.—The first section of the new submarine telegraph cable from Europe to Hongkong has been laid and connected with shore stations. This section is that between Colombo, Ceylon and Penang, in the Malay States. The next section to be undertaken is that between Penang and Singapore, and the one thereafter between Singapore and Hongkong. The last section to be laid will be the one between Aden and Colombo. Operators are already engaged to take charge of and operate the new sections as completed.

French Cable Employes' Outing.

The French Cable Company's Employes' Association held its seventh annual outing on July 6, at Witzels' Point View Island, New York. The steamer "Fulton Market" met the members at the foot of Fulton Street, East River, at 9 a. m., and they had a delightful sail to their destination, where they arrived in time for a good breakfast. After breakfast, they indulged in many races and a game of baseball, and at 6.00 p. m. dinner was served, after which the party returned to New York. The guest of honor was Mr. E. C. Sweeney, manager. Among those present were: Mr. John R. White, agent at Chicago; Mr. Sutton, of Yonkers, N. Y., and many others, numbering altogether 125. The officers of the association are E. C. Sweeney, honorary president; M. J. Martin, secretary; C. Limbrick, treasurer; arrangement committee: L. J. Desnouee, chairman; F. J. Sherry, G. Bain, A. Harrigan, J. McCune, N. A. Weiss and C. A. F. Boulton.

THE TELEPHONE.

R. M. Ferris, chief engineer of the New York Telephone Company, was drowned while bathing at Siasconset Beach, Mass., Sunday, July 13. No one witnessed the accident, the finding of his clothes in a heap upon the beach being the first intimation of it. Deceased was about thirty-five years of age.

Mr. E. W. O'Brien, formerly manager of the Leavenworth, Kan., exchange of the Missouri and Kansas Telephone Company, but now retired, was a recent New York visitor.

Mr. Henry W. Pope, secretary of the Telephone Pioneers of America, New York, recently spent a week in the Berkshires, during which time he called on Mr. C. K. Hunt, of Winsted, Conn., an old-time telegrapher.

Mr. George W. Foster, assistant to the president of the Southwestern Telephone and Telegraph Company, and corresponding secretary of the Telephone Pioneers of America, Dallas, Tex., is spending two months in New York.

Mr. Foster Hume, division commercial superintendent of the Cumberland Telephone and Telegraph Company, at Memphis, Tenn., has been appointed special agent to the general commercial superintendent, with headquarters at Atlanta, Ga.

Mr. F. L. Woodruff, superintendent of the Alabama Division of the Southern Bell Telephone and Telegraph Company, Atlanta, Ga., has been appointed district commercial superintendent of the Cumberland Telephone and Telegraph Company, with headquarters at Memphis, Tenn., vice F. Hume, transferred.

Mr. Frank B. Knight, special agent of the Southwestern Telegraph and Telephone Company, Dallas, Tex., and an old-time telegrapher well known throughout the country, was married to Mrs. Lillian Ballard, of the same place, on June 21. Both Mr. and Mrs. Knight have many friends in Dallas and elsewhere.

Mr. P. Kerr Higgins, general superintendent of the Brazos Valley Telegraph and Telephone Company, Waco, Tex., has been appointed general manager of The Texas Independent Telephone System, with headquarters in the same city. This system comprises about 700 miles of toll pole line, 25,000 telephone stations, and twenty-four exchanges, covering the center of Texas, from Dallas to Elgin, with branches to San Antonio and Port Arthur.

Removing Poles in Albany.—An agreement has been reached between the New York Telephone Company and the Municipal Gas Company, of Albany, N. Y., through which 200 poles will be removed from the streets of that city and about 600 poles will be used jointly by the companies.

Long Vancouver Telephone Cable.—A 35-mile telephone cable has been laid between Vancouver and Vancouver Island, B. C. At one point along the route of the cable the water is 1,356 feet deep. The cable was made in England at the cost of over $100,000. It cost $20,000 to lay it.

Opposed to Reduction of Rates.—The Bell Telephone Company, of Pennsylvania, and the Central District and Printing Telegraph Company were represented recently before the Pennsylvania Railroad Commission and protested against the telephone rate reductions proposed by the commission.

Impersonating by Telephone.—The New York Telephone Company is making an investigation to see if there is any law by which impersonation by telephone can be punished or prevented. The inquiry is a result of the investigation now being conducted by the United States Senate Lobby Committee into the impersonations of statesmen by David Lamar in conducting a lobbying campaign.

Rates in California.—A report has been made to the California State Railroad Commission recommending a reduction of long-distance telephone rates. The Pacific Telephone and Telegraph Company contends that the acceptance of the report might serve as a precedent for the Commissions in Oregon, Washington, Idaho and Nevada to take like action and seriously affect the company's annual receipts. The bill would cut the receipts nearly $400,000 a year.

CANADIAN NOTES.

Mr. Thomas Ahearn, president of the Ottawa, Ont., Electric Railway, and an old-time telegrapher, is spending a few weeks in Europe.

Mr. James Kent, manager of the Canadian Pacific Railway's telegraphs, Montreal, Que., has returned from his annual trip of inspection, which took him as far as the Pacific Coast.

Shortage of Wireless Operators in Canada.—According to the *Wireless World*, it has been found difficult to maintain a twenty-four-hour watch at all the wireless stations of the Canadian Department of the Naval service on account of the shortage of operators. The Department has been compelled to institute a learners' division on the Pacific Coast for the training of operators.

Mr. John McMillan, superintendent of telegraph, Manitoba Division, Canadian Pacific Railway, Winnipeg, Man., has been appointed general superintendent of Western lines, with headquarters at Winnipeg. Mr. McMillan is succeeded as superintendent of the Manitoba Division by Mr. E. M. Payne, inspector of telegraphs, Winnipeg. Mr. B. S. Jenkins, general superintendent of telegraphs, Winnipeg, has been assigned to other duties.

RADIO-TELEGRAPHY.

Signor Guglielmo Marconi, accompanied by Mrs. Marconi, sailed from New York for England on the steamer "Mauretania" on July 2. Mr. Marconi visited the Belmar, N. J., station on June 30.

d'Arsonval Wireless Telephone.—It is stated that Professor Arsène d'Arsonval, of Paris, France, has perfected a long-distance wireless telephone, and expects to have it ready for testing in October.

Wireless in Ontario.—The Department of Naval Service, of Canada, is receiving tenders for the erection of masts and buildings for wireless telegraph stations at Kingston, Toronto and Port Burwell.

Wireless Distress Calls Bring Relief.—The lumber-carrying steamer "Riverside" was wrecked on the coast of California early in July, the crew being saved by relief vessels answering the wireless distress calls.

Wireless in the Antarctic.—It is stated that continuous wireless communication is now maintained between Sydney, Australia, and Dr. Mawson's winter camp in the Antartic by the way of Hobart, New Zealand and McQuarie Island.

Danish-Canadian Wireless Plan.—A committee has bought from the Universal Radio Syndicate of London the Poulsen patents for Denmark, and the Danish Radio-Telegraph Company has been established to build stations and operate the system between Scandinavia and Canada.

English-Marconi Contract Repudiated.—The English Government has acquiesced in the Marconi Company's repudiation of the agreement which was negotiated last year, and will proceed to negotiate for a fresh contract with that company for the establishment of an "all-red" wireless system.

Wireless Between Norway and Boston.—The Norwegian Storthing has sanctioned the contract arranged between the Marconi Company and the Government, providing for a wireless service between Norway and the United States. A station at Stavanger will be connected with one at Boston.

Time Signals by Wireless.—Wireless time signals are received daily at the Greenwich Observatory, London, from the Eiffel Tower and Norddeich, Germany, stations, and can be read with an error not exceeding 0.05 second. Both the French and German times appear to be 0.3 second late on the average, as compared with the Greenwich determinations.

New Marconi-English Contract.—The proposed new contract between the English Government and the Marconi Wireless Telegraph Company for the erection of wireless stations for the "all-red" route is not so favorable to the government as was the former contract. The Marconi company asks $32,500 per station over the price agreed upon in the original contract.

Apology to Mr. Marconi.—William Marconi and Godfrey C. Isaacs, managing director of the Marconi Wireless Company, are to receive a full apology from the German newspaper, *Welt am Montag*, against which they brought a libel suit for accusing them in an article of exploiting the "Titanic" disaster for the company's benefit by holding out news for sale.

Telegraphone Patents Denied in England.—The English courts have refused a further grant of the British patents owned by the Telegraphone Corporation of New Jersey in Valdemar Poulsen's invention for "storing up speech or signals by magnetic influence," on the ground that it has not been worked in England.

Outing of New York Postal Branch Office Managers.

The sixth annual outing of the Postal Telegraph-Cable Company branch managers, first district, Eastern Division, was held June 28. The steamboat "Nassau" left Pier 8, East River, New York, at 1 p. m., with over 400 men on board, and reached Witzel's Point View Island, College Point, L. I., at 2.20 p. m. Upon arrival, the men posed for a group picture, which turned out to be a very fine specimen of the photographers' art. Then the field events were held, with the following results:

Walking match—First, P. A. Hickey; second, S. Cohen. Fifty-yard dash—First, T. A. Hagarty; second, Vincent Puelo. Quarter-mile run—First, W. Regan; second, C. Barnett. Fat men's race—First, B. Lynch; second, W. Lubkert. Fifty-yard potato race—First, T. Mooney; second, J. Christ. Relay race—Won by Commercial Cable employes. The baseball game was won by the general operating department team.

At 6.30, the "four hundred" sat down to an excellent dinner, and, when coffee was served, Chairman Thos. J. Donovan delivered an address of welcome to the members and introduced Manager Thos. E. Heffren, who covered the subject "Call Circuits" in an able manner.

Superintendent C. F. Leonard was the guest of honor, and, when he was called upon to speak, Chairman Donovan, on behalf of the force of the first district, presented him with a handsome cut-glass, silver-topped water set, as a token of their love, esteem and assurance of continued hearty co-operation. Mr. Leonard was greeted with great applause as he arose, and responded feelingly to the kind words of Chairman Donovan, and thanked the employes for their gift. He complimented them on their splendid organization and team work, and enthusiasm shown by them, and pointed out the value of the life of first vice-president and general manager Edward Reynolds as an example for all young men to follow. He dealt with Mr. Reynold's career from the day he entered the service as a humble operator in a small New York City branch office to the present time. The telling point of the speech was the reference to character and moral courage, emphasizing the fact that even with character a man cannot be a leader without moral courage. His speech was punctuated by applause throughout. Several times the gathering rose to its feet and cheered. Mr. Leonard also thanked President C. H. Mackay for his generosity in providing this splendid entertainment, so thoroughly enjoyed by all.

This outing was the largest in number and the most successful in every way of any ever held in the Postal service.

A feature of the ball game was the reappearance on the field of John Coogan, now and for years past the Newark, N. J., manager of the Postal Telegraph-Cable Company, and one time a member of the Newark, N. J., Baseball Club of the Eastern League. He convinced the spectators that he still retains the proclivities of a professional by strongly objecting to the umpire's decisions.

The judges were J. J. Whalen, manager of the operating department, F. E. McKiernan, and W. J. Deegan.

Among those present were:

A. C. Ackerman, F. Ackerman, M. Alpen, C. J. Adame, A. Auslander, J. Amato, J. De J. Almonte, W. Appleton, D. Allen, C. Ashland, C. Ashurst, W. Anderson.

J. Brizzi, H. T. Barkman, J. Burke, J. M. Barry, C. Barnett, L. A. Butler, W. Bearns, E. Brewster, W. P. Brown, F. J. Block, G. Brooks, W. Bradbury, T. F. Biles, J. Burns, O. Bryan, A. Butscher, J. J. Butt, G. Brady, L. Bunno, J. Barry, C. Barnett, E. D. Bunno, L. Baker.

H. Cansor, P. Callahan, M. Callahan, J. Cunningham, R. Casserly, S. Cohen, H. Crawford, F. Cohen, W. Commerce, L. Corper, J. J. Cochrane, P. Cardillo, H. Christ, N. Crean, S. Colcucci, H. Casserly, J. Costelloe, R. Cumerford, J. Court, J. F. Cain, J. F. Coogan, J. F. Coogan, jr., M. Coogan, A. H. Clarke, D. W. Cotte, J. Cavanagh, E. Cassidy, S. Carpenter, J. P. Cullen, W. J. Conly, B. J. Conlin, J. R. Custer, A. Coughlin, J. Collins, G. Cobranchi, F. J. Connelly.

J. J. Donohue, J. B. Doiron, J. L. Daniel, T. J. Donovan, T. Doyle, C. Dedon, W. J. Deegan, J. W. Dorner, J. Daly, B. J. Dixler, J. A. De Giottote, P. Drexler, R. Dopman, J. Doherty, J. H. Donnelly, J. Detrio, E. J. Dunn, T. S. Drew, J. R. Dennison.

G. Ekholm, J. S. Ellis, J. Ellis, W. Ebbett, C. Euble, J. Esposito.

T. Farrell, W. Fox, W. Faltz, I. Finkelstein, W. J. Fives, T. W. Fennell, V. F. Fiore, R. J. Fogarty, E. Fiske, J. Fleming, G. J. Freudenberg, A. Foy, F. Ferrante, D. Fives, J. Friedman, J. H. Flood, C. J. Flood, B. Feraco, C. A. Francis, F. Filardi, A. Fierro, C. Fucci, J. L. Fiorella, W. Finley, C. A. Fagan, W. Feeley, A. G. Fisher, H. J. Finn, S. Fidler.

S. Goldfogel, C. A. Good, M. Gunther, A. Goss, M. F. Geigle, M. Goldfogel, P. Gallagher, J. F. Gorman, R. Grant, J. T. Gleason, F. Grochowski, W. J. Gorman, L. Greenberg, J. C. Geigle, A. Gabelli, P. Gerquist, W. Gould, J. B. Greener.

M. Henry, H. Holstein, T. Hegarty, P. A. Hickey, J. Henry, J. M. Hughes, D. Hynes, J. L. Harkins, F. Haas, M. Hartwig, L. L. Howell, T. J. Hammill, D. Higgins, E. B. Haggerty, C. Hoille, T. Hughes, J. Hennessey, J. Heffernan, C. Harris, T. E. Heffren, E. E. Hamlin, C. Harper, C. Hellmuth, E. C. Hillard.

J. Isola.

R. Jacobs, E. Jordan, H. Jacobs, T. Jordan, W. L. James, L. Jensen, M. Joyce, T. F. Jennings.

A. F. Kavanaugh, A. A. Kramer, H. Kearns, L. P. Kearsley, G. Kiesel, L. H. Kendrick, F. J. Kernan, F. G. Kernan, J. Kenna, J. Keating, M. A. Kerner, W. J. Kavanaugh, J. Koenig, W. H. Knapp, C. J. Keller, T. J. Keogh, J. Kane, C. Klutzman, M. Klepper, F. Kleindinst.

C. P. Lindner, W. Lang, S. Lederman, T. Lisitonio, A. Lyons, L. Lewis, J. J. Leahy, C. Lane, W. L. Larkin, L. Lemonte, C. F. Leonard, E. Leonard, J. J. Leary, J. A. Lindsay, J. J. Loughlin, B. Ley, E. C. Le Seur, J. J. Logan, J. Lackey, M. Lynch, D. Lane, J. Lynch, R. Latta, E. B. Lubkert, T. Logan, W. J. Leavy, S. M. Lissy.

W. E. McNerny, A. M. McNeil, E. M. McGowan, T. P. M. McGowan, E. M. McNally, J. A. McGovern, J. J. McDermott, H. McCormack, J. McCrohan, J. McCauley, J. G. McArdle, J. J. McArdle, E. M. McKiernan, F. E. McKiernan, R. L. McCurdy, F. M. McCarthy, H. J. McNamee, T. McShara, A. McLaughlin, M. A. McConnell, G. McLaughlin, J. N. McGinn, D. J. McQuade, J. McCue, J. P. McGowan, J. F. McNeill, R. C. McCue, W. J. McCarthy, J. F. McNeill, jr., W. McKiernan, J. McGivney, J. J. Maguire, B. Manaseri, R. H. Miller, W. H. Michener, J. Mulvaney, T. Murphy, C. Mallette, R. Madden, E. Monize, D. J. Murphy, M. Moran, J. A. Manning, G. Mitchell, T. Messie, J. Malone, N. A. Malpas, T. Mulligan, C. F. Meyers, W. V. Madden, C. Maurer, W. J. Mitchell, J. A. Mooney, W. G. Mills, W. Morgan, G. F. Murray, D. F. Mallen, J. P. Moran, N. A. Meehan, J. A. Meade,

A. Maloney, B. Morris, B. Monahan, C. Many, J. A. Maloney, A. Motta, J. S. Martin, J. Marshall, L. Mundy, J. J. Morris, P. J. Manion.

A. Nagler, A. Novitzsky, F. Neary, J. Norton.

W. E. Orange, J. O'Brien, G. J. O'Brien, J. O'Donnell, E. O'Brien, J. Oughton, J. O'Donnell, S. E. Ostrom, F. Onorato, G. O'Keefe, T. O'Connor, M. Olsen.

J. Powers, C. Phillips, J. Privitar, T. Powers, F. G. Payne, A. V. Pullo, E. W. Place, M. Pertka, J. Pinto, F. Piscitello, T. Powers.

E. Quinzer, E. Quinn, J. Quinlan.

D. F. Regan, E. J. Rahtes, J. Robinson, P. J. Rocland, C. Ruffer, W. J. Regan, P. Reilly, L. O. Rogers, J. Russo, A. C. Rogers, W. M. Reilly, G. Renkin, W. Redlefson, J. Reilly, T. V. Rahtes, H. J. Reinhardt, J. J. Reilly, J. R. Ryan, J. Reidler, J. J. Richardson, S. Russo, jr., H. A. Rahtes.

D. Setteducato, D. Sullivan, J. Santulli, J. F. Shugrue, E. B. Stanley, F. Sancinnati, W. V. Stahl, J. Sayers, F. J. Sherry, M. J. Stothard, E. Steiner, H. F. Scharf, E. M. Sturgis, J. M. Sullivan, L. Segal, W. Schlaefer, P. R. Shingler, R. Stewart, H. Swanson, D. Shorttall, J. Schmidt, B. Schatzman, R. L. Stephens, G. W. Stephens, J. Smith, M. L. Smith, J. E. Shine, L. Starace, A. Sekosky, J. Shandley, L. Schwartz, W. Schreiber, S. Schwartz, W. Scrivens, E. A. Sullivan, V. Scafardi, F. Sullivan, W. Sizer.

E. P. Tully, H. Tier, J. J. Tobin, D. Thomas, E. Tracy, R. Thompson, T. H. Tierney, R. Taylor, F. Tiernan, A. C. Teller, J. T. Tynan, J. Tonery, J. Tully, S. Tannenbaum.

E. M. Underhill, A. Ulrich, H. Ummelman.

C. Vogt.

F. Woessner, H. Wiese, J. H. Wilson, C. Winterhalter, H. Williams, H. E. Wilson, J. Wildman, R. Wright, T. Whelan, C. H. Wanamaker, J. P. Williams, J. J. Wallace, J. J. Whalen, A. J. Ward, A. Walsh, G. Wiedman, R. Weschler, A. Williams, J. J. Walsh, J. H. Woodward.

F. C. Yaunger, C. Yacht.

J. Zengschmidt, H. Zweifel, W. Zimmerman, P. Zachares, and six musicians.

Milwaukee Messengers Entertain Chicago Messengers.

The Milwaukee Western Union Messengers, on Sunday, June 29, held their ninth "annual picnic and messengers' bicycle race," to participate in which the Chicago Western Union messengers were invited. One hundred and seventy-five Chicago messengers arrived at 11 o'clock, and brought with them the *Chicago Daily News* band of twenty-nine pieces; also their baseball team. They were met at the station by seventy-five Milwaukee messengers, all in new uniforms. The latter greeted the visitors with waving American flags, and their yell: Rah, Rah, Rah, Who are we, We are the Western Union boosters of Milwaukee."

Lines were formed and the procession was headed by manager H. Lindstrom, of the Chicago messenger department, and manager F. A. Mohr and assistant manager Chas. Salb, of Milwaukee. They were followed by a messenger carrying a large American flag, and the *Daily News* band. The procession consisted of 250 fully uniformed messengers and the baseball team, besides those at the head, and the boys marched down Wisconsin Street like regularly drilled soldiers. The messengers were conveyed by trolley cars to Washington Park, where a lunch was served and a game of baseball played between the Chicago and Milwaukee messengers. After the game, which resulted in a victory for the Chicago boys, with a score of eleven to five, there were watermelon races, running races, and various other games, which were greatly enjoyed by all. The band gave a concert during the afternoon, which was much appreciated by the boys. Among other features of entertainment was the part rendered by Willie Fields, Chicago's messenger comedian, who kept his brother messengers in good humor until it was time to return to the city. At 6 p. m. the return trip was made, and the Chicago messengers took their train for home at 7.20.

The bicycle race took place in the morning on the eight and one-half mile Vanderbilt automobile race course and was won by Robert Dryer, with Freddy Beyers second.

There was a generous supply of good things to eat, and all the boys enjoyed their outing to the greatest degree. A group picture of the messengers was taken during the day.

The messengers from Chicago were accompanied by assistant general manager M. T. Cook, superintendent J. Fitzpatrick, Mr. H. Linstrom, Mr. Tully, Mr. McGrath, Mr. A. C. Murphy, Mr. F. W. Brainerd, Mr. A. C. Kaufman, manager Commercial News Department, of New York, and the various district commercial managers of the city of Chicago. Numerous Associated Press men were also present. A loving cup, appropriately inscribed, will be sent to the Chicago messenger baseball club to commemorate the occasion.

The affair was so successful that the Chicago messengers are now planning to entertain the Milwaukee boys in Chicago some time in August, on which occasion a baseball game will be the main feature.

Morse Electric Club Outing.

The summer outing of the Morse Electric Club will be held at Donnelly's Boulevard Hotel, College Point, L. I., N. Y., Saturday, July 26. The Western Union Telegraph Company has placed its steamer at the disposal of the club for the purpose of conveying the members and guests to and from the hotel grounds. The steamer will leave Starin's Pier, foot of Cortlandt Street, New York, 1:45 p. m. sharp.

The entertainment committee is arranging to make this outing an attractive and enjoyable one. Athletic events and a game of baseball between the members will be features of the occasion.

The hotel may also be reached by College Point Ferry, foot of East 99th Street. Mr. W. C. Merly is secretary of the club.

Mr. R. J. Murphy, treasurer, should be notified by each member not later than July 24 whether he will be present or not.

Mr. L. F. Wise, manager, Western Union Telegraph Company, Minneapolis, Minn., in remitting to cover his subscription for another year, writes: "We always take pleasure in boosting for the Age, as it well merits the appreciation of all telegraph employes."

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

CHANGES OF ADDRESS.—In ordering a change of address the old as well as the new address must be given.

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NEW YORK, JULY 16, 1913.

Organization of Telephone and Telegraph Companies.

Most people see things on the surface only. Take, for instance, a watch, or a clock. It indicates the time, and, as long as it does that, we do not concern ourselves with the mechanism. The watch, however, has a most delicate organism which is well worth studying.

So it is with a telegraph or telephone company. The public and the average employe only see the huge machine work and the results of its action, but have little idea of the mechanism that brings about such results.

Elsewhere in this issue, we publish an article by Mr. C. G. Dubois, comptroller of the American Telephone and Telegraph Company, which explains, in a general way, the organization of that great corporation, and its relations with the various operating companies throughout the United States. The operation of this vast system of communication is so even, on the whole, that any slight irregularity is very likely to cause more or less complaint from the telephone user. The organization that makes such a record possible must necessarily be of a highly developed kind. A reading of Mr. Dubois' article will show how nicely the various parts of the telephone machine are balanced and adjusted to one another to bring about the three main purposes of the organization; viz.: Best service to the public, best care of its employes and reasonable returns on the investment in the property.

The organization of the Western Union Telegraph Company was outlined in a similar manner in our issues, dated January 1 and 16, 1912, by Mr. E. Y. Gallaher, then auditor of the company, but now comptroller. Every telegrapher should be familiar with the organization of his company, and this article of Mr. Gallaher was especially interesting because it dealt largely with historical features chronologically arranged.

The two articles referred to are of great value in one important respect, and that is they are promotive of a better understanding between all the parties concerned, without which a business of any kind, large or small, cannot be conducted harmoniously.

Resistances in Duplexes and Quadruplexes.

In the operation of a bridge duplex or quadruplex the outgoing and incoming signals are required to take one of several paths in order to do their work. Whichever path is taken, however, the resistance must be the same as that of any other of the paths, in order to keep the apparatus in "balance."

The determination of the proper resistances for the various paths is one of the most interesting problems in telegraph engineering, and, when one understands the law of divided circuits, the calculations become comparatively easy.

The specifications of the telegraph companies give all of this information for standard working conditions, but it is a satisfaction to an observing mind and to the student to know the whys and hows of things as they are found.

Mr. H. W. Drake, in an article in this issue, tells how the various resistances in duplex and quadruplex sets are determined, and gives several curves and diagrams, showing the relations of the various factors under ordinary conditions.

Mr. Drake's article is commended for its clearness, simplicity and practicability, and should be carefully studied by those who are earnest in their desire to know the duplex and quadruplex in their essentials.

The First Public Telegraph Office.

On July 4 the dedication of the tablet marking the site of the first public telegraph office took place in Washington in the presence of an intelligent and appreciative audience. The tablet is placed in the granite wall of the building formerly occupied by the Post Office Department, and is about seven feet above the sidewalk, protected by an iron railing, and is in plain sight of pedestrians.

The exercises were introduced by the playing and singing of "The Star-Spangled Banner," after which prayer was offered by the Rev. S. V. Leech. Dr. Marcus Benjamin described the work of the committee on marking points of historic interest, and was followed by Mr. George C. Maynard, the well-known old-time telegrapher of Washington, who described the first public telegraph office, on the site of which the tablet is placed.

The family of Professor Morse was represented by Mrs. Lelia Morse Rummell and her son, William Morse Rummell, and his wife. Among the old-timers present was Dr. James J. Clark, an intimate associate of Morse, who made the "harp registers."

The inscription on the tablet reads:

"Samuel F. B. Morse, artist and inventor, "opened and operated on this site, under the direc- "tion of the Post Office Department, the first public "telegraph office in the United States, April 1st, "1845.

"What Hath God Wrought!"

Reference was made to this matter in our issue dated July 1.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

Under what conditions will a line, 100 miles long, with a battery of 100 gravity cells, acquire a potential of 100 volts throughout its entire length?

Are such conditions realized in practice?

Give reasons why a perfectly insulated circuit cannot be realized in practice?

Referring to Fig. 94, of Pope's book on telegraphic circuits, if the distant end of the line be connected to the earth, what kind of current will pass into the line?

Will this current affect the electromotive force of the battery?

What will the electromotive force of the battery be under these conditions?

Will the distribution of potentials along the line be changed?

What will be the potential at the distant end of the line?

At what point will it be zero?

How can the potential at any point along the line be calculated?

Referring to Fig. 95, if a wire be connected between the earth and any point along the upper line how will the current flow?

How would the value of such a current be determined?

Making a similar connection with the lower, or negative line, how would the current flow?

Where are the two points of zero potential located?

How may the potential at any point on a perfectly insulated line be calculated. Study Fig. 97 of Pope's book.

How is the distribution of potentials within the battery itself determined? Study Figs. 98, 99, 100 and 101 in this connection.

Does Ohm's law apply to the distribution of potentials within a battery?

In wet and unfavorable weather, does a practical telegraph circuit preserve its highest insulation?

If it does not, what is the cause?

Why does the insulation of a line become defective in wet weather?

Is there any way to avoid leakage of current at the insulators?

(To be Continued.)

Year-Book of Wireless Telegraphy.

A book of uncommon character has just made its first appearance in "The Year-Book of Wireless Telegraphy and Telephony, 1913." It is published for the Marconi Press Agency, Ltd., London, England. It is replete with information, and shows the enormous development of wireless telegraphy. Both in the popular mind and in practice the subject has become so widely established that a thorough digest of information has become an absolute necessity, if those who are concerned with wireless telegraphy, in one way or another, are to keep pace with its rapid progress.

The aim of the publishers has been to produce a volume which shall be at once indispensable to those concerned in wireless telegraphy, whether technically or commercially, and contain information sufficient to make intelligible to the general public the immense variety of matters relating to the subject.

Among the contents are a concise chronological record of progress in wireless telegraphy since 1896; the London convention of 1912; the laws and regulations of the principal countries concerning wireless telegraphy; a complete list of land and ship stations of the world, with their call letters, ranges, wave lengths, and the nature of service, and several articles by prominent men, covering the entire field of wireless application. There is also a full glossary of technical terms in English, French, German, Italian and Spanish, and a valuable feature is a map of the world, showing the location of wireless stations and their characteristics.

The book contains 564 pages of text, and many illustrations of men prominent in the development of wireless telegraphy, together with biographical sketches of them, views of stations, apparatus, etc. The price is $2.00 per copy. Copies may be obtained of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

PHILLIPS'S MAGAZINE.—The first number of Phillips's magazine, published by the American Society of Electrical and Mechanical Experts, New York, of which Mr. Walter P. Phillips is president, has made its appearance. The book is a compendium of general information, especially prepared, however, for those interested in the personalities of telegraph, telephone, wireless, typewriter and talking-machine people. The initial number contains many interesting stories, more or less of a telegraphic character, some of which are reprinted from TELEGRAPH AND TELEPHONE AGE.

Course of Instruction in the Elements of Technical Telegraphy—XLIII.

(Copyrighted.)

(Continued from page 403, July 1.)

[We began in our issue for October 16, 1911, the publication of a course of instruction in technical telegraphy. The course, which was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, is published for the benefit of those of our readers who desire to fit themselves for better positions in their vocation. It is elementary throughout and is divided into chapters, following one another in logical order.

The course has received the hearty commendation of telegraph officials and experts for its scope and accuracy and its sound practicability. In each chapter examples are presented in order to illustrate the application of the rules to practical cases, and each chapter is followed by a series of questions pertaining to the subject of the chapter, to be worked out by the student in order to review his progress. Back numbers containing these valuable articles can be obtained on application, at 10 cents per copy.]

The Atkinson Repeater.

Fig. 51 illustrates a very successful form of repeater, in which the device for the prevention of false breaks is somewhat similar to that of the Neilson shunt repeater. R and R^1 are the main line relays; T and T^1 their corresponding transmitters; R S and R S^1 repeating sounders.

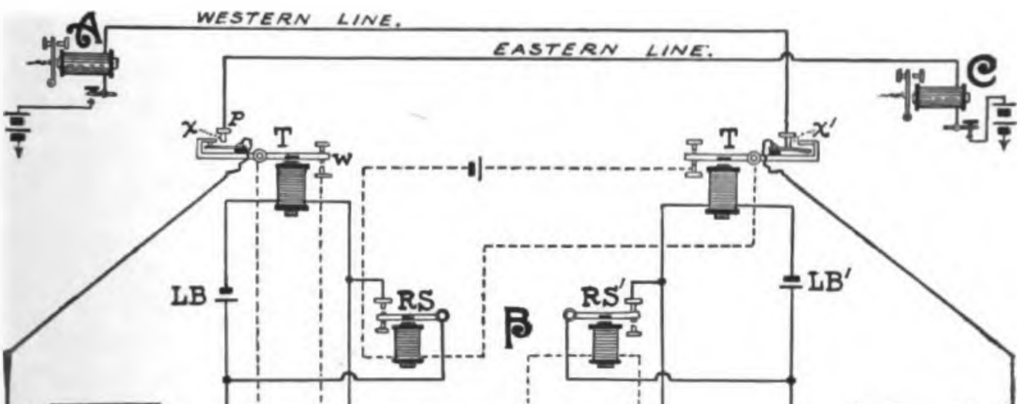

FIG. 51—DIAGRAM OF ATKINSON REPEATER.

A is the distant station on the western line, C the terminus of the eastern circuit, and B the intermediate office at which the repeater is located.

The action of the repeater is as follows: A opens his key, breaking the circuit of M B through R, which therefore opens. This breaks the local circuit in which T is placed, causing the eastern line to be interrupted at post P. R^1 consequently opens and T^1 would do likewise, but for the shunting device provided for the express purpose of keeping it closed. It will be seen by tracing the dotted lines of the local circuit in which R S^1 is placed that the circuit is broken at W the moment the armature of transmitter T leaves its lower stop, and that the armature of R S^1, acting simultaneously with the transmitter, shunts the local points of R^1 before the latter has time to open, since the contact spring of T remains in contact with post P until the other end of the armature has almost reached its limiting stop, and, of course, R^1 remains energized until the break at x actually occurs. When A closes his key the western circuit is re-established. R closes, T responds, and through its contact point the eastern circuit is again closed.

When C breaks, A is made aware of the fact the moment he again closes circuit, for then T being closed through the points of R, the shunt round R^1 is removed by the closing of R S^1, and T^1, responding to the opening of R^1, breaks the western circuit.

The success of this repeater, as of the Neilson shunt, is due to the repeating sounders R S and R S^1, being in the shelter of the local circuit, and thus protected from line variations in bad weather.

(To be Continued.)

An Important Book on Testing.

Every student-telegrapher should have in his library of electrical literature a copy of "Electrical Instruments and Testing," by Norman H. Schneider. The importance of electrical testing cannot be over-estimated, and a practical knowledge of this branch of technical telegraphy is indispensable to those who would progress. This book is the latest on the subject of testing and is clearly written and well illustrated. It is as useful to the telephone man as to the telegrapher, as it contains a good deal of information on testing in telephone exchanges. The work is designed for the practical man and contains only the simpler mathematics. The chapters on the testing of telegraph wires and cables, and the location of faults were written by Mr. Jesse Hargrave, a well known telegraph engineer.

The price of this book is $1.15, postpaid, to any part of the world and orders will be filled by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, on receipt of price.

The Bell System—Its Constituent Companies and Their Relations to Each Other.*

BY CHARLES G. DUBOIS, COMPTROLLER, AMERICAN TELEPHONE AND TELEGRAPH COMPANY, NEW YORK.

The Bell telephone system gives a national telephone service throughout the United States, reaching and connecting 7,500,000 telephones in 70,000 communities. The extent and national character of this telephone service can be best appreciated by comparison with the 65,000 post-offices and 60,000 railroad stations in the country. The 2,500,000 miles of toll wire connecting these 70,000 communities appear, on even a large wall map, as a fine network over the entire country, with white spaces only where there are mountain ranges or deserts.

This national telephone service is furnished through the co-operative efforts of many different companies, each working in its own territory or on its own functions for the whole country. Some of the companies that furnish telephone service in the large cities or other thickly settled parts of the country are of themselves very large corporations, with thousands of employes and millions of dollars invested in telephone equipment.

Each company manages its own affairs. But national service naturally presents many problems which must be worked out under the supervision of one responsible agency, in order to secure to the public the best results in constantly extending the service and increasing its efficiency.

The agency through which the problems of the whole system are worked out is the American Telephone and Telegraph Company, sometimes called the parent company.

This company has three great functions or responsibilities, viz.:

(1) The central administration of the whole system.

(2) The development of the system as a unit, including the supply of money for the new construction which this involves.

(3) The operation of long-distance lines.

While all these functions are really directed to the one purpose of maintaining and developing the different parts as one comprehensive and efficient whole, we can, perhaps, understand this purpose most easily by considering these functions separately.

For the purpose of dealing in an orderly and systematic fashion with the problems of the telephone business as a whole, and the problems of the various companies that have some relation to the whole system, there are various departments in the parent company, each having its own duties and responsibilities.

The engineering department has charge of the design and standardization of apparatus, the methods of plant engineering and construction, and the method of handling telephone traffic. It is intimately concerned with and generally responsible for the development of the art of transmitting messages over wires by electricity, and the protection of the apparatus and wires from outside electrical interferences, such as lightning or the high-tension electric currents of near-by electric light and power wires.

The legal department advises all the departments and companies on legal questions. It compiles and distributes information as to the laws and decisions throughout the country which may be pertinent to the telephone business, or any branch of it.

The accounting department has charge of the methods by which the accounts are kept in the various companies. It audits the books of the companies and sums up the results of the whole system in various reports, statistical tables and charts.

The financial department receives and pays out the money of the parent company and supervises the general financial transactions of the whole system. It also has charge of stocks and bonds issued and the transfer of these as they pass from one owner to another.

The information department conducts the advertising and publicity work of the whole Bell system.

While these departments are made up chiefly of specialists, as is necessary for the complicated problems that have to be worked out, yet the general point of view is maintained by an intimate personal relationship among the heads of the different departments, and by the practice of referring all questions of major importance to the president or senior vice-president, accompanied by the recommendations of the department heads.

Thus, the central administration of the whole Bell system deals only with general, as distinguished from local questions, and applies to such general questions both the special skill of experts and the broad judgment of executive officers.

It is estimated that there are about 100,000 people who have directly invested money in the Bell system—many of them only $100 to $500 each. There are also thousands of indirect investors—those, for instance, who have put money in savings banks, which, in turn, have bought Bell bonds. These thousands of investors are the real owners of the Bell system. Some of them own bonds of the parent company; some own bonds of the different associated companies; a few own stock of certain associated companies. The great majority, however, own American Telephone and Telegraph Company stock.

The parent company owns about ninety per cent of the stock of the Associated Bell Companies, and the financial unity of the whole Bell system is maintained by the responsibility which the parent company takes for supplying money to each associated company, according to the needs of the territory each serves.

No single asssociated company has, or could have, the broad and continuous markets for its securities that the parent company has. In fact, the connection with the American Telephone and Telegraph Company is one of the chief elements of value in such associated company securities as are marketed.

*Western Electric News.

When, toward the end of each year, the needs of each associated company are determined for the coming year, they are summed up by the parent company and the supply of money is arranged for. Thereafter, the construction work of each company can proceed evenly, with the certainty that the money to pay men and to buy material will be at hand when needed.

Another function of the American Telephone and Telegraph Company which contributes in no small degree to the unity of the whole system, is the ownership and operation of the so-called long-distance telephone lines. These are the lines which connect the principal cities of the country together, and are the main routes of telephone communication between places in these territories of different associated companies.

As they are thus used more especially for service between distant points, these lines are constructed according to the highest standards known to the art. They are most efficiently maintained, and no expense is spared to give first-class service over them, even to very great distances. Commercial telephone service is now given from New York as far west as Denver, and plans have been completed for the extension of four heavy copper wires from Denver to San Francisco.

It is these long-distance lines that unite the associated companies into a national system and thus make universal service possible. Every Bell telephone connects directly with the local exchange operated by an associated company. The associated company may operate in only a few counties or in a single State, but anyone who wishes to speak from his telephone to a person in a distant village or city, far beyond the territory of that associated company, has only to express his wish and the through connection is established over the long-distance lines. The service is not limited to the community nor confined within the boundaries of the associated company, but is nation-wide.

In the early days of the telephone, many individuals, firms and companies, were given licenses to use the instruments, each within a certain defined territory. At first only local exchanges were operated; then lines between near-by exchanges, and, as time went by and the distance increased over which telephone conversations could be held, companies occupying adjacent territories tended to consolidate. This tendency greatly reduced the number of licensees, so that there are now only twenty-five companies having direct licenses, although these licenses in the aggregate cover the entire United States. The companies holding these licenses are commonly known as the Associated Bell Operating Companies.

For operating purposes, they are generally grouped in eight territorial divisions, the boundaries of which are determined by the commercial and geographical conditions.

The names of these divisions are derived from their geographical locations, and the licensee companies included in each division.

Each company has its own board of directors and its own administrative officers. Generally—but to this there are some exceptions—all the companies in one group have one headquarters and the same president, treasurer, general auditor, general counsel and other principal officers.

These associated Bell operating companies own and operate nearly 5,000,000 telephone stations and 1,700,000 miles of toll wire, and thus come in daily personal contact with the public all over the country.

After the fundamental patents on telephone instruments expired, many individuals and companies entered the telephone business—some by more or less distant alliances with the Bell system; others with no alliance but with the object of rendering a local service where the Bell service was not available; and still others with the avowed purpose of starting exchanges where the Bell system was already giving service.

The policy of the Bell system is to extend the toll line service to the widest limits, doing this through its own facilities wherever it has such facilities, but at any points where it has not such facilities utilizing the facilities of other companies at fair and agreed rates, thus giving to the public the widest service, and, at the same time, avoiding duplication of plant with the waste and expense to the public which duplication entails.

In pursuance of this policy several thousand companies owning and operating over 2,500,000 telephone stations are connected, under various contract arrangements, to the toll lines of the associated Bell operating companies, and exchange traffic with them, the effect of which is to extend Bell toll facilities to many towns and rural sections where the Bell companies do not directly operate.

Perhaps no corporation in the country is more generally and widely known by name than the Western Union Telegraph Company, which has been furnishing a general telegraph service throughout the country for more than fifty years. In 1909 the American Telephone and Telegraph Company purchased a substantial interest in this company, and thereby established relations between the telegraph and telephone which have several important advantages to the public. In the first place, there is the convenience of sending and receiving telegrams and cablegrams by telephone. This is not only of daily convenience in the cities, but an even greater benefit is that the telegraph service is thus extended to many rural communities which it never reached before. In the next place, since wires can be used for both telephone and telegraph messages at the same time, a greater joint traffic can be carried over present lines, and as new lines are built they have a greater capacity because of their joint use for both telephone and telegraph purposes.

The manufacturing and supply department of this whole telephone and telegraph system is the Western Electric Company.

The purpose is to foster and maintain relations between the Western Electric Company and the other companies in the Bell system as thoroughly co-operative as the relations that prevail within the organization of any well-managed single company.

The American Telephone and Telegraph Company establishes the types and quality of material required in the service of the Associated Bell Companies, and, at the end of each year, makes for the Western Electric Company a general statement, showing the quantities of the principal materials that will be required in the following year.

The well-defined and widely known purpose animating the owners, the managers and the employes of this aggregation of companies, is to give an efficient and universal telephone and telegraph service throughout this country. It is their sincere conviction that nothing short of such a universal service can be adequate to the needs of the country. It is their firm belief that there is no way of getting this service efficiently, except through one system, conducted under American business methods, and subject at all times and all places to the scrutiny and control of the public authorities. It is their earnest intention that the Bell system shall meet all the exacting requirements of such a service, alike in the daily routine and in the great emergencies.

Doubtless, everyone will agree to these three fundamental propositions: The public is entitled to an efficient service at fair rates; the employes are entitled to good working conditions and fair wages; and the investors are entitled to a fair return on their money. But, in their specific application everyone must contribute clear thinking, hard work and loyal co-operation, as between individuals, departments and companies.

The Siphon Recorder.

The siphon recorder, invented by William Thomson (Lord Kelvin) in 1867, is an instrument that records in ink, on a moving band of paper, messages received over submarine cables. It consists of a bent glass siphon tube nearly as fine as a human hair. The siphon is suspended by a fine bronze wire; one end of the tube dips in a reservoir of blue aniline ink, the other end can move across the surface of a travelling band of paper, upon which it inks its movement.

If the end of the siphon touched the paper the friction thus introduced would be fatal to the proper working of the instrument because of the loss of sensitiveness; the siphon is, therefore, kept in a state of constant vibration by attaching the tube near its end by means of a silk fiber to an electromagnetic vibrator. The message is thus recorded as a close row of ink dots on the moving paper, and the glass tube is quite free to swing sideways under the action of the received signals.

The siphon tube is joined by two silk fibers to a rectangular suspended coil of fine insulated copper wire, which coil hangs in a strong magnetic field.

The currents from the cable flow through the wire of the suspended coil, and the reaction of these currents with the magnetic field cause the coil to oscillate to one side or the other, dependent upon the direction of the current. The motion of the coil is transmitted by means of the two fibers to the siphon and thus the signals are recorded as received.

Telephone Pioneers of America.

FRED J. BOYNTON.

Mr. Fred J. Boynton, chief traveling auditor of the New England Telephone and Telegraph Company, Lowell, Mass., entered the telephone service in that city in September, 1881, as auditor of the National Bell Telephone Company of Maine, Boston and Northern Telephone Company, Bay State Telephone Company, Suburban Telephone Company, Granite State Telephone Company and the Union Telephone Company. These companies, together with the Telephone Dispatch Company, of Boston, were absorbed in the organization of the New England Telephone and Telegraph Company. He was also auditor of the Erie Telephone and Telegraph Company, comprising the Cleveland Division,

FRED. J. BOYNTON, LOWELL, MASS. (1881)

Northwest Division and Southwest Division, with headquarters at Lowell, Mass., up to October, 1883.

Mr. Boynton was chief clerk of the secretary and auditor's office of the New England Telephone and Telegraph Company, Boston, Mass., from October, 1883, to October 17, 1884, becoming, on the latter date, secretary and auditor of the company, which position he held until September 1, 1890. In addition to this position he was also secretary and treasurer of the New England Telephone and Telegraph Company of Massachusetts from April, 1888, to April, 1893, and was also a director of the company from April, 1888, to April, 1892. In September, 1890, he was appointed traveling auditor for the company, and in July, 1910, received the appointment of cash auditor. In June, 1911, he was appointed chief traveling auditor, which position he still holds.

Origin and Development of Branch Telegraph Offices.

When one begins to dig under the surface of things to look for causes he is surprised to find so many interesting facts that escaped attention. If one should ask how branch telegraph offices originated, in probably ninety-nine cases out of a hundred the answer could not be given.

Considerable light is thrown upon this interesting question in Reid's "Telegraph of America," and from this story we take a few abstracts:

The first suggestion of the local employment of the telegraph sprang, in part, from the habit of telegraph superintendents connecting their homes with their offices. They could thus be apprised of all emergencies requiring their counsel, and could give directions as promptly as if personally present. Probably the first private telegraph line for local business purposes was erected in 1849 for Colonel R. M. Hoe, the well-known inventor of the cylinder printing press. He was a director of the Magnetic Telegraph Company, and had a line constructed between his office in Gold street and his factory in Sheriff street, New York, using the ordinary Morse machinery for communication.

The first strong stimulus given to the construction of local lines, and which led to their ultimate multiplication, was given when opposition companies commenced the struggle for public business. At first a single well-located office was deemed sufficient.

But when Gustavus Swan, in September, 1853, left the New England lines to open an office at the Astor House, New York, for the collection of messages for all lines, and the companies saw how large were his receipts, the advantage of auxiliary stations at all the natural centers of business became evident. Up to 1853 there was no telegraph office in New York, out of Wall street, or its immediate neighborhood, except the office of the National Western Lines opened by James D. Reid, at 181 Broadway, in 1851, when for the first time New York and Pittsburgh and Cincinnati were put in direct telegraphic connection. In April, 1853, the New York, Albany and Buffalo Company opened the first auxiliary office at the St. Nicholas Hotel. In the fall of the same year the Magnetic Telegraph Company opened an office at the Irving House, Broadway. It was some time, however, before the companies took active measures in this direction. The volume of telegraphic business was not yet large. Meanwhile a new enterprise started into life.

In 1854, Henry Bentley, a youth aged 20, armed with a single silver half-dollar, and a few dollars in currency, started from Poughkeepsie on a barge to try his fortune in New York.

About this time J. B. Richards, a skillful mechanician, was at work at 621 Grand street, New York, perfecting the printing telegraph instruments of Royal E. House. Here Bentley found his way as an apprentice. In 1855 he assisted in the organization of a company for the erection of a Metropolitan telegraph line to communicate between points within the city and by the aid of modified House printing instruments. When organized it was named "The New York City and Suburban Printing Telegraph Company."

The central office was a deep basement in Chambers street, near Broadway. Three wires radiated therefrom. The tariff was ten cents for ten words, but the scheme was a failure; messages were few and far between. Bentley, however, having faith in the enterprise, leased the lines, and agreed to pay the stockholders twenty-five per cent of all he made.

Meanwhile, he had, as a writer for the daily and weekly press, managed, by great economy, to save several hundred dollars. J. B. Richards and friends gave him one thousand more. Bentley at once waited on a number of hotel proprietors and induced them to give him free office rent, and to board, without charge, an operator. This done, he opened offices in several hotels and other places. Immediately a fine business sprang up. Bentley's purse was soon large and full.

The Magnetic Telegraph Company had attempted to connect Brooklyn by a submarine cable at Fulton Ferry. Finding, however, that the maintenance of telegraph communication with Long Island was difficult and unremunerative, it was abandoned. The cable was, however, subsequently taken up and relaid by Bentley at Dunlop's Ferry above Blackwell's Island, at the lower end of Hell Gate, from which point the wire was continued down to Williamsburg and Brooklyn, and offices were opened at both of these places. Fifteen offices in all were thus opened. All did a fair business and returned good monthly balances.

While thus carrying out his project of a city telegraph, Bentley started a system of message depositories where messages might be left, called for, and carried by messengers to the telegraph office. For this purpose he had stamps of various denominations in the form of a small shield engraved, which could be purchased and affixed to a dispatch when deposited. Boxes for the reception of dispatches were left with druggists and others. Messengers called at stated hours and carried them to the telegraph stations. But spirited as all this was, it would not work. Wrong tariffs were paid. Illegible messages were dropped in the boxes. Answers were also received with imperfect addresses, which made delivery impossible. All this soon raised a storm, and claims for damages became unpleasantly frequent. Under such circumstances the boxes were withdrawn.

In connection with these telegraphic arrangements Bentley started the Madison Square Post-Office, soon after known as "Bentley's Dispatch," for the delivery of letters in the city and for deposit at the general post-office. There were at that time no auxiliary post-offices. This was maintained for several years with great success and profit. At last Bentley sold out at a large price. Ill health also induced him to dispose of his telegraphic arrangements and lines to the American Telegraph Company by whom they were, subsequently, greatly enlarged.

Immediately prior to the close of the war, Mr. Bentley resumed his connection with the telegraph by building a number of private lines in Philadelphia, the majority of which were finally merged in the "Philadelphia Local Telegraph Company," with a capital of $400,000 and a liberal charter. Under this organization, hundreds of miles of telegraph lines were built and a very varied service supplied to a large number of persons.

Mr. Bentley was one of the earliest promoters of private line printing telegraphs. One of his first devices was a plan securing an open circuit when the lines were not in use. In 1864 he turned his attention to the evils of a variable and unnecessarily large resistance in relay-magnets. By experiment he proved what Varley afterward so clearly demonstrated that a greater resistance than 150 ohms in a relay was a disadvantage. Another important achievement of Mr. Bentley was the employment of the pure carbon masses as obtained from the retorts of the gas works, sawn into shape, and used, in its crude state, as the negative element of a battery.

Difference in Strength of Day and Night Signals in Radio-Telegraphy.

Mr. L. W. Austin, of the United States Naval radio-telegraphic laboratory, in an article in the *Journal of the Washington Academy of Sciences,* states that the first explanation given of the difference in strength of day and night signals after the discovery of the phenomenon by Marconi, was that sunlight, by ionizing the air around the sending antenna, produced energy losses which resulted in a decrease in the strength of the received signals. This idea has long been abandoned as affording a full explanation of the phenomenon, the author says. Recent observations between the Arlington station and the station at the Bureau of Standards, eight kilometers apart, show that if the effect exists at all it is a matter of no more than one or two per cent.

At a later period it was supposed by many workers in radio-telegraphy that the increase in strength of signals at night was caused by the decrease in absorption in the upper conducting layers of the atmosphere after the ionization due to the sunlight and possible cathode rays from the sun had ceased.

The data accumulated by the United States Navy Department during the last three years appear to make this explanation improbable for the two following reasons: (1) It is known that in certain regions and at certain wave-lengths the ground absorption is more than twenty times as great as would be the case if the signals were sent over salt water. The sun's rays can hardly be thought to affect the losses in the earth to any extent, yet on some nights these waves travel across the same region, reaching the receiving station with a great strength as would have been the case if there had been no absorption at all. (2) Observations on undamped oscillations from the arc have shown that at night there is a selective strengthening and weakening of the signals with changing wave-length. For example, during the recent tests of the arc at Arlington, it was found that when the night signals at the receiving station were faint at the regular wave-length of 4,100 meters, changing to 3,950 meters would almost invariably bring them in with greatly increased strength and *vice versa.* This suggests the light and dark interference bands of optics and, as Dr. De Forest has suggested, the phenomenon may be explained by the interference of a set of waves traveling along the earth's surface with another set, which has been reflected from the conducting layers of the upper atmosphere. Calculations show that the height of the reflecting surface would be from forty to sixty miles, which are very probable values for the point at which conductivity would begin. This phenomenon has been observed so constantly in the work with the arc that there can be no doubt of its existence. The fact that it has not been observed in the case of spark waves is due partly to the fact that spark apparatus is generally not changed in wave-lengths by such small percentage of steps, and partly to the shortness of the wave trains which would not permit the direct and deflected trains to overlap for any considerable difference of path.

These facts indicate that the greater strength of night signals is probably due not to a decrease in absorption, but rather to additional energy which reaches the receiving station by reflection. This explanation would involve the idea that at night the upper atmosphere becomes stratified in such a way that at some given height, differing at different times, there is a sufficiently sudden change in conductivity to permit reflection. It is conceivable that this stratification is broken up in the day time either by vertical convection currents, or by the more or less irregular ionization produced by the ultra-violet rays or cathode particles from the sun.

It is certain that the difference between night and day signals is much less for long waves than for short, but the observations on the Clifden signals (wave-length about 7,000 meters) at Brant Rock (2,460 miles) and at Arlington (2,840 miles) do not agree with the observations of Marconi at Glace Bay that the day signals are equal to or better than those at night. At Brant Rock, during the autumn and winter, the received current from Clifden, through twenty-five ohms resistance, was, in general, about thirty-five micro-amperes in the day time, rising at times to fifty-five, while at night the current frequently amounted to more than 100. In summer the signals were always faint, and much of the time inaudible in the day time, varying probably between seven and twelve micro-amperes. Night signals were much louder, no exact measurements being made on them. The observations on Clifden at Arlington agree qualitatively with the Brant Rock results.

Increase Assessments in Memphis.—It is proposed to make a material increase in "localized" assessments of railroad, telephone and telegraph properties in Memphis, Tenn. A special commission has the matter in charge.

Western Union Service in the Ohio Floods.*

BY I. N. MILLER, SUPERINTENDENT WESTERN UNION TELEGRAPH COMPANY, CINCINNATI, OHIO.

Commencing March 25, the State of Ohio, as well as adjoining states, experienced one of the greatest floods known. All the valleys of the State were filled with water from hill to hill, and many places were entirely submerged. Almost all highway and railroad bridges crossing the principal rivers were carried away, and all transportation facilities suspended. The flood was due to a succession of heavy rains, there being an average downfall of about seven inches within four or five days. Only one small reservoir was washed out. The telegraph and telephone facilities was rendered useless temporarily.

Hamilton, Ohio, probably suffered more than any other city, considering its size. The Western Union office, located a half square from the Court House, had twelve feet and three inches of water on the office floor. It had been recently refurnished with modern equipment, which was all carried away or destroyed.

At Dayton, Ohio, the Western Union office is located on as high ground as any other part of the business district. Here the depth of water on the office floor was ten feet, six inches. The current came in from the rear, breaking down doors and windows and carrying the furniture, consisting of a heavy counter, desks, tables and wardrobes, through the front windows. No trace of them has ever been found. One can imagine the condition of this stricken city when it is stated that practically the entire business district and a large portion of the residence district was covered by from six to twenty feet of water, running at a rate which prevented the possibility of making use of boats or any kind of water craft. The people were marooned in their offices and residences from two to four days. The Western Union force, consisting of thirteen persons, was in the office at the time the levees gave way, and everyone had to rush for a stairway to reach the upper floors, where they remained until the water receded so that boats could be used. A crate of cabbage was captured as it floated near, and this was all the force had to eat for four days. The buildings for two half blocks north of the office burned, but favorable winds prevented the fire from reaching the block in which the Western Union was located. Families, living in two-story houses having no attic, were compelled to take off the doors, place them on the bureaus and washstands in the second stories and remain standing on these doors for forty-eight hours, the water being two feet deep on the second floors.

At Columbus, Ohio, the water did not reach the principal business section in which was located the Western Union office, but the whole west side was under water and practically wrecked.

At Marietta, Ohio, the Western Union office, located in the business district and upon ground as high as any other building, had six feet six inches of water on the office floor, the office being located in the second story, making nineteen feet of water in the street in front of the office.

At Pomeroy, Ohio, the building in which the Western Union office was located was entirely destroyed and carried away.

Notwithstanding the crippled telegraph facilities, the Western Union Company was called upon to handle four or five times as much business as usual, and the bravery and energy displayed by the employes in keeping up communication under such unfavorable circumstances is worthy of the highest praise. As soon as the main offices had to be abandoned, temporary offices were established beyond the flood limits. At Dayton, Ohio, five temporary offices were established and they succeeded in handling five times the usual volume of business. Every employe worked continuously for forty-eight hours and until relief could be furnished. With but few exceptions, the railroads were thirty days in building temporary structures across the rivers and resuming the running of trains. Western Union supplies had to be distributed by automobiles and operators transported in the same way. Almost every office lost its supplies and many their entire files. Many of the cities had constructed levees which were supposed to be above the floods. Not a single one, however, stood the test, and cities like Lawrenceburg, Ind., surrounded by a levee, were very seriously damaged when the break came, the inrush of water carrying everything before it.

Dayton, Ohio, suffered the greatest loss of any of the large cities. Fortunately for it, the great manufacturing plant of the National Cash Register Company was above the flood limit. It is practically a city within itself, and its officers immediately converted it into telegraph office, post-office, hotel, hospital, restaurant, Union Depot, relief headquarters, city building, and, in fact, the entire business of the city was centered at this one point and there is probably no record of another instance where a single business enterprise rendered so great a service to a stricken city as did the National Cash Register. The president, Mr. J. H. Patterson, was made chairman of the relief committee, and, with the immense resources commanded by the company, it was practically the salvation of the people of Dayton, who had no houses in condition to live in and nothing to eat.

In a letter from manager Browne, of Dayton, that official gives the following details of how the service was maintained:

"The Dayton main office was abandoned on account of flood at 8:35 a. m., on March 25. The water in the main office, which is a large room eighty-five feet long by sixteen and one-half feet wide, and used for commercial and traffic purposes combined, reached a height of ten and one-half feet. The water subsided on March 28, but the room was uninhabitable, because of the wreckage. Temporary quarters were secured on the second floor of the Beckel House, corner Third

*From the *Journal of the Telegraph*.

and Jefferson Streets, on March 29, and retained until about April 10, when part of the forces were moved back to the Patterson Building, our old quarters. The traffic department rented three rooms in the Patterson Building, on the second floor, which were made into one long room, well adapted for work. The bookkeeping department remained in the Beckel House about ten days longer.

"On March 26, an office was opened up at the National Cash Register Company's plant. The office was maintained until April 12.

"On March 26, offices were opened at Wolf Creek tower, an 'O. S.' station, and at Miami City, a passenger ticket office in West Dayton, on the Pennsylvania Railroad. These offices afforded opportunities of sending out messages conveying information of safety from the people of the residence section of the city, which included Riverdale, Daytonview and the West Side.

"On March 28, an office was opened in the East Exchange of the Bell Telephone Company, and this was maintained for the benefit of the people of that section until conditions became such that business could be handled downtown.

"As I look back over the situation, the most striking feature seems to me to be the wonderful loyalty to duty of all of our employes. Anyone not on the ground cannot imagine the distressing conditions on all sides.

"The general service may be said to have been stopped on March 25 and resumed on March 26. We were out of business about twenty-four hours. Normal conditions were restored about April 10, as far as handling straight telegraph business is concerned. Nearly all of our furniture and files were either washed away by the flood or rendered useless."

Mine Rescue Telephone Equipment.

The urgent need for some means of instant and continuous communication in mines between an advance or rescue party equipped with its oxygen apparatus, and the rear party outside the mine has been met by the Western Electric Company, which has succeeded in producing a light, serviceable and extremely simple telephone equipment for use in rescue work.

A man wearing an oxygen helmet, which covers his mouth, cannot use the ordinary type of telephone transmitter, so that a special type of transmitter, known as the "throat" transmitter, has been developed to meet this unusual condition. The transmitter is very light and compact and is provided with a soft rubber cup to adapt itself to the curves of the throat. This throat transmitter has been found, by actual test, to transmit speech practically as well as the standard Bell instruments. Both receiver and transmitter are held firmly in position in such a manner that they will not interfere with any type of oxygen apparatus now on the market. The telephone equipment used by the man at the outside, or directing end, is a standard switchboard operator's set, consisting of a chest-type transmitter and head-band receiver.

The rescue party is connected with the rear by means of a small wire cable, carried in a leather case, fastened to the helmet man's belt, paying out as he advances. The total weight of telephone equipment carried by the helmet man, including one coil of wire, is only a little over five pounds.

One end of the coil connects with the head re-

RESCUE TELEPHONE EQUIPMENT.

ceiver and throat transmitter by means of an aluminum-encased jack. The other end is equipped with a similar jack connecting with a plug and cord running to a battery and apparatus box. This box is an essential part of the equipment and must be located at the point from which the rescue party is being directed. The operator's telephone set is connected to the apparatus and battery box by means of a cord, plug and jack.

The General Order Company.—An opportunity to invest in a paying mail-order business is offered by the General Order Company, Chicago, Ill., of which Mr. F. W. Conger, a former and well-known telegraph official, is president and general manager. Subscriptions will be received to shares of preferred stock, with bonus of common, in this mail-order house, which is now doing business. In this company's advertisement in the June 16 issue, it was erroneously stated that "commission was offered as a bonus with the preferred stock." It should have read "with bonus of common stock." This statement was misleading, hence this explanation.

Outing of Employes.—Two thousand employes of the Central District Telephone Company, Western Union Telegraph Company, Western Electric Company, and the American Telephone and Telegraph Company, at Pittsburgh, Pa., held their second annual outing on June 7. The programme of entertainment consisted of various games and dancing.

Mr. W. H. Baker, secretary of the Western Union Telegraph Company, New York, in remitting to cover his subscription for another year, writes: "Every ambitious telegraph and telephone employe should read Telegraph and Telephone Age."

Resistances of Bridge Duplex and Quadruplex Sets.

BY H. W. DRAKE, NEW YORK.

Because of the increasing use of the bridge types of duplex and quadruplex sets, questions are frequently asked regarding the joint resistance of the various circuit branches comprised in such sets. As the calculation of these joint resistances by the application of Kirchoff's laws to each case is a somewhat tedious process, the following analysis and formulas may be of interest.

Fig. 1 represents a bridge duplex set, in which the generator or battery connection has been replaced by a ground connection. The joint resistance of the circuit between the points m and n is often required to be known. It will be seen that the five branches of the circuit between those points have the same form as a Wheatstone Bridge. By Kirchoff's laws it can be proved that the joint resistance of such an arrangement of branches is:

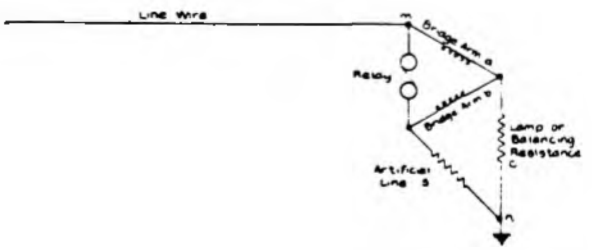

FIG. 1.—DIAGRAM OF BRIDGE DUPLEX SET.

$$R = \frac{b(a+c)(r+s) + ar(c+s) + c(a+r)}{b(a+c+r+s) + (a+r)(c+s)} \qquad (1)$$

(The full deriviation of this formula is given in Kempe's "Handbook of Electrical Testing," page 587 of the 1900 edition.)

For almost all cases arising in actual practice the preceding formula may be reduced to a much simpler form, because the apparatus forming some of the branches has the same resistance in all sets. In this country, the bridge arms a and b usually measure 500 ohms each, and the polar relay r has a resistance of either 400, 600 or 800 ohms. By substituting these figures and canceling, the following formulas are obtained:

$$\text{When } r = 400,\ R = \frac{cs + 286c + 321s + 71{,}430}{c + s + 321} \qquad (2)$$

$$\text{When } r = 600,\ R = \frac{cs + 375c + 344s + 93{,}750}{c + s + 344} \qquad (3)$$

$$\text{When } r = 800,\ R = \frac{cs + 444c + 361s + 111{,}111}{c + s + 361} \qquad (4)$$

The foregoing formulas have been further simplified by substituting in them the six most commonly used values for the resistance lamp c. In Fig. 2 are shown twelve curves based on these simplified formulas (5 to 16, inc.), together with the formulas themselves. By the use of these curves or formulas, the resistance of almost any bridge duplex set may be readily determined, if the resistance of the artificial line s is known.

To the student who likes to see the physical meaning of a formula, it may be pointed out that the constant term in each of the expressions given in Fig. 2 represents the lowest resistance the duplex set can have under the given conditions of lamp and relay resistance. It is evident that this minimum set resistance is attained when the artificial line is short-circuited; i. e., when its resistance s becomes zero. Substituting zero for s in any of the formulas on the chart causes the fractional term to disappear, leaving R equal to the constant quantity forming the first term of the right-hand member of

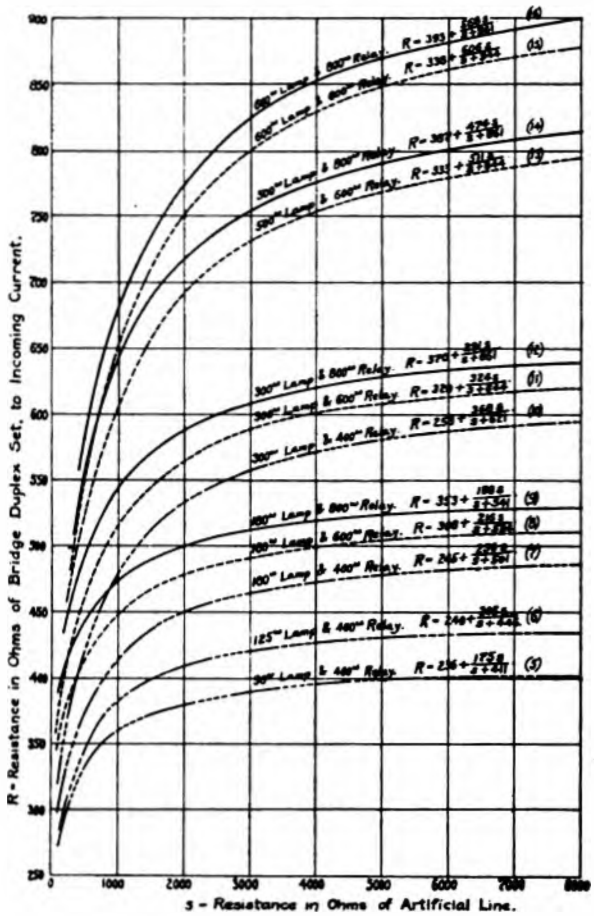

FIG. 2.—CURVES BASED ON FORMULAS 1, 2, 3 AND 4.

the equation. As a proof of this, it may be noted that by the ordinary law of divided circuits, when s is short-circuited (see Fig. 1).

$$R = \frac{r\left(a + \frac{bc}{b+c}\right)}{r + a + \frac{bc}{b+c}} \qquad (17)$$

Substituting the proper numerical values in this formula will, in every case, give the same value for R as that of the constant term in the formula shown on the chart, Fig. 2. For example, if the lamp c = 300 ohms and the relay r = 800 ohms, the chart gives

$$R = 370 + \frac{291s}{s + 661} \qquad (12)$$

Assuming $s = 0$, and using the "divided circuit" formula given,

$$R = \frac{800\left(500 + \frac{500 \times 300}{500 + 300}\right)}{800 + 500 + \frac{500 \times 300}{500 + 300}} = 370 \text{ ohms.}$$

If the artificial line is opened, which makes $s =$ infinity, the value of the fractional term (in any of the formulas on the chart) becomes the same as the numerical coefficient of the fraction. The highest resistance the duplex set can have is, therefore, the sum of this numerical coefficient and the first or constant term of the expression; for example, when $R = 370 + \frac{291s}{s + 661}$, the maximum value that R can attain is $370 + 291 = 661$ ohms. This

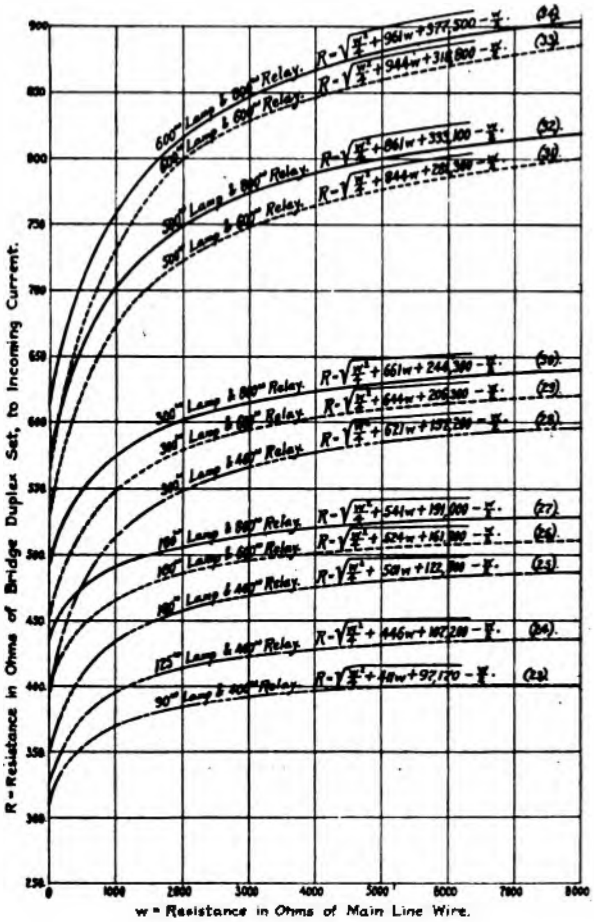

FIG. 3.—CURVES BASED ON FORMULAS 19, 20, 21 AND 22.

is again proved by the law of divided circuits, which, when the branch s is open, gives us the formula

$$R = \frac{a\,(b + r)}{a + b + r} + c \qquad (18)$$

Substituting the values of a, b, c and r in the example under consideration, this formula becomes

$$R = \frac{500\,(500 + 800)}{500 + 500 + 800} + 300 = 661 \text{ ohms.}$$

The reader will also have noticed that the maximum value for the set resistance is the same as the constant quantity which appears in the denominator of the second or fractional term of all the expressions for R on the chart. We can, therefore, by inspection of these formulas, immediately obtain the minimum and maximum values for the resistance of a duplex set. For example, the set resistance must fall between 236 and 411 ohms if a 400-ohm relay and 90-ohm lamp are used; between 320 and 644 ohms if a 600-ohm relay and 300-ohm lamp are

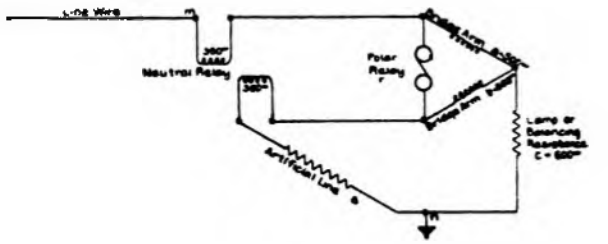

FIG. 4.—DIAGRAM OF BRIDGE DIFFERENTIAL QUADRUPLEX.

used, or between 393 and 961 ohms if an 800-ohm relay and 600-ohm lamp are used. (These figures apply, of course, only to sets having 500 ohms in each bridge arm.) In actual practice, the range of resistance of the set is much smaller than these figures indicate. For a set having an 800-ohm relay and 300-ohm lamp, the minimum and maximum values of R will be 545 ohms and 643 ohms respectively, if the resistance of the artificial line s is never less than 1000 ohms or more than 10,000 ohms.

In some problems, the resistance of the main-line wire is given and not the resistance of the artificial line. It is well known that the resistance of the artificial line, when properly balanced, is equal to the resistance of the distant set, plus the resistance of the main-line wire; or, if the latter is represented by w, we have

$$s = w + R, \qquad (19)$$

assuming that the leakage on the main-line wire is negligible. Substituting this value of s in equations 2, 3 and 4, the following formulas are obtained:

When $r = 400$, $R =$

$$\sqrt{\frac{w^2}{4} + w\,(c + 321) + 286c + 71430} - \frac{w}{2} \qquad (20)$$

When $r = 600$, $R =$

$$\sqrt{\frac{w^2}{4} + w\,(c + 344) + 375c + 93750} - \frac{w}{2} \qquad (21)$$

When $r = 800$, $R =$

$$\sqrt{\frac{w^2}{4} + w\,(c + 361) + 444c + 111{,}111} - \frac{w}{2} \qquad (22)$$

As in the preceding case, these formulas have been simplified by substituting in them the most commonly used values of the lamp resistance c, with the results shown on the chart, Fig. 3.

For the combination bridge-differential quadruplex arranged as shown in Fig. 4, the derivation of formulas for the resistance of the set is simplified by the fact that the "lamp" resistance c always has the same value, 600 ohms.

The general formula for the resistance between the points m and n is:

$$R = 350 + \frac{b(a+c)(r+350+s)+ar(c+350+s)+c(a+r)}{b(a+c+r+350+s)+(a+r)(c+350+s)} \quad (35)$$

By substituting the constant values of a, b and c, this becomes:

$$R = 350 + \frac{2.2\,rs + 2470r + 1700s + 595{,}000}{(950+s)\left(2+\frac{r}{500}\right) + r + 500} \quad (36)$$

This formula may be further simplified by substituting the values of r for polar relays in common use; the results are shown, both as formulas and curves, on Fig. 5.

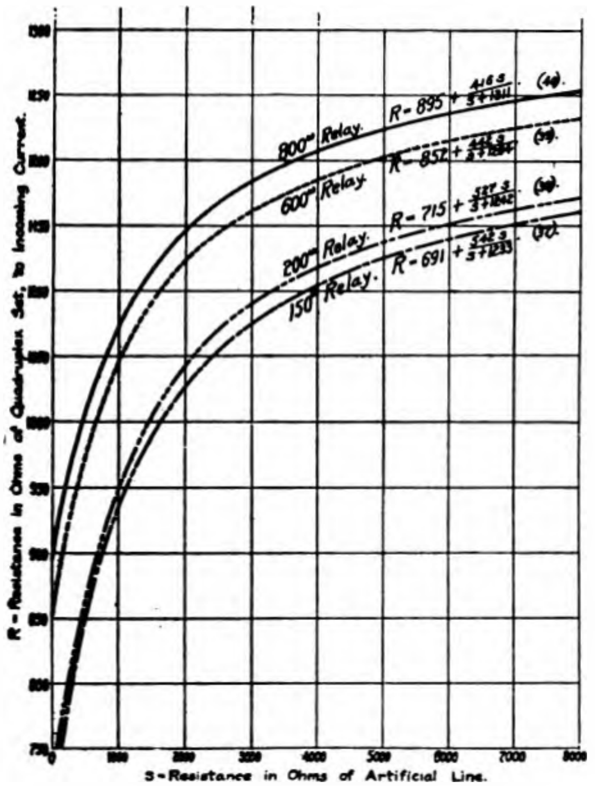

FIG. 5.—CURVES BASED ON FORMULA 36.

By applying the same reasoning as in the case of the duplex sets, the formula 36 may be changed into the following form, to give the relation between the set resistance R and the main-line resistance w:

$$R = \sqrt{\frac{w^2}{4} + 1200w + \frac{1025r + .25rw}{1 + .001r} + 717{,}500} - \frac{w}{2} \quad (41)$$

By substituting the commonly used values of relay resistance r, the simplified formulas and curves shown on Fig. 6 are obtained.

The remarks made in connection with duplex sets, regarding the range of values for the set resistance R, also apply to these formulas. For example, with an 800-ohm relay, the minimum value of R is 895 ohms and the maximum 1311 ohms. The range of actual working values is much smaller; for this particular case, with limits of 1,000 ohms and 10,000 ohms for the artificial line s, the minimum and maximum values of R will be 1,075 ohms and 1263 ohms, respectively.

The current flowing through the various branches of bridge duplex and quadruplex circuits is easily determined, for the cases where the potentials applied at each terminal are equal and of the same polarity, assuming, as before, that we may neglect the leakage on the main-line wire. Under these conditions, no current will flow in the main-line wire, which may, therefore, be removed from the circuit without affecting the current distribution in any

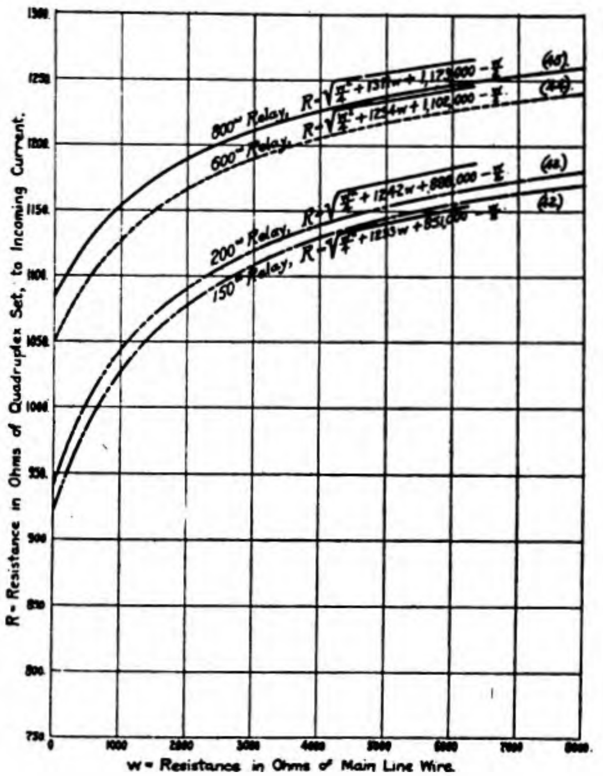

FIG. 6.—CURVES BASED ON FORMULA 41.

way. This leaves, at each set, the very simple circuit shown in Fig. 7, in which the total current I is equal to

$$\frac{E}{c + s + \frac{b(a+r)}{a+b+r}} \quad (46)$$

The current through the bridge coil a and the polar relay r is

$$I_1 = I\,\frac{b}{a+b+r} \quad (47)$$

The current through the bridge coil b is

$$I_2 = I\,\frac{a+r}{a+b+r} \quad (48)$$

For the other conditions occurring in the operation of these circuits, such as unequal voltages, or voltages of opposite polarity applied to the terminals, the currents in the various branches can be determined by applying Kirchoff's laws to each case. Where equal voltages of opposite polarities are applied to the two sets, the work may be simplified by considering the main-line wire to be grounded at its electrical center, and calculating from one end of the circuit to this ground connection. As most electricians know, such a ground connection can actually be applied to the wire under the conditions stated,

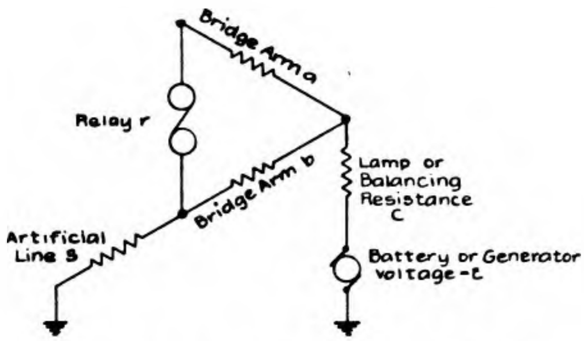

FIG. 7—DIAGRAM OF SIMPLE CIRCUIT AT EACH SET.

without disturbing the distribution of current in the various branches. It may also be pointed out that in a well-balanced duplex circuit having sets closely similar at each end, the value determined by (46) and (47) for the current passing through the polar relay when the terminal batteries are in opposition will also be the correct value for this current when the terminal batteries are in conjunction. The direction of the current through the polar relay will, of course, be reversed if the polarity of the distant battery has been reversed to bring about the conjunction referred to.

Evolution of the Electric Ear.

BY ANDREW PLECHER.

March 20, 1800, is the memorable date on which Volta addressed the following letter to the president of the Royal Society, London: "The apparatus of which I am about to speak is nothing more than an assemblage of good conductors of different kind arranged in a certain manner. Twenty, forty, sixty pieces of copper, or better of silver, are placed each above a piece of tin, or very much better of zinc, and an equal number of layers of water, salt water, lye, etc., or pieces of pasteboard well soaked in these liquids. Such interposition of layers between each couple or combination of the two different metals, such an alternative arrangement always in the same order of these three kinds of conductors is all that constitutes my instrument."

This man from Como, Italy, gave us the indispensable battery without which no telephone would have been thought of. It remained for the Dane, Oersted, to discover, in 1820, that if a wire carrying an electric current was approached to a magnetic needle the latter was deflected. This led Arago, the Frenchman, to construct the first electromagnet by making the current circulate many times around a soft iron core.

By interrupting at different prearranged intervals the electric current passing many times around a soft iron core, Morse, on October 19, 1832, returning aboard the ship "Sully" from France to America, conceived the art of telegraphy. It was then observed that every make and break produced a distinct sound in the iron core which made even the surrounding air vibrate.

By interrupting at regular intervals of audible frequency the electric current passing many times around any iron core, Professor Page, in 1837, by his galvanic music, gave us the principle of the magnetic telephone receiver exactly as it is in use up to the present moment. It has been proven that the armature of the magnetic receiver may be a foot thick without harm to the receiving, and need not be a thin disk.

By using, with the Page receiver, a sounding board, on which iron strings were stretched, De La Rive increased the intensity of the sound emitted by the magnet.

By using, with the Page receiver, a transmitter, consisting of a box whose side opposite the mouthpiece was closed by a membrane having a make and break similar to a Morse key, Philipp Reis, an American, by the way, transmitted, in 1861, musical sounds to perfection, but speech in an unintelligible manner.

By using a Page receiver and fastening the iron armature to a membraneous diaphragm, Bell made out of the magnetic receiver a magnetic transmitter, which was exhibited at Philadelphia in 1876, with little or no success. In 1877 he substituted a thin, all-iron diaphragm for his membraneous diaphragm, having the iron armature attached, and with the thin, all-iron diaphragm the magnetic transmitter acted perfectly. Speech was transmitted over a distance of twenty miles. Two instruments were used, one serving as transmitter and the other as receiver.

The same year Edison discovered the microphonic principle, and immediately perfected it in his carbon transmitter. Speech was transmitted over more than a thousand miles.

In 1905 the battery receiver and the electrostatic balance transmitter were discovered, which were perfected in 1910. A series of primary impulses sets up secondary impulses, which sets the mass of human cells into activity to give the world an auditory system.

SPOOKS ON THE WIRES.—The telegraphone was recently installed on a Western railroad. One night an operator on the road was snatching a little sleep between times, when he was awakened by a humming noise, followed by "Hello, you," and a conversation started. The operator, who was little more than a novice, immediately jumped up and started for the city for help to drive out the spooks, when it dawned on him that it might be the telephone over the telegraph wire. Upon investigation this proved to be the fact.

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The Standard Closed Circuit Cell

When telephone talking circuits are equipped with Edison Primary Cells, and the instruments and line are in keeping with the quality of the battery, transmission of the first order is assured, no matter how severe the service.

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THE RAILROAD.

THE OFFICE of Mr. E. E. Dildine, assistant superintendent of telegraph of the Northern Pacific Railroad Company, has been removed from St. Paul, Minn., to Tacoma, Wash.

MR. J. H. SHEARER, division operator of the Pennsylvania Railroad Company, at Elmira, N. Y., will be pensioned on September 18, when he will have attained his seventieth birthday. At the time of his retirement, Mr. Shearer will have completed a service of forty-nine years and four months. He is a member of the Old-Time Telegraphers' and Historical Association, and other kindred telegraph societies. He has a wide acquaintance among telegraph people.

WIRELESS ON THE LACKAWANNA.—The Delaware, Lackawanna and Western Railroad Company, which is installing a wireless system between Scranton, Pa., and Binghamton, N. Y., has completed the installation of the Scranton station, and is able to pick up messages from the government station at Fort Myer, Va., near Washington. The Binghamton station is not yet completed. The Marconi system is being installed. Mr. L. B. Foley, New York, is superintendent of telegraph of this road.

DISPATCHING EXTENSIONS ON NEW YORK CENTRAL.—The New York Central and Hudson River Railroad is equipping telephone dispatching circuits on the Adirondack Division, from Utica, N. Y., to Adirondack Junction, Que., the dispatcher being located at Utica; on the West Shore road from Albany to South Utica, and on the Pennsylvania Division from Lawrenceville to Ulysses. The company is also stringing an additional long-distance talking circuit over the West Shore route, from New York to Buffalo. Western Electric telephone equipment is being used in this new work, as has been done on almost all of the company's circuits, the greater part of the selectors, however, being of the Gill type. Mr. A. B. Taylor is superintendent of telegraph on this road.

Telephone Dispatching on the Louisville and Nashville.

The Louisville and Nashville Railroad Company now has in service 5,418 miles of telephone wire, covering a track mileage of 2,539, and is rapidly building lines to cover the entire system. It has already constructed 239 miles of poles for exclusive telephone service and has under construction 796 miles of pole line for this purpose, covering its main line from Bowling Green, Ky., to Mobile, Ala., passing through the State of Tennessee; also over a new road being constructed through another part of the same state.

About four years ago, after a thorough investigation of all the telephone lines then working on various railroads throughout the country, the management became impressed with the superiority of the telephone over the telegraph for railroad purposes, and as a result immediately erected a telephone dispatching line between Louisville and Cincinnati. This proved to be such an unqualified success that other construction was authorized and started, with the result as stated. It is the announced intention of the railroad to substitute the telephone for the telegraph for local work, and the telegraph department is taking every advantage of the outside wire plant in the way of obtaining simplex telegraph and phantom telephone service over the physical telephone lines, in addition to the regular local communication, thus securing three telephone and two telegraph circuits over four wires. The telegraph, or simplex circuits, are also being duplexed, doubling their capacity. The Louisville and Nashville telegraph department is handling all of this construction work. Mr. R. R. Hobbs is superintendent of telegraph.

R. R. Hobbs, Superintendent of Telegraph, Louisville and Nashville Railroad.

Mr. R. R. Hobbs, superintendent of telegraph, Louisville and Nashville Railroad, Louisville, Ky., was born in that city July 26, 1872. He began his telegraphic career in Chattanooga, Tenn., in 1885,

R. R. HOBBS, SUPERINTENDENT OF TELEGRAPH, LOUISVILLE AND NASHVILLE RAILROAD, LOUISVILLE, KY.

and worked for the Western Union and Postal Telegraph-Cable Companies and the Associated Press. He filled positions as chief operator, wire chief and manager, and afterwards entered the railroad service as operator, becoming successively clerk, dispatcher, chief operator, manager, finally receiving the appointment of superintendent of telegraph in September, 1912.

MR M. H. DUVALL, now of the firm of Goodwin & Duvall, real estate, Augusta, Ga., writes: "I wish to thank you for renewing my subscription as heretofore. I have not lost interest in all that pertains to the service, and look forward with pleasure to the receipt of each issue of the AGE, as it enables me to keep in touch with many good friends of auld lang syne."

The Western Union Improved Quadruplex.

(Continued from page 414, July 1)

THE PROPORTIONAL RHEOSTAT. As shown in Fig. 5, the plug of this instrument should be inserted at the disks marked "1,200." This makes the value of the added resistance 1,200 ohms and that of the leak resistance 900 ohms, which results in a current ratio of 3 to 1 for the marking signals of the transmitter as compared with its spacing signals. The plug must not be placed in the disks marked "900," giving a ratio of 4 to 1, unless special authority has been given for the use of that ratio because of extraordinary conditions.

THE CONDENSERS. The combination condenser, 3-A, consists of a wooden box, containing three capacity groups, two of which are adjustable and the other non-adjustable, as shown in Fig. 5. The adjustable condensers, each of which has a total capacity of 3⅞ microfarads, graded in the manner shown, are used in the artificial line for securing the static balance. The non-adjustable condenser, having a fixed capacity of one microfarad, is intended for use as a spark condenser, and is connected between the ground and the dividing point of the WE-5-U retardation coil, as illustrated at "SC" in Fig. 1.

The holding condenser, shown at HC in Fig. 1, will usually be of the old style "Adjustable Condenser, 2-A," having a total capacity of about three microfarads. If such a condenser cannot be obtained, one of the adjustable groups of a combination condenser, 3-A, may be used instead.

The ¼-microfarad condenser, WE-21-Y, shown at "EC" in Fig. 1, is used to eliminate or reduce the spark which develops at the pole-changer contact points. It is connected in series with a twenty ohm resistance lamp across those points.

THE POLAR RELAY. This relay, as shown in Fig. 5, has two J-shaped permanent magnets, the "South" poles of which are adjacent to each other and connected together with a soft iron bridge piece. Attached to this bridge piece is a soft iron C-shaped piece, in which is fitted, with a very small air-gap, the pivoted end of the soft iron tubular armature. The free end of this armature, which, by the arrangement just described, is also a "South" magnetic pole, plays between the "North" pole-pieces of the two J-shaped permanent magnets. The armature lever is, therefore, attracted equally by both pole-pieces, and will remain in contact with either its right or left-hand stops when placed there by hand, if no current is flowing through the magnet coils on the two pole-pieces. These coils are so connected together, for use in the quadruplex, that when a current is passed through them, it tends to demagnetize one pole-piece and to strengthen the magnetism of the other pole-piece. Instead of being attracted equally by both pole-pieces as before, the armature is then only feebly attracted by one of them and with increased force by the other, so it moves toward the latter pole-piece with great speed. If the direction of the current is reversed, the attraction is transferred to the other pole-piece, and the armature swings over in response to the change.

As already stated, this relay is connected in the cross-wire of the bridge, the arms of which are represented by the two windings of the retardation coil, WE-5-U. The two 400-ohm windings of the polar relay 6-A may be connected in series or in multiple, giving a series resistance of 800 ohms or a joint resistance of 200 ohms respectively. The series connection of the two 300-ohm windings of the polar relay 6-B give a resistance of 600 ohms, and the multiple connection of those windings gives a joint resistance of 150 ohms. The series connection is generally preferable, but the multiple one has been found advantageous under some conditions, particularly on short lines. The multiple connections are shown in Fig. 6; for series working connect together the two inner of the four binding posts on which the windings terminate, instead of wiring them as illustrated.

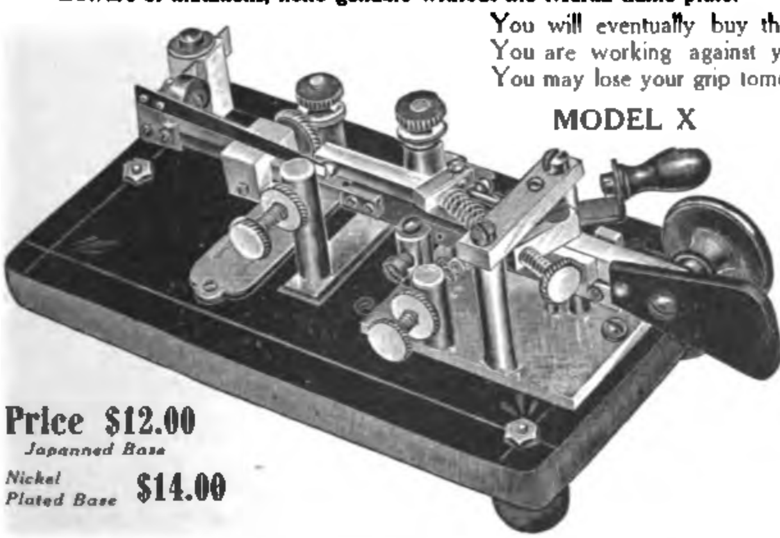
In order to center the polar relay, which is always advisable in the initial stages of adjustment, first throw the double lever of the line resistance box (see Fig. 5) over to its extreme right-hand position, which will open both the main and artificial lines. Then set the armature lever midway between the relay cores, leaving an air-gap of about 1/32 inch on each side. Afterward, adjust the limiting stops until the play of the lever between them is just sufficient in amount to ensure the necessary clearance between contact points without "sticking." It should be noted that the air-gaps between the armature and the relay cores can be regulated by moving these cores in or out of the permanent magnets, where they are held by small set-screws. While the spacing mentioned (1/32 inch for each air-gap) is usually the best all-around adjustment, it is sometimes found desirable to deviate considerably from that figure. After the cores and contact points have once been properly set, any "bias" necessary to strengthen the signals or overcome other peculiar conditions, may be obtained by turning the large thumb screw which moves the carriage on which both contact posts are mounted.

THE MIL-AMMETER. This instrument, which is connected in series with the polar relay in the bridge, has been specially designed to facilitate the operations of line balancing. It will also indicate the precise value of such portions of the incoming currents as pass through the polar relay and afford—as well, by the character of its deflections—an index of the general condition of the circuit.

The mil-ammeter may also serve a useful purpose in detecting the presence of underground faults—such as escapes—which generally manifest themselves in a peculiarly distinctive way upon the meter.

(To be Continued.)

IRON BEDSTEADS AS WIRELESS ANTENNAE.—Mr. A. A. Campbell-Swinton, a well-known English electrical engineer, has, in the course of recent investigations, discovered that an iron bedstead, with its wire mattress on an upper floor, answers quite well as an antenna for the receipt of wireless signals.



CATALOG OF BOOKS ON THE TELEGRAPH, TELEPHONE, WIRELESS, ETC.

ABERNETHY, J. P.—The Modern Service of Commercial and Railway Telegraphy, in Theory and Practice, including the Railway Station and Express Service; arranged in Questions and Answers; $2.00.

BATES, DAVID HOMER.—Lincoln in the Telegraph Office; Recollections of the United States Military Telegraph Corps during the Civil War; 432 pages; illustrated; $2.17.

BELL, JAMES, A.I.E.E.—Submarine Cable Telegraphy; 63 pages, 39 illustrations; $1.00.

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DODGE, G. M.—The Telegraph Instructor. This volume, now in its fourth edition, is admirably designed for the student and beginner, for in explanation and illustration it is clear and profuse; 260 pages; $1.00.

DYER, FRANK LEWIS, AND MARTIN, THOMAS COMMERFORD.—Edison: His Life and Inventions. Two Volumes; $4.00 net; sent prepaid for $4.28.

HERBERT, T. E.—Electricity in its Application to Telegraphy. Adopted by the English Post Office Telegraph Department. Fourth edition, 48 illustrations; $3.00.

HOUSTON, E. J.—A Dictionary of Electrical Words, Terms and Phrases; 980 pages; 582 illustrations; $7.00.

HOUSTON, E. J.—A Pocket Dictionary of Electrical Words; cloth, $2.50.

JONES, WILLIS H.—Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students. This standard work was in 1904 carefully revised and 74 pages and 30 diagrams added, including full descriptions of the newest apparatus adopted by the Western Union and Postal telegraph companies. It presents the finest study of the telegraph ever published; it explains clearly the equipment of a modern telegraph office, and is a text-book that no student, operator, engineer or official can afford to be without; 334 pages, 52 chapters, 160 illustrations; $1.50. A new edition of this work is now in the course of preparation and will be ready in September.

LOCKWOOD, T. D.—Electrical Measurement and the Galvanometer and its Uses; 144 pages, fully illustrated with diagrams of connections, engravings of apparatus, etc. $1.50.

MARSHALL, PERCIVAL.—Small Accumulators; How Made and Used; an Elementary Handbook for the Use of Amateurs and Students; 50 cents.

MAVER, WM., JR.—American Telegraphy and Encylopedia of the Telegraph. This fine work, revised and enlarged, treats of the systems, apparatus and operation of telegraphy; 668 pages; 492 illustrations; $5.00.

McNICOL, D.—American Telegraph Practice. This is the latest work on telegraphy and is a very comprehensive handbook on the subject. It treats every phase of telegraphy in a complete manner and brings everything up to date. 498 pages; 418 illustrations; $4.00.

MEADOWCROFT, WM. H.—A B C of Electricity. This book begins at the very root of electrical science, and contains a vast amount of useful information; 50 cents.

MEYER, FRED L.—Twentieth Century Manual of Railway and Commercial Telegraphy. This work embraces all kinds of commercial messages, train orders, phrases, etc.; 269 pages; illustrated; $1.00.

MEYER, FRED L.—Railway Station Service. A text-book for those who wish to become properly equipped as station, baggage, freight or ticket agents; 216 pages; fully illustrated; $1.25.

MONELL, DR. S. H.—The Cure of Writers' Cramp, and the Arm Troubles of Telegraphers. This valuable treatise should be in the possession of every telegrapher suffering from this common annoyance; 50 cents.

OFFICIAL DIAGRAMS of the Postal Telegraph-Cable Company's Apparatus, and Rules Governing the Construction and Repair of Lines. This book has been produced by authority of the Postal Telegraph-Cable Company, and under the personal supervision of John F. Skirrow, associate electrical engineer. All of the engravings are made from the official blue-prints of the Postal Company, and are therefore absolutely correct; 134 pages; 105 full-page illustrations; 50 cents.

PHILLIPS, WALTER P.—Phillips' Code. A popular, generally used and thoroughly tested method of shorthand arranged for telegraphic purposes, and contemplating the rapid transmission of press reports; also for general newspaper and court reporting; flexible leather cover, pocket size; $1.00.

PRIME, S. IRENAEUS.—Life of S. F. B. Morse. The only work authorized by the family and executors of the great inventor, compiled from original data. This is the finest, most accurate and complete life of Prof. Morse, and includes the history of the invention of the telegraph and the many important business connections with those who were interested with Prof. Morse in the development of the telegraph, that has ever emanated in any shape or at any time from the press; sheepskin; 775 pages; illustrated; $3.00.

POPE, FRANKLIN LEONARD.—Modern Practice of the Electric Telegraph; a Technical Handbook for Electricians, Managers and Operators; 234 pages; 185 illustrations; $1.50.

PREECE, W. H., AND SIVEWRIGHT, J.—Telegraphy. A description of every telegraph system and apparatus used in the English telegraph department; ninth edition; with appendix; 504 pages; 272 illustrations: $2.50.

REID, JAMES D.—The Telegraph in America. A complete detailed history of the telegraph, including the organization of the various telegraph and cable companies; 894 pages; illustrated; full morocco binding; $5.00.

SCHNEIDER, N. H.—Electrical Instruments and Testing: with chapters by Jesse Hargrave, of the Mackay Telegraph and Cable Company, on testing wires and cables and locating faults in telegraph and telephone systems; how to use the voltmeter, ammeter, galvanometer, potentiometer, ohmmeter, the Wheatstone bridge, and the standard portable testing sets; new edition, thoroughly revised and brought up to date, May, 1913; 256 pages; 133 illustrations; cloth, $1.15.

SCHNEIDER, N. H.—Model Library, comprising 4 books, viz.: Study of Electricty for Beginners; Dry Batteries; Electrical Circuits and Diagrams; Electrical Bells, Alarms, etc.; bound in one volume; cloth, $1.00.

TALTAVALL, JOHN B.—Telegraphers of Today. Biographical and historical sketches of more than 900 leading telegraphers, living and dead; published in 1894; 354 double-column pages, 11 x 14 inches; gilt edges; imitation morocco bindings; only work of the kind; of much practical value to those who would keep in touch with the personnel of the profession; reduced from $5.00 to $1.00; express charges collect.

THOM, CHARLES, AND JONES, WILLIS H.—Telegraphic Connections; Embracing Methods in Quadruplex Telegraphy and other Apparatus; 20 plates with circuits distinguished by being printed in three different colors; $1.50

WATSON, A. E.—Storage Batteries, Their Theory, Construction and Use.—An up-to-date work for the practical man; $1.50.

WEBER, W. L.—Handy Electrical Dictionary; 224 pages; 32 illustrations; 50 cents.

WILKINSON, H. D.—Submarine Cable Laying and Repairing; revised, 1909; $6.00.

TELEGRAPH SKETCH BOOKS.

LIGHTNING FLASHES AND ELECTRIC DASHES.—A book made up of bright, ably written stories and sketches, telegraphic and electrical, that should find a place in the home of every telegrapher; 160 large double-column pages; profusely illustrated; reduced from $1.50 to $1.00.

PHILLIPS, WALTER P.—Sketches, Old and New, by the author of Phillips' Code, containing a number of telegraph stories, told with all the charm of that delightful storywriter; 200 pages; illustrated; $1.00.

BOOKS ON WIRELESS TELEGRAPHY AND TELEPHONY.

ASHLEY-HAYWARD.—Wireless Telegraphy and Wireless Telephony; 140 pages; illustrated; $1.00.

BISHOP, LEON W.—Wireless Operators' Pocketbook of Information and Diagrams; 200 pages; illustrated; $1.00.

BOTTONE, S. R.—Wireless Telegraphy and Hertzian Waves; diagrams and illustrations; $1.00.

COLLINS, A. FREDERICK.—History of Wireless Telegraphy. Its Theory, Experiments and Results Obtained; 300 pages; 332 illustrations; $3.00.

COLLINS, A. FREDERICK.—Manual of Wireless Telegraphy; 300 pages; 129 illustrations; $1.50.

EICHHORN, GUSTAV.—Wireless Telegraphy; 126 pages; 79 illustrations; $2.75.

FLEMING, PROF. J. A.—Elementary Manual of Radio-Telegraphy and Radio-Telephony. 340 pages; illustrated; $2.50.

HOPPOUGH, C. I.—Wireless Telegraphy and Telephony; a well-written and comprehensive treatise; 236 pages; many illustrations; $1.50.

KENNELLY, A. E.—Wireless Telegraphy and Wireless Telephony; illustrated; $1.00.

LAUGHTER, V. H.—Operators' Wireless Telegraph and Handbook. Complete treatise on contruction and operation of wireless telegraph and telephone; 180 pages; 86 illustrations; $1.00.

LODGE, PROF. OLIVER J.—Signaling Across Space Without Wires. A description of the work of Hertz and his successors. Illustrated; $2.00.

MAVER, WM., JR.—Wireless Telegraphy; Theory and Practice; 368 pages; 258 illustrations; $1.50, reduced from $3.00. June 1, 1913.

MORGAN, ALFRED POWELL.—Wireless Telegraph Construction for Amateurs; $1.50.

MORGAN, ALFRED POWELL.—Wireless Telegraphy and Telephony, simply explained; 154 pages; 156 illustrations; $1.00.

NAVY DEPARTMENT.—Wireless Telegraph Stations of the World. Including shore stations, merchant vessels and vessels of the United States Navy, etc.; also calls and wave lengths of stations. Corrected to January 1, 1912. 35 cents.

PIERCE, GEORGE W., A.M., PH. D.—Principles of Wireless Telegraphy; 350 pages, 235 illustrations; $3.00.

ROBISON, LIEUTENANT-COMMANDER S. S.—Manual of Wireless Telegraphy for the Use of Naval Electricians; 129 pages; 60 illustrations; $1.75.

STORY, A. T.—The Story of Wireless Telegraphy; 215 pages; 56 illustrations; $1.00.

TREVERT, EDWARD.—A B C of Wireless Telegraphy; 120 pages; 20 illustrations; $1.00.

VREELAND, F. K.—Maxwell's Theory and Wireless Telegraphy; 250 pages; illustrated; $2.00.

BOOKS ON THE TELEPHONE.

CUMMINGS, G. W.—Electricity and Magnetism in Telephone Maintenance; 138 pages; 45 illustrations. A very clear exposition of the underlying principles of the telephone and its care; $1.50.

HALL, FRANK B.—Handbook of Standard Telephone Construction Methods; illustrated with dimensional drawings; $4.00.

HOMANS, JAMES E.—A B C of the Telephone; a practical treatise for students and workers; 350 pages; 260 illustrations; $1.00.

MCMEEN AND MILLER.—Telephony; comprehensive and detailed exposition of the theory and practice of the telephone art; 948 pages; 671 illustrations; $4.00.

MILLER, KEMPSTER B.—American Telephone Practice; fourth edition; entirely rewritten and greatly extended. This comprehensive study of the subject explains in detail every piece of telephone apparatus; 904 pages; 304 illustrations; $4.00.

SMITH, ARTHUR BESSEY.—Modern American Telephony in All Its Branches; 800 pages; 470 illustrations; $2.00.

VAN DEVENTER, H. R.—Telephonology; 638 pages; 736 illustrations; treats of magneto, common battery and automatic systems, composite telegraphy and telephony and describes all kinds of modern apparatus; $4.00.

CABLE CODES.

A B C CODE, fourth edition; $5.00.

A B C CODE, fifth edition. This book is entirely different from the work known as the "A B C Code, Fourth Edition," and the two should not be confounded; $7.00.

A 1 UNIVERSAL COMMERCIAL ELECTRIC TELEGRAPHIC CODE; $7.50.

MCNEILL, BEDFORD.—Code; $6.00.

MOREING, C. A., AND NEAL T.—Telegraphic Mining Code; $5.00.

OFFICIAL VOCABULARY, compiled by the International Telegraph Bureau at Berne, containing over 1,000,000 carefully selected words; four volumes, $30.00.

POSTAL CODE, TELEGRAPH CABLE.—Office size, 6¼ by 9½, $7.50; pocket size, 4¼ by 6½, 864 pages, $6.00.

WESTERN UNION TELEGRAPHIC CODE.—Contains 175,000 words and phrases, carefully selected from the official vocabulary; $16.00; with flexible leather cover, $18.00; Pocket edition, unabridged, $10.00.

INTERNATIONAL CABLE DIRECTORY OF THE WORLD.—Contains the names, lines of business and cable addresses of upwards of 30,000 subscribers to the Western Union Telegraphic Code; a three-years' subscription, $16.00.

Any other code can be furnished on order.

Express or carrying charges on Cable Code Books are not prepaid; these books are sent charges collect.

Any electrical book published, American or foreign, will be sent promptly to any address in the world on receipt of price, postage or express charges prepaid.

Address, and make post-office money-orders, express orders, drafts and checks, etc., payable to J. B. Taltavall, Telegraph and Telephone Age, 253 Broadway, New York.

MUNICIPAL ELECTRICIANS.

UNDERGROUND WORK IN READING.—The fire and police committees of Reading, Pa., have been directed to secure the services of a competent person to complete the work of laying underground in certain parts of the city the police and fire-alarm wires.

POLICE SIGNAL SYSTEM.—Mr. J. P. Barrett, former municipal electrician of Chicago, Ill., has received a patent on a municipal lighting and police signaling system. Street lamps are utilized for the purpose of signaling the police.

FIRE WIRES UNDERGROUND IN ALBANY.—The appropriation of $20,000 for placing the Albany, N. Y., fire-alarm wires underground in the business section, which was referred to in our previous issue, has been made, and the work will be undertaken at once. The materials will include cables, test posts, fire-alarm box pedestals, fire-alarm boxes, etc. The ducts laid by the public service corporation will be used.

The Watertown Convention.

The officials of the International Association of Municipal Electricians are making extraordinary preparations for the convention of that body, which will be held at Watertown, N. Y., August 19 to 22. The convention will be a busy one as far as work is concerned. Several papers of importance will be presented at the meetings, and it is expected that the discussion of these will bring out many additional facts of interest to the members. The headquarters will be at the new Hotel Woodruff, and the meetings will be held in the Odd Fellows' Temple, which is near the hotel. Exhibits will also be displayed at the meeting place.

President J. W. Kelly, Jr., of Camden, N. J., predicts a large and enthusiastic attendance. A complete and interesting programme of entertainment has been arranged for the ladies of the party in which the members of the association will take part when time will permit.

Mr. Clarence R. George, of Houston, Tex., is the secretary of the association, and will be glad to give any further particulars regarding the meeting.

The Old Timers' Reunion.

Arrangement for the thirty-second annual reunion of the Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps, which will be held at the Hotel Cadillac, Detroit, Mich., August 26, 27 and 28, are practically completed. The work yet to be done concerns details which will in no way affect the main programme, which was announced in full in our issue dated June 16.

Mr. Thomas A. Edison, the well-known inventor and old-time telegrapher, has promised to be present at the banquet on the night of August 28. He will be motoring through Michigan about that time, and he will make it his duty and pleasure to be in Detroit on the twenty-eighth.

Mr. L. M. More, manager of the Buffalo Chamber of Commerce office of the Postal Telegraph-Cable Company, suggests that the New York members could easily arrange to spend Monday, August 25, at Niagara Falls on their way to the reunion. A train leaves New York on the New York Central Sunday night at 8.02 o'clock, arriving at Niagara Falls Monday morning at 8.15. As the Detroit boat does not leave Buffalo until 6 p. m., Monday, the entire day could be spent at the Falls and vicinity and Buffalo, which are always interesting places to visit. Such a side trip would add greatly to the enjoyment of those taking advantage of it.

Meetings of Associations, Societies, etc., During 1913 and 1914.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, at New Orleans, La., May 19, 1914. Secretary, P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS, at Watertown, N. Y., August 19-22. Secretary, Clarence R. George, city electrician, Houston, Tex.

OLD-TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION AND SOCIETY OF THE UNITED STATES MILITARY TELEGRAPH CORPS, at Detroit, Mich., August 26, 27 and 28. Secretary of the Old-Timers, F. J. Scherrer, 30 Church street, New York; secretary of the Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

TELEPHONE PIONEERS OF AMERICA, at Chicago, Ill., October 16 and 17. Secretary, Henry W. Pope, 15 Dey street, New York.

The Telegraph at the Battle of Gettysburg.

Apropos of the fiftieth anniversary of the battle of Gettysburg, which was recently commemorated at that historical spot by a reunion and encampment of soldiers of the "Blue" and the "Gray," the following article from the *Pittsburgh Press* of June 29 will be read with particular interest, showing as it does the importance of the telegraph and the heroism of operators during those momentous times:

"It was a boy of seventeen who pushed the button which threw the Army of the Potomac into that fierce struggle at Gettysburg which changed the face of history. This is the story of his deed.

"On June 30, 1863, the North and South alike were in a state of panic. Lee, with his host of bronzed and heroic fighters, had invaded Pennsylvania.

"Stanton, secretary of war, sat in his office in Washington, sleepless and anxious, on the night of the last of June. He and his cause faced ruin at the hands of the Napoleon of the Confederacy.

"Beside him was Major Thomas T. Eckert, head of the military telegraph service.

"Stanton received a message from some of his secret service men telling him that Lee was turning on Meade. The situation was tremendous. If Lee could concentrate his scattered army before Meade could do likewise, he could cut Meade up in detail and have the North at his mercy.

"There was a telegraph office in Frederick, Md. The sounder began spluttering. Bickford took the message. It was from Eckert.

"'Call Fonda to the key. We have a dispatch we want him to carry.'

"Ten Eyck Fonda came. He was a boy of seventeen, of an old New York family, who now lives in Omaha, Neb.

"'Secretary Stanton wants you and two others to carry a very important dispatch to Gen. Meade's headquarters,' clicked Eckert. 'Will you go?'

"The boy knew that the country to the rear of Meade's army was sown with Stuart's Confederate raiders under Mosby. But he did not hesitate. 'Yes,' he clicked back.

"And this is the message, never before published, which Fonda took over the wire from Eckert, dictated to the sender by the great secretary in Washington:

"'To Maj. Gen. Meade, Comdg. A. P.

"'On march.

"'The advance guard of the Confederate army under Gen. Early have entirely evacuated Wrightsville and other points on the Susquehanna river, and are making a forced march to join Gen. Lee's main army at a point between Hanover and Gettysburg—part of their forces now at Hanover—and they confidently expect to be able to form a junction with Gen. Lee's main army not later than to-morrow evening. Circumstances and conditions permitting, I would urge you to assume the offensive as quickly as possible on Lee's divided forces.

(Signed) E. M. Stanton,
Sec'y of War.'

"This was followed by the following to Fonda—

"'Make every effort to deliver this message to Gen. Meade in person. I cannot advise you definitely as to the location of his headquarters, but you can follow the main army tracks and try to locate him as early as possible. Eckert.'

"Boots and saddles! Would Rose and Hardesty go along? Well, they didn't care much about it. But Fonda, thrilled with the sense of big things, appealed to their patriotism, and they went.

"Horses! They got orders for the best. Each took a copy of the dispatch and into the darkness they galloped abreast.

"Fonda says the three passed a Confederate raiders' camp at Taneytown. They fired off their revolvers and made a bluff at an attack, and so got past safely.

"At 4 a.m. they came to a place where the northward road divided into three. They stopped. 'Let us each take a separate road,' said Fonda, 'and maybe one of us will get through. Ride like the devil.'

"Without a handshake or a farewell they parted—and Fonda never saw either of them again. Fonda rode on alone in the glimmering dawn. When he saw the Union headquarter's flag he put spurs to his horse, flew past the sentry, dashed up to Meade's tent and demanded to see the general at once. Meade was acquainted with Fonda and knew his voice.

"'Sergeant,' he called, from within the tent, 'let that man in.'

"Staggering with weariness, the boy saluted and gave the general his dispatch, taking on the envelope the scribbled receipt, which is published in facsimile on this page.

"'Hdqrs. A. P.

'Received telegram from T. H. Fonda, July 1, 5-15 a. m. G. G. Meade, Maj. Genl.'

"And then the boy telegrapher knew what it was to push the button that set in motion the machinery of the battle.

"Fonda received this telegram of thanks from Washington, July 2, 1863.

"'Am directed by the secretary of war to express his thanks to Fonda, Rose and Hardesty for their quick delivery of important telegrams to Gen. Meade, and that he fully appreciates the energy and effort constantly displayed by telegraph men in the discharge of any duty they may be called upon to perform.

'Thomas T. Eckert.'"

(Fonda still has the original of this dispatch.)

Distinguished Subscribers.—A few days ago we received, in the same mail, $2.00 checks from Mr. Andrew Carnegie and Mr. Thomas A. Edison to renew their subscriptions to Telegraph and Telephone Age for another year. It is interesting to note that Mr. Edison's renewal covered his thirty-first subscription to this paper, and a copy of every issue of this publication is on file in his library at West Orange, N. J. Mr. Carnegie's remittance covered his twenty-sixth renewal. It is surprising how many of the old, retired members of the craft evince an interest in the telegraph by subscribing for and reading this publication.

OBITUARY.

Frank P. Medina, aged 55 years, a patent attorney and former manager of the Postal Telegraph-Cable Company in San Francisco, Cal., died in that city June 28.

Thomas F. Kehoe, a well-known old-time and brilliant telegrapher, identified with the Postal Telegraph-Cable Company, New York, for the past twenty-five years, died June 30. Mr. Kehoe was born at Copake Iron Works, N. Y., November 30, 1868, where he became a messenger in 1880. Two years later he was an operator, and he worked for railroads and telegraph companies and other interests until 1888, when he accepted a position with the Postal Telegraph-Cable Company, New York, with which he has been identified every since. Whenever the company had occasion to call for men of special talent, Mr. Kehoe was among those invariably selected.

Miscellaneous Items.

Mr. F. J. Lepreau has been appointed assistant western sales manager of the primary battery department of Thomas A. Edison, Inc., Orange, N. J., for the central western territory, with headquarters at Chicago, Ill. Prior to this change, Mr. Lepreau was western representative of the same interests at Chicago.

Gold and Stock Life Insurance Association.—The proceedings of the thirty-fifth annual meeting of the Gold and Stock Life Insurance Association, held in New York January 20, have been issued in neat pamphlet form. In addition to the record of the work of the association during the previous year, the constitution and by-laws and a list of the members are given. Mr. Gardner Irving is president, Mr. W. J. Dealy, secretary, and Mr. Louis Dresdner, treasurer, all of 195 Broadway, New York.

Serial Building Loan and Savings Institution.—The fifty-seventh semi-annual statement of the Serial Building Loan and Savings Institution, New York, for the six months ended June 30, shows the assets to be $701,944.52. This is the first time in the history of this institution that the assets have passed the $700,000 mark. Mr. A. G. Saylor is president and Edwin F. Howell, secretary.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

Mr. Frank H. Morris, formerly chief operator of the Seattle, Wash., office of this company, has been added to the force and assigned to duty in the Southwestern division, automatic department. He came East in quest of additional knowledge and experience.

Miss Ethel Pronk, of the automatic department, died suddenly on July 6.

SAVANNAH, GA., WESTERN UNION.

Mr. Z. P. Bowers, assistant wire chief, left us to go with the American Telephone and Telegraph Company at Charlotte, N. C. Mr. S. D. Sweat, all-night chief, succeeds Mr. Bowers. Mr. Frank Elmore succeeds Mr. Sweat as all-night chief.

SEATTLE WESTERN UNION.

Mr. Frank H. Morris, chief operator, has resigned and Mr. W. F. Schwandt, traffic chief, has been promoted to fill the vacancy. In leaving the service Mr. Morris was presented with a handsomely engraved watch by his friends, including all the office employes. He will take a rest on his father's orchard and stock ranch on the Columbia River.

Mr. J. M. Keyser has been promoted to be traffic chief vice Mr. W. F. Schwandt.

Mr. Ed. Slingerland, wire chief, has gone to the Philippines, and Mr. L. H. Wright, quadruplex chief, officiates at the board as wire chief.

Mr. John Derville, some time on the *Times* staff, has accepted a position with the Associated Press, Pacific Coast division.

Mr. W. J. Lloyd, general manager Mountain Division, Denver, Col., was a recent visitor at this office and met many old friends.

The office is being generally overhauled. The company is putting in entirely new and modern equipment.

Printer circuits have been established, day and night, between Seattle and San Francisco, and Seattle and Portland; and for day service between Seattle and Spokane. It is reported that a Wheatstone circuit between Seattle and Chicago may be established in the near future.

The introduction of the automatics is made necessary in order to facilitate the handling of the increased business which is overtaxing the Morse circuits.

Telegraph and Telephone Age

No. 15 NEW YORK, AUGUST 1, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Electrical Terms.

In acquiring a knowledge of electrical measurements and the action of electricity generally, progress is sometimes retarded by failing early to appreciate the importance of distinguishing the meaning of the terms energy, force, work and power.

Now, whenever any kind of work is to be done, force must be exerted through a distance in order to produce motion; hence, the term applies to all kinds of force that tends to produce motion. To distinguish one kind of force from another, the word is usually coupled with a term which indicates the character of the force. Thus, we have the terms mechanical-, chemical-, magnetomotive-, and electromotive-force.

To produce motion energy is required; hence, energy is a general term which represents the capacity to do work, but in itself does not indicate how much work is performed. Nor does it give any idea of the rate at which the work is being performed. The student should, therefore, note the distinction between the meaning of the terms electrical energy and electrical work.

When a current of electricity flows through a wire the energy expended is represented by the amount of heat generated, but the electrical work performed is equal to the product of the electromotive force (E), current (I), and time the current flows (T).

Electrical work is measured in joules (J), and the formula is $J = E \times I \times T$.

where $E =$ Volts
$I =$ Currents in amperes
$T =$ Time in seconds.

The term electrical power refers to the rate at which work is being done and not to the amount. The rate of work is measured in watts (W), and in every case is equal to the product of the current and the electromotive force. The formula is $W = E \times I$. The importance of not confusing these terms may be appreciated by the illustration an electric lamp affords.

The electric light company is interested in the power it must be able to supply for light, but the consumer is only concerned with the number of hours he keeps the lamp lighted; that is to say, the amount of work the current does for him.

The student will also note that when the lamp is cut out there is, nevertheless, just as much electrical force at its terminals as when it is cut in, but no work is being done. Laymen also sometimes fail to distinguish the difference between the terms "ampere" and "amperage." For example, a student recently remarked to the writer: "You said yesterday that a four-ohm sounder only requires one-quarter of an ampere of current, and now you state that it requires an 'amperage' of about 250 to operate the magnet. Which is correct?" Both statements are correct. The one-quarter ampere simply represents the current per second that must be supplied, while 250 represents the amount of current, or "amperage," that is required to provide the necessary magnetomotive force.

For example, a four-ohm sounder has about 1,000 turns of wire in its coil, hence there is one-quarter of an ampere of current in each of the convolutions surrounding the core of the magnet. The sum of these separate currents is 250, which is the equivalent in magnetomotive force of 250 amperes flowing around the core in one single turn. It will simplify matters greatly if students will avoid using the word amperage in connection with magnetomotive force, and, instead, use the term ampere turns.

CHOKE COILS AND RESISTANCE COILS.

The distinction between a choke coil and a resistance coil is much greater than students usually realize. The first question that often suggests itself is that as both consist of a number of convolutions of wire, with resistance, why are they not interchangeable for the purpose of reducing the current in a conductor?

The answer is, because the choke coil, although unavoidably possessing ohmic resistance, is constructed in a manner which causes it to do more than merely diminish the current. In fact, the diminution of current in the circuits in which choke coils are inserted is usually an undesirable factor, but is unavoidable. The purpose of a choke coil is to "choke" or retard the sudden rise and fall of current in the circuit and thus lessen the electrical disturbances between adjacent parallel wires. A resistance coil, on the other hand, causes no change in the character of the current other than its diminution. It should not retard or "choke" the current. In other words, a choke coil is one which is constructed in a manner to produce inductance, while a resistance coil is constructed so as to prevent inductance.

A choke coil consists of a coil of wire wound around a paper or wooden core, or it may have no core at all; at least, no core is required, except for support. When a current flows through such a coil the interaction between the parallel currents flowing in the various turns of wire causes the coil to develop a counter-electromotive force, which exerts its influence against the original supply, thus causing inductance or "back-pressure," which retards the full rise of the current. If an iron bar is then inserted in the coil, the inductance will be greatly increased. If the coil is wound on an iron ring, the inductance will be maximum.

A resistance coil consists of a spool so wound on a wooden or porcelain core that the current doubles back on itself through the convolutions and thereby causes no counter-electromotive force; hence, it is said to be non-inductive, and does not alter the character of the current.

Telegraph and Telephone Patents.

ISSUED JULY 1.

1,066,147. Electromechanical Telegraph System. To W. K. Queen and T. E. Pickett, Needham Heights, Mass.

1,066,148. Printing Telegraph System. F. B. Rae, Glen Ridge, N. J.

1,066,388. Sanitary Telephone Attachment. To G. W. Downs, New York.

1,066,410. Attachment for Telegraph Instruments. To R. A. Grout, Davenport, Ia.

ISSUED JULY 8.

1,066,786. Locking Device for Telephones. To C. C. Bielitz, Brooklyn, N. Y.

1,067,179. Wireless Telephony. To V. H. Laughter, Detroit, Mich.

ISSUED JULY 15.

1,067,274. Telephone Register and Lock Out Device. To C. V. Richey, Washington, D. C.

1,067,354. Train Telephone Connection Pole. To W. Leach, Moose Jaw, Saskatchewan, Canada.

1,067,561. Telephone Receiver Casing. To L. Swanson, New York, N. Y.

1,067,606. Telephone System. To M. E. Grönvigh, Bergen, Norway.

1,067,629. Telegraph Display Signal. To F. W. Wood, Newport News, Va.

1,067,711. Multiple Signal Transmitter. To C. E. Beach, Binghamton, N. Y.

1,067,715. Telephony. To S. G. Brown, London, England.

1,067,718. Telephone Transmitter. To J. Collins, Quaker City, Ohio.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, July 28:

American Telephone and Telegraph Co.	127½
Mackay Companies	77½
Mackay Companies, preferred	68
Western Union Telegraph Co.	66

PERSONAL.

MR. DAVID HOMER BATES, secretary of the Society of the United States Military Telegraph Corps, New York, delivered his lecture on "Personal Reminiscences of Lincoln in the Telegraph Office," at the Ocean Grove, N. J., Young People's Temple, recently.

MR. S. M. ENGLISH, president and general manager of the Postal Telegraph-Cable Company of Texas, and Mr. A. P. Wozencraft, general attorney, Southwestern Telegraph and Telephone Company, Dallas, Tex., were business visitors in New York on July 24.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. EDWARD J. NALLY has resigned as vice-president and director of this company. After a short rest he will enter another field of activity.

ADDITIONAL WIRES are being strung in the South and Middle West to take care of the increasing business. Mr. W. I. Capen, of New York, vice-president, is in charge of the work.

MR. F. J. KERNAN, acting auditor of this company, has been appointed auditor.

MR. C. F. LEONARD, superintendent at New York, has returned to his office from his vacation.

AMONG recent executive office visitors were Mr. J. S. Greever, manager of the Chattanooga, Tenn., office. Mr. Greever was accompanied by his wife.

MISS M. WUNDER has been appointed manager at Bel Air, Md., vice Miss A. M. Hershner, resigned.

MR. H. H. SCHAFER, formerly of the Lima, Ohio, office, has been appointed manager at Fostoria, Ohio, vice D. D. Noel, resigned. Mr. Allison Aker succeeds Mr. Schafer as assistant to Mr. E. A. Siferd, manager at Lima.

MISS M. PERLE JONES, manager at Sherman, Tex., has been transferred to Hope, Ark. She was succeeded by Mr. W. W. Burkhalter.

MR. J. L. KOEHL has been made manager of a branch office at Dallas, Tex., vice W. W. Burkhalter, who has been transferred to the Sherman, Tex., office.

THIS COMPANY will establish an office at Joplin, Mo., within the next thirty days, when the new lines now in course of construction will reach that point.

NEW OFFICES have been opened at Sumner,

Washington, F. E. Coffeen, manager; Lamison, Ala., J. M. Thornhill, manager; Kitchen Siding, Ga., J. P. Phillips, manager, and Washington, Ga., J. J. Cooper, manager.

THE NEW HAVEN, CONN., Amateur Athletic Club recently donated a beautiful silver cup to be contested for by the Western Union and Postal bicycle messenger boys. The race was started by former President Taft. The Postal messenger boys won the cup, which has been suitably mounted and placed on the manager's desk, where the public can view it.

R. H. Hawkins, Manager, Denver, Col.

Mr. R. H. Hawkins, whose appointment as manager of the Denver, Col., office of the Postal Telegraph-Cable Company was announced in our issue dated July 16, was born in Saline County, Mo., October 6, 1872, and began his telegraphic career at Armstrong, Mo., November 15, 1893, as agent and operator on the Chicago and Alton Railway. He later became manager for the Postal Telegraph-Cable Company at Leadville, Col., and afterwards acting manager and operator for the same company at El Paso, Tex. From the latter city he went to Albuquerque, N. M., as operator and manager, and from there was advanced to be chief clerk to Superintendent W. C. Black at Denver, Col., which position he held at the time of his appointment as manager of that office.

L. M. More, Manager Chamber of Commerce Office, Postal Telegraph-Cable Company, Buffalo.

Mr. L. Maurice More, manager of the Chamber of Commerce office of the Postal Telegraph-Cable

L. M. MORE, BUFFALO, N. Y.

Company, Buffalo, N. Y., was born in Fulton, N. Y., March 8, 1849, and entered the telegraph service in his native town in 1865. His entire business career has been spent in the western part of New York State.

His first position of importance was as manager for the Western Union Telegraph Company at Niagara Falls, and he afterwards became manager of the Dominion Telegraph Company's office at Ogdensburg, N. Y. He later went to Buffalo as joint manager for the Atlantic and Pacific and Dominion Telegraph Companies, and has been in that city ever since. Prior to the acceptance of his present position, he was manager for the American Union and the American Rapid Telegraph Companies successively.

In his present position Mr. More has proved to be an efficient official. He has suggested that the old-timers stop off at Buffalo and Niagara Falls for a day on their way from New York and other Eastern points to the Detroit convention of the Old-Time Telegraphers and Historical Association and Society of the United States Military Telegraph Corps, August 26, 27 and 28.

The Resignation of Mr. E. J. Nally.

The many friends of Mr. Edward J. Nally will learn, with deep regret, that he has severed his relations with the Postal Telegraph-Cable Company, as announced in another column in this issue. Mr. Nally has been identified with telegraph interests for thirty-eight years. He began his business career as a messenger for the Western Union Telegraph Company at St. Louis, Mo., and his fidelity to the company's interests and quickness of perception soon won the attention of his superiors. These traits of character became more marked as time went on, and the young man's career progressed steadily and rapidly. His executive ability was soon recognized, and he was advanced step by step until he finally reached the highest active position in the service of the Postal Telegraph-Cable Company, that of first vice-president and general manager.

Mr. Nally assumed these important duties April 11, 1907, with headquarters in New York, and filled them with honor to the company and to himself up to the time of his retirement. In addition, he was a director of the company, and was a loyal and able official.

Mr. Nally has a host of friends who will all feel that the telegraph service has, in his retirement, lost a wise and able manager. He has their sincerest and best wishes for success in whatever line of business he may engage in.

ANGLO-AMERICAN EXPOSITION, 1914.—The Philadelphia Commercial Museum has arranged to organize the American Industrial Section of the Anglo-American Exposition to be held in London from May to October, 1914. The time has been selected to celebrate 100 years of peace and progress of the English-speaking people since the Treaty of Ghent in 1814. Mr. W. P. Wilson is director of the Philadelphia Commercial Museum.

MR. W. H. SPAIN, manager of the Western Union Telegraph Company, St. Louis, Mo., writes: "You are mighty good not to stop my paper. I would miss it as I would a meal, and I'm a great feeder."

Western Union Telegraph Company.

EXECUTIVE OFFICES.

MR THEO. N. VAIL, president of the American Telephone and Telegraph Company and of the Western Union Telegraph Company, celebrated his sixty-eighth birthday on July 16. He was born in Carroll County, Ohio, July 16, 1845.

MR. M. C. RORTY, manager joint telephone arrangements, has returned from a business trip to Detroit, Chicago, Omaha and Denver.

MR. A. R. BREWER, on August 1, together with his family, will spend three weeks at his summer cottage at Bristol, N. H.

MR. L. DRESDNER, assistant treasurer of the company, has returned to his office after a brief vacation.

MR. WILLIAM HOLMES, superintendent of the tariff bureau of this company for the past forty-five years, is confined to his home by illness. His friends will be pleased to learn that he is improving rapidly.

MR. J. MCROBIE, general manager American District Telegraph Company, New York, has returned from a ten days' trip to Chicago, Cleveland, Detroit and other Middle West points, in connection with business of the company.

CONFERENCE BETWEEN COMPTROLLER AND AUDITORS.—A conference between Mr. E. Y. Gallaher, comptroller, and the division auditors of the company, was held in the board room, at 195 Broadway, on July 14, 15, 16 and 17, and it was highly successful. Pleasant remarks were made by Mr. Theo. N. Vail, president, and Mr. Newcomb Carlton, vice-president. In the evening of July 17 a dinner was tendered to the visitors at the New York Athletic Club, and this was followed by a theater party at the New Amsterdam. There were fourteen persons in attendance at the conference, which had a tendency to make the accounting department more cohesive. A group photograph of the party was taken. Among those present, besides Mr. Gallaher, were: Messrs. H. W. Ladd, auditor; H. K. Huntington, auditor of disbursements; C. McKay, auditor of receipts; L. Roth, special agent, and division auditors Matthew Quinlan, New York; W. McD. Milne, Chicago; J. J. Hoefman, Atlanta, Ga.; C. A. Rhodes, San Francisco, Cal.; C. W. Carver, Denver, Col., and J. Q. Pipkin, Dallas, Tex.

BOSTON CONFERENCE.—A conference between the district commercial superintendents of the Eastern Division was held July 23 and 24 in the office of Mr. C. F. Ames, district commercial superintendent, Boston. The object was to discuss the interests of the public with a view to adopting new ideas for better and more rapid service, as well as to increase the efficiency of the office forces. Among those present were: Mr. A. G. Saylor, general manager of the Eastern Division, New York, and Messrs. J. A. Hill and Allen Woodle of his staff; district commercial superintendents A. C. Terry, Pittsburgh, Pa.; J. W. Reed, Philadelphia; W. A. Sawyer, New York, and C. W. McKee, St. John, N. B., and district superintendent E. P. Griffith, Jersey City, N. J., together with their chief clerks.

MR. G. R. CALVERT, formerly manager of the Birmingham, Ala., office of the Western Union Telegraph Company, is studying law, which profession he proposes to practice in the future.

MR. C. R. TILGHMAN filled the duties of Mr. F. Kitton, assistant to the plant engineer, during the latter's absence on his visit to Big Moose, N. Y.

MR. E. E. EASTMAN, who has, for the past forty-six years, been connected with the Western Union Telegraph Company at Portland, Me., has retired.

S. G. Smith, Manager Western Union, Youngstown, Ohio.

Mr. Shirley G. Smith, whose appointment as manager for the Western Union Telegraph Company at Youngstown, Ohio, was announced in these columns July 1, was born at Ashland, Ohio, January 22, 1883, and entered the telegraph service in Cleveland, Ohio, September 30, 1901. He has been manager at Kingston, N. Y., Mt. Vernon, N. Y., Williamsport, Pa. and Scranton, Pa., in the order named, and was appointed manager at Youngstown May 17 of this year.

C. H. Mulford, Manager Western Union Telegraph Company, Memphis, Tenn.

Mr. Clare Hilliard Mulford, whose appointment as manager of the Western Union Telegraph Company's office at Memphis, Tenn., was announced in our issue dated July 16, was born in Greenwich, N. J., June 20, 1879. He studied telegraphy while carrying messages in Bridgeton, N. J., and went to Chicago, Ill., September 1, 1896. During his connection with the telegraph, he has filled positions as clerk, manager and inspector, his latest advancement being to the managership of the Memphis office.

Death of Mrs. Belvidere Brooks.

Mrs. Alpha Gerald Brooks, aged 47 years, wife of Mr. Belvidere Brooks, vice-president of this company, died at her home in New York, 7.30 p. m., July 25, having arrived in the morning of the same day from Denver, whither Mr. and Mrs. Brooks and sons had gone to spend a vacation. Mrs. Brooks was stricken in Denver on July 19 and Mr. Brooks brought her home, accompanied by a doctor and trained nurses. She did not rally, however, and the end came Friday night, July 25.

A month ago, Mr. and Mrs. Brooks celebrated the thirtieth anniversary of their wedding, which took place at Waco, Tex. Besides her husband, Mrs. Brooks is survived by four sons: Gerald, Belvidere, jr., Bruce and Joseph W. Mr. Brooks has the deepest sympathy of his many friends in his bereavement. The funeral took place Monday, July 28.

Morse Club Outing.

The summer outing of the Morse Electric Club was held at Donnelly's Boulevard Hotel, College

Point, L. I., N. Y., Saturday, July 26, and was a highly enjoyable affair, about sixty-five persons being in attendance.

It was expected to convey the party to the grounds on the Western Union steamer "Robert C. Clowry," but as the steamer was engaged in cable repair work, she was not available, and another boat was chartered.

Various athletic games were indulged in, winding up with a game of baseball.

The seventy-five-yard dash was won by L. J. Murphy.

The hundred-yard dash was won by T. E. Fleming., jr.; A. M. Fisher, second, and W. C. Merly, third.

The Fat Men's race was won by J. F. Nathan, with T. F. Clark second.

The baseball game between married and single men was called after five innings, the score then being a tie.

The party soon afterwards sat down to dinner, during which musical and vocal selections were rendered, and a thoroughly enjoyable time was had.

A silent toast was proposed by Mr. Conrad Meyer to the memory of Mrs. Belvidere Brooks.

THE CABLE.

The Central and South American Telegraph Company has installed four fiber conduits beneath the street pavement from the office of the company, in Panama, a distance of about a thousand feet. The company's local construction gang has drawn cables through to supplant those suspended on poles in the street. A submarine cable has been laid from the foot of the street across the tidal flats to the landing hut at Punta Mala. Altogether, about fifteen miles of aerial cable are to be removed. Along with this work the company has made the local connections with a new direct cable to Santa Elena, its landing station near Guayaquil, Ecuador.

Enjoyment at Hazel Hill.

The bachelors of the Hazel Hill, N. S., cable station of the Commercial Cable Company gave a dance in the club house on the evening of July 3, and it proved to be a very enjoyable affair. About fifty couples participated.

On July 4 the annual sports for prizes amounting to $150, tendered by Mr. Clarence H. Mackay, president of the company, were held by the Hazel Hill forces, and in the evening a short impromptu dance was given.

Mr. P. McKenna, formerly of the Hazel Hill station, but now superintendent of the Commercial Pacific Cable Company, San Francisco, Cal., together with Mrs. McKenna, were the guests of Mr. and Mrs. Robert Davis at Hazel Hill.

Mr. Oscar Moll Returns to Germany.

Mr. Oscar Moll, general manager of the Deutsche Atlantische Telegraphengesellschaft, with headquarters at Coln, Germany, who has been in the United States for the past month, returned home on July 23, sailing on the steamer "America" from New York.

Mr. Moll is an unusual personage, and he has had a wonderfully long and successful career in submarine cable interests.

Mr. Moll was born in Berlin in 1851. When leaving college, he entered the Foreign Gallery of the London office of the Electric and International Telegraph Company. When these lines were turned over to the Government, Mr. Moll became identified with the Indo-European Telegraph Company, at London. This company has land lines through Persia. When the Shah of Persia visited England, Mr. Moll had a special assignment to Buckingham Palace and witnessed the Shah's reception.

At the beginning of 1874, he was appointed secretary to the Direct United States Cable Company, then in process of organization. He at once became a very important factor in everything pertaining to the development of this enterprise and later succeeded to the general managership of the company. This position he held until he was called to Germany, in 1899, to take charge of the submarine cable expansion from Germany to the United States.

This was Mr. Moll's second visit to the United States. Notwithstanding his long telegraph and telephone service, he is still young and active and there is no sign of winter in his hair.

CANADIAN NOTES.

J. McMillan, General Superintendent Canadian Pacific Railway Company's Telegraphs, Winnipeg, Man.

Mr. John McMillan, whose appointment, on July 1, as general superintendent of the Western lines

J. MCMILLAN, GENERAL SUPERINTENDENT, WINNIPEG, MAN.

of the Canadian Pacific Railway Company's Telegraphs, with headquarters at Winnipeg, Man., was announced in the July 16 issue, is a native of England, having been born in Liverpool, November 2, 1866. In 1883 he accompanied his parents to Canada, and in June of that year became engaged in construction work on early telegraph lines of the Canadian Pacific Railway. He also studied telegraphy. Early in 1885 Mr. McMillan served as a foreman of telegraph construction of the government military telegraph lines, subsequently returning to the maintenance staff in the railway service. In 1888 he was general foreman of construction work and in 1889 again returned to the maintenance staff at Winnipeg. He became an operator at Winnipeg in 1895, and in 1906 was transferred to the Mountain Division as circuit manager, repeater chief and telegraph agent. In 1902 he was appointed inspector of the Central and Western divisions of the Canadian Pacific Railway Telegraphs, with headquarters at Winnipeg. In 1906 he became assistant superintendent of telegraph, and in April, 1907, was appointed superintendent, with headquarters at Calgary, Alta., where he remained until January, 1912, when he was transferred to Winnipeg as superintendent, which position he held at the time of his recent appointment as general superintendent.

Mr. W. J. Camp, assistant manager Canadian Pacific Railway Company's Telegraphs, Montreal, Que., is on a trip of inspection that will take him as far as the Pacific Coast. He is accompanied by Mrs. Camp.

Mr. A. H. Davies, wire chief of the Canadian Pacific Railway Company's Telegraphs, Ottawa, Ont., accompanied by his wife, was a New York visitor on July 17.

THE TELEPHONE.

Mr. George W. Foster, assistant to the vice-president of the Southwestern Telegraph and Telephone Company, Dallas, Tex., is in New York, and is making it the occasion to call on his numerous friends. Mr. Foster began his business career in the telegraph service in the early seventies. He and the publisher of this paper were operators together in 1874 to 1877 at Sandusky and Toledo, Ohio. Mr. Foster was general superintendent of the Postal Telegraph-Cable Company at Dallas, Tex., when he left the telegraph service, in 1893, to engage in the telephone business, with which he has since been identified.

C. L. Meyers, special agent for the Cumberland Telephone and Telegraph Company, with headquarters at New Orleans, La., killed himself at St. Louis, Mo., July 10. The act was due to nervous trouble.

John J. McAlister, age fifty-six, chief test boardman of the American Telephone and Telegraph Company, New York, died at his late residence, Maywood, N. J., July 19. Mr. McAlister began service in 1876 as messenger in the American District Telegraph Company, serving later as office boy and clerk to the then General Superintendent H. W. Pope. He entered the telephone service in March, 1893. During his telegraphic career, Mr. McAlister occupied many positions and was Superintendent of the Bankers' and Merchants' Telegraph Company in the late eighties. He also had charge of the telegraph department of a large New York banking concern before entering the telephone service.

Suit to Dissolve Pacific States Telephone Merger.—On July 24, the United States Government panies for the dissolution of the so-called merger of telephone interests on the Pacific Coast. Violation of the Sherman anti-trust act is the charge made.

To Enjoin Metropolitan Telephone and Telegraph Company.—Suit has been brought in the Court of Chancery, at Trenton, N. J., by the New York Telephone Company for injunction to restrain the Metropolitan Telephone and Telegraph Company from further using its corporate title, alleging that the latter has infringed on the name which rightfully belongs to a corporation merged with the New York Telephone Company.

Spare Pair Society Outing.

The annual outing of the Spare Pair Society of Philadelphia, was held June 21. There was a large attendance of local telephone employes, and representations from the Western Union Telegraph Company, the Western Electric Company and the American Telephone and Telegraph Company were also present. After the games a dinner was served, and then the results of the ballots cast for officers was announced as follows: Leo C. Gainor, president; J. H. Carrol, vice-president; J. D. Ferry, secretary, and W. F. Laudeman, treasurer.

Telephone Pioneers of America.

A meeting of the executive committee of the Telephone Pioneers of America was held at 15 Dey Street, New York, July 24. A report was received from the Plan and Scope Committee, detailing the proposed arrangements for the entertainment at the Chicago meeting, October 16 and 17, and the action of the committee was endorsed. The meeting is to be held at the Congress Hotel, and the business of the association will occupy the entire day of the sixteenth; the business to be transacted in the forenoon and addresses to be made by Messrs. N. C. Kingsbury, vice-president, Thomas A. Watson, Thos. B. Doolittle, and M. J. Carney in the afternoon. In the evening there will be a play given by local talent in a downtown theater, to be attended by members, telephone officials and families.

On the second day there will be automobile rides through the various parks and boulevards, and an inspection of the new telephone building and the shops of the Western Electric Company, and field sports. The usual banquet will be held on Friday evening, October 17, at the Congress Hotel. The committee will invite the presidents, vice-presidents and general managers of all associated companies who are not members of the association.

The applications of twenty-six members were approved by the committee.

The Late R. M. Ferris.

The drowning, while bathing, of R. M. Ferris, chief engineer of the New York Telephone Company at Siasconset Beach, Mass., July 13, which was noted in our previous issue, has cast a gloom over telephone circles that is felt deeply. Deceased had many admiring business and social friends, and his sudden death was a staggering blow to all. The officials of the company keenly feel the loss of an adviser so capable and accurate in judgment as he was.

Deceased was born in Poughkeepsie, N. Y., May 20, 1876, and was, therefore, a little over thirty-seven years of age at the time of his death. He was educated at the Military Academy at Poughkeepsie and at the Massachusetts Institute of Technology, Boston, from which latter institution he was graduated in 1897. He immediately entered the service of the New York and New Jersey Telephone Company and remained with it and its successor, the New York Telephone Company, up to the time of his death. He started as a tester on pole lines, and through merit, worked up to the highest engineering position of the company. He was appointed chief engineer of the New York Telephone Company January 1, 1906, and two years ago his title was extended to cover the associated companies in the Eastern group.

Mr. Ferris lived in Montclair, N. J., and was a member of the American Institute of Electrical Engineers and of the New York Telephone Society. His wife and two children survive him. His family was spending the summer at Siasconset and he was spending the week-end with them when the accident occurred.

A wireless alarm was sent out to steamers at sea to keep on the lookout for the body of the deceased, but up to the present time, the body has not been found.

RADIO TELEGRAPHY.

THE MARCONI WIRELESS TELEGRAPH SCHOOL, E. E. Butcher, engineer of instruction, will be closed from August 3 to August 17. Those desiring to enter the new class should join Monday, August 18.

OBLIGATORY WIRELESS IN ARGENTINA.—It is proposed to make it obligatory for all steamers carrying passengers arriving at or leaving Argentina ports, to be fitted with wireless telegraph equipment.

WIRELESS TELEPHONY.—Experiments have been carried on between Northampton and Letchworth, England, a distance of forty-two miles, with the Grindell-Matthews system of wireless telephony. It is reported that the tests were successful.

WIRELESS COMMUNICATION BETWEEN GERMANY AND AMERICA.—Transatlantic wireless communication on the Goldschmidt system has been established between Hanover, Germany, and Tuckerton, N. J., a distance of 3,600 geographical miles. This communication was effected in the daytime, the transmitting system being 150-kw. capacity.

RADIO EXAMINATIONS.—The United States Civil Service Commission will, on August 20, hold an open competitive examination in various places throughout the United States for radio sub-inspector. From the register of eligibles resulting, certification will be made to fill a vacancy in this position at $6.00 per day, and a vacancy in the position of assistant sub-inspector at $4.00 per day, in the New York Navy Yard; also at other places, as vacancies occur. The examination is for males only, who must be at least 21 years of age. Applications should be made to the United States Civil Service Commission, Washington, D. C.

FIRST CASE OF VIOLATION OF WIRELESS LAW.—The first case of violation under the Federal wireless law was brought before the Federal District Court, New York, July 7. Elman B. Myers, the defendant, is charged with operating, without a Federal license, a wireless apparatus of sufficient power to carry on radio communication beyond the borders of New York State. His counsel interposed a demurrer, contending that the law was unconstitutional, as it interfered with the intrastate rights of the defendant, who was only seeking to telephone to Brooklyn, and if his radio waves went over the State line, he should not be prevented from using them within the State for that reason. After listening to arguments for the Government, Judge Mayer decided that a court of first instance could consider the constitutionality of the statute, and overruled the demurrer. The case will be tried before a jury.

Transatlantic Wireless Communication with Six Kilowatts.

The new telefunken high-frequency alternator invented by Count Arco, and recently used in some transatlantic wireless tests from the Atlantic Communication Company's station, at Sayville, L. I., is comparatively a very small machine, allowing an antenna radiation of less than six kilowatts. Yet with this very low energy complete messages were faultlessly received, word for word, at Nauen, Germany, nearly 4,000 miles away, day after day during the tests. These tests are now being discontinued while more powerful generators are being built.

By such high-frequency alternators generating undamped oscillations, it is a simple matter to use the same wireless equipment both for telegraphing and telephoning, by simply switching over from the telegraph key to the microphone. With the telefunken apparatus it has been possible to telephone from Berlin, Germany, to Vienna, Austria, and also from New York to Washington.

WIRELESS BETWEEN ALASKA AND SIBERIA.—On Sunday night, July 20, the United States Army Signal Corps wireless station at Nome, Alaska, established communication with the Russian station at Anadyr, Siberia. Diplomatic agreement will be necessary, however, before the two stations can co-operate for commercial purposes.

GOVERNMENT STORM WARNINGS BY WIRELESS.—The Agricultural and Navy departments are now sending wireless storm warnings and general weather forecasts to ships at sea. Bulletins are sent out from the navy wireless stations at Radio, Va., and Key West, Fla., a few minutes after 10 o'clock every night.

W. B. Vansize, Former Telegrapher, Now a Successful Patent Attorney.

Mr. William B. Vansize, the well-known patent attorney of New York, like many other successful men, began his business career as a telegraph operator. He was born in Utica, N. Y., and received his education at the same place. He started business as a messenger for the Western Union Telegraph Company in Utica, and, with unusual diligence, soon became an operator. He was chief operator of the Albany, N. Y., office of the Atlantic and Pacific Telegraph Company for several years. He learned shorthand reporting and reported for the Canadian Parliament at Ottawa; for the New York Legislature at Albany, and was in the company of lawyers so much that he was encouraged to study law. While he worked nights in the Albany Western Union office, he pursued his law studies in the daytime in the Albany Law School,

W. B. VAN SIZE, PATENT ATTORNEY, NEW YORK.

and in the offices of Rufus W. Peckham, who was afterwards Justice of the Supreme Court of the United States, being, in due time, admitted to the bar. He then went to New York, and joined the night force at 195 Broadway, a few months later obtaining a position in the office of Clarence Cary, attorney for the Western Union Telegraph Company. He was the first tax attorney the company had; indeed, the position was created by him and still exists.

While in the service of the Western Union Company, Mr. Vansize later made a specialty of patents and patent litigation. He afterwards went with the American Bell Telephone Company, in Boston, and returned to New York with Mr. Theo. N. Vail, when the latter gentleman relinquished active duty with the Bell Company, in 1886. He was employed by Mr. Vail in a long series of litigated cases, involving the Faure and Brush patents on storage batteries, and succeeded in sustaining the Faure patent and the Swan patent.

Mr. Vansize was next employed by the Edison General Electric Company; its successor, the General Electric Company, and by the Sprague Electric Railway Company, to litigate a long line of patents for propelling vehicles on rails, including those of the late Stephen D. Field, Vandepoele, Hunter, Henry, and others. In every case Mr. Vansize was successful.

Mr. Vansize has been under contract with nearly all of the large electric corporations at one time or another, including, besides the interests already mentioned, the Postal Telegraph and Commercial Cable Companies and the Western Electric Company. His practical experience with electrical apparatus and patent litigation has been wide and varied, and all his knowledge is now used for the benefit of his individual clients, who, he says, "do not all die or combine at one time." He has no allegiance to any of these corporations and confines his activities wholly to the interests of individual and corporate clients.

Mr. Vansize, while associated with the late C. H. Sewall, introduced the telephone in Albany County in 1878, and is a member of the Telephone Pioneers of America.

Reunion of Old-Time and Military Telegraphers.

The annual reunion of the Old-Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps will be held at the Hotel Cadillac, Detroit, Mich., August 26, 27 and 28, and from present indications, it will probably be the most successful and largest gathering ever held by the affiliated associations.

A full program of the reunion was published in our issue dated June 16, and from it will be seen that most liberal provision has been made for the entertainment of the members and their families.

The local entertainment committee emphasizes the importance of members securing hotel accommodations in advance of the date of the meeting, as there will likely be a run on the hotels about that time. Members are therefore urged to give this matter immediate attention and thus avoid possible disappointment.

A feature of the reunion will be the attendance of Mr. Thomas A. Edison at the banquet on the night of August 28. This will, no doubt, be the source of great pleasure to the members who will thus have an opportunity to greet the famous old telegrapher, and it will be an equally great pleasure to Mr. Edison to meet the old timers, for he is never so happy as when he is in the company of telegraphers.

Further information regarding the reunion may be obtained of Mr. F. J. Scherrer, secretary for the Old Timers, 30 Church Street, New York, and of Mr. David Homer Bates, secretary for the Society of the United States Military Telegraph Corps, 658 Broadway, New York.

Improved Incandescent Lamp.—The General Electric Co., Schenectady, N. Y., announces the development of a new form of incandescent lamp which consumes a little more than one-half of one watt per candle power. This is a saving of one-half in current, as compared with the present consumption in tungsten lamps. The lamp bulb is filled with nitrogen gas at atmospheric pressure and the filament is of tungsten.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, AUGUST 1, 1913.

Politics, Religion and Business.

A manager of a fairly large city office some time ago informed us that he had got himself and his company into trouble in a very peculiar way. There was a temperance movement in the town and the manager of the telegraph office was asked to lend his name as a vice-president of the movement to further the good of the community. This he did. It so happened that there were some half-a-dozen wholesale liquor establishments in the city, which were fairly good customers of the telegraph company. The manager for the other company took advantage of the opportunity to canvass these customers in his own behalf, with the result that the influence of the six concerns was used with others to divert telegraph patronage from the company first referred to, whose manager had allowed his name to be used in the temperance movement. The manager was not willing to admit that he made a mistake in allowing his name to be used for such a purpose, but one of the liquor concerns wrote to the superintendent, complaining of the action of the manager, with the result that apologies had to be made to save his position.

The manager of a telegraph office is not supposed to take sides with any faction, religion or political party, or in any way express his preferences, because he will necessarily make enemies for his company. He, as a matter of fact, is not the sufferer. It is the interests he represents, and when a man accepts a position as manager of an office, he ought to remember that his opinions, no matter what they may be, should never be publicly expressed. That is one of the qualifications that fit him for his office.

Managers in former years have got themselves and their companies into serious trouble by asserting that they had just as much right to express their opinions publicly, as had any other citizen. The usual result has been that they were promptly relieved of their duties. It makes no difference what the man, as an individual thinks, as manager he must conform to the rules of business ethics. A manager has the public to deal with, and the public mind on any subject is not a unit. Men divide themselves into factions and parties, and to take sides with one is to oppose the other. Men are so constituted that they will oppose their enemies in every way, and it is natural that if a manager shows a preference for either side, the opposing side will use it to his injury. That is human nature.

The efficient manager should be on friendly terms with all parties of whatever kind, and with individuals, in order to keep his company's interests free from any semblance of partiality. The company cannot afford to show any favoritism, as it caters to all alike. It is absolutely impartial in its dealings with the public, and it is upon public confidence and support that it depends for its existence. The manager is the representative of the company in his prescribed district, and he must carry out its laws and rules, and see that they are properly respected. The company may be laid open to serious injury by his neglect or failure to perform the delicate duties of his position.

A manager must protect the interests of his company, no matter what he thinks as an individual, and his success as a manager depends entirely upon his power of discrimination and good judgment at times of public excitement of any nature. The main thing is to avoid participating by word or deed in anything in the nature of a public controversy.

Telegraphers' Mutual Benefit Association to Assume its New Title.

On August 18, the title of the Telegraphers' Mutual Benefit Association will be changed, by order of Judge Goff, of the Supreme Court of New York, to Telegraph and Telephone Life Insurance Association. This order is in accordance with the change in the constitution and by-laws of the Association which was made at the last annual meeting, held in New York March 12. The court having now sanctioned the change, the name of the famous old organization will pass out of existence, and the new one will be substituted.

The new title, all will agree, expresses the broadened activity of the Association more accurately than did the old one, yet there will be many expressions of regret of the discontinuance of the original title, and, no doubt, the Association will be referred to by the old members by the original name for a long time to come. To the newer and future members it will not make so much difference, as sentiment for the old name, through long familiarity and association, will be lacking.

Although the change of title was authorized last March, many persons have wondered why it has taken so long to become effective. Many legal technicalities have to be provided for in making a change of this character, and the machinery of the State does not run at a very high speed. The practical work of making such a change involves the provision of new stationery, forms, etc., and their adoption at a definite time, in order that all transactions shall be legal and binding. So, when the change is actually made, it will become effective at every agency at the same time.

It is scarcely necessary to add that the change of name in no wise affects the present certificates in force, and, apart from sentimental reasons, it is confidently expected that the new name, expressing, as it does, more clearly the objects of the Association, will prove to be a powerful stimulus in impressing the eligible telephone employes that the Association affords to them, as it has hitherto, a splendid means of securely providing protection for their families and dependents at low charges.

Monument to Morse in Buenos Ayres.

It is proposed to erect a suitable monument in Buenos Ayres, Argentine, to Prof. S. F. B. Morse. The *Revista Telegrafica*, of that city, in advocating the proposition, states that the Argentine Republic has made no recognition of the valuable services of Prof. Morse to humanity further than naming a small railroad station in the desert after him.

A new building is being erected in Buenos Ayres for the telegraph and mail services, and it is suggested that a Morse monument be erected therein, or in some other public place, bearing a tablet containing the words of President John Quincy Adams: "Morse has done for his country and for humanity much more than all the politicians of the age."

Electrical Research Laboratory at Boston.

Massachusetts Institute of Technology, Boston, Mass., has established an Electrical Research Laboratory and Bureau, to be devoted to research and engineering investigation. Its official title is Division of Electrical Engineering Research, and an endowment of more than one hundred and ten thousand dollars is assured. The central feature of the endowment is the grant of $10,000 a year for five years from the American Telephone and Telegraph Company, through President Theo. N. Vail.

A year ago the company, through Mr. Vail, gave to the Institute the Dering electrical library of more than thirty thousand titles, valued at more than $100,000. To maintain it, the company has offered the sum of $5,000 a year.

International Electrical Congress at San Francisco in 1915.

Preliminary plans for the International Electrical Congress, which is to be held in San Francisco during the week beginning September 13, 1915, in conjunction with the Panama-Pacific International Exposition, and under the auspices of the American Institute of Electrical Engineers, are being effected by the Committee on Organization.

In the week preceding the Congress there will be a meeting of the International Electrotechnical Commission.

The Congress is being divided into twelve sections. Section VIII will consider telegraph and telephone subjects, including (a) all communication of intelligence by the use of wires, and (b) electromagnetic waves and radio-telegraphy and telephony. Dr. E. B. Rosa, Bureau of Standards, Washington, D. C., is secretary of the Committee on Organization. Dr. Charles P. Steinmetz, of Schenectady, N. Y., is president.

Physiological Effects of Hertzian Waves.

Have Hertzian, or electromagnetic, waves any effect upon the human organism? is a question that is receiving the attention of scientific investigators. The *Elektratechnische Zeitschrift*, of Berlin, states that radio-telegraphers are subject to anæmia—a deficiency in red blood corpuscles and their hæmoglobin contents. This malady is traceable to various causes, notably to the faulty location of, and unhealthy conditions in, some operating rooms—particularly on ships. It is not unlikely that the ozonization of the air round about the high-frequency current apparatus has an injurious effect—this suspicion being confirmed by the headaches, anæmia and bad appetite and digestion of employes in high-tension stations. It remains to be established whether Hertzian waves themselves have any physiological or pathological action. Dr. Thompson has observed the production of subjective light glimmerings when the head is approached to a powerful electromagnet, and Danilewski has observed muscular contraction in a frog placed near a powerful electric generator; the latter investigator has also noticed that, if the muscles of a frog contract under the influence of electric oscillations to which an insulated man serves as conductor, they cease when the experimenter earths his body. Collins claims that a sleeping cat can be awakened by the influence of Hertzian waves, and that the powerful radiations now employed by many wireless stations have an appreciably injurious effect on operators.

Public Utility Commissions.

Public Utilities in Maine.—An election will be held in Maine to vote on the proposition to establish a commission for the regulation of public utilities in that State.

Public Utilities Commission in Illinois.—A bill has been signed by the Governor of Illinois abolishing the State Railroad Commission and establishing in its stead a Public Utilities Commission of five members.

Pennsylvania Public Utilities Commission.—The Pennsylvania Legislature has passed a public utilities measure, providing for a commission of seven members. The commission is given sweeping powers in the making of rates and the regulation of public service corporations.

Massachusetts Public Service Commission.—The supervision of telephone and telegraph lines has been transferred from the Massachusetts Highway Commission to the Public Service Commission, a new body recently created. The commission has authority to initiate investigations as to rates, service and capitalization.

Course of Instruction in the Elements of Technical Telegraphy—XLIV.

(Copyrighted.)

(Continued from page 435, July 16)

[The Course of Instruction in the Elements of Technical Telegraphy, which has been running regularly in this journal since October 16, 1911, has met with wide-spread favor and is being studied diligently by thousands of telegraphers and others throughout the world. It is being translated into Spanish, and printed in South American electrical journals, and has attracted universal attention for its clearness of expression and its practicability. It has been endorsed by the officials of telegraph, telephone, cable and railroad companies, many of whom have acknowledged the improvement in the technical standing of their progressive members, and they commend the Course as being of the most practical kind of instruction.

This course was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, and is being published now for the benefit of those of our readers who desire to fit themselves for higher positions in the engineering branch of telegraphy, and it has been a valuable aid in this direction. It is elementary, and devoid of higher mathematics, yet it is fundamental in character and extremely easy to learn.

Each chapter is complete in itself, and the chapters are arranged in natural order so that the student acquires the knowledge step by step in logical sequence. Each chapter is followed by test questions on the subject of the chapter, thus enabling the student to review his progress from time to time.

Back numbers containing these valuable lessons can be obtained at 10 cents per copy.]

The Phillips' Repeater.

Fig. 52 represents a theoretical arrangement of Phillips' Repeater. Before attempting to describe the functions of the apparatus employed, it may be well to explain fully the nature and application of differentially wound electro-magnets, as two of these instruments are used in this form of repeater.

Take a soft iron core, such as shown at D R^1, and wind a dozen turns of wire round it, as at C^1. Complete the circuit through the local battery D B, and the core becomes magnetized, the polarity of its ends depending upon the direction of winding.

Now take another wire and wind a dozen turns round the core, as at C, but in the opposite direction to the winding of C^1, and connect as shown, imagining the circuit of C to be uninterrupted at the point *y* and not broken as in the figure.

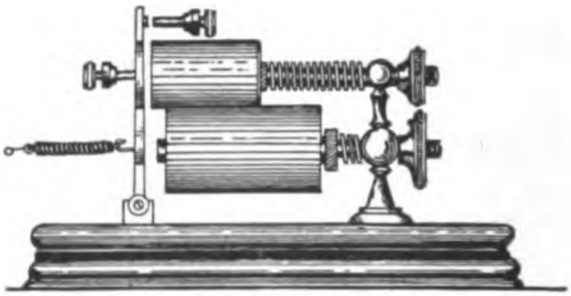
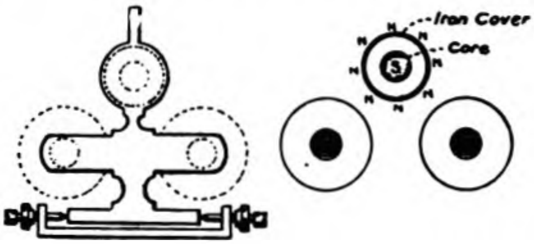


FIG. 53. SIDE VIEW OF RELAY.



FIGS. 54 AND 55. DETAILS OF RELAY MAGNETS.

Assuming that the winding of C^1 tends to produce a South pole at the core end next the armature, then the winding of C being opposite to that of C^1 tends to produce a North pole at the same end, and since there is the same current strength and an equal number of turns in each coil, the magnetizing forces (amperes $\times$ turns)

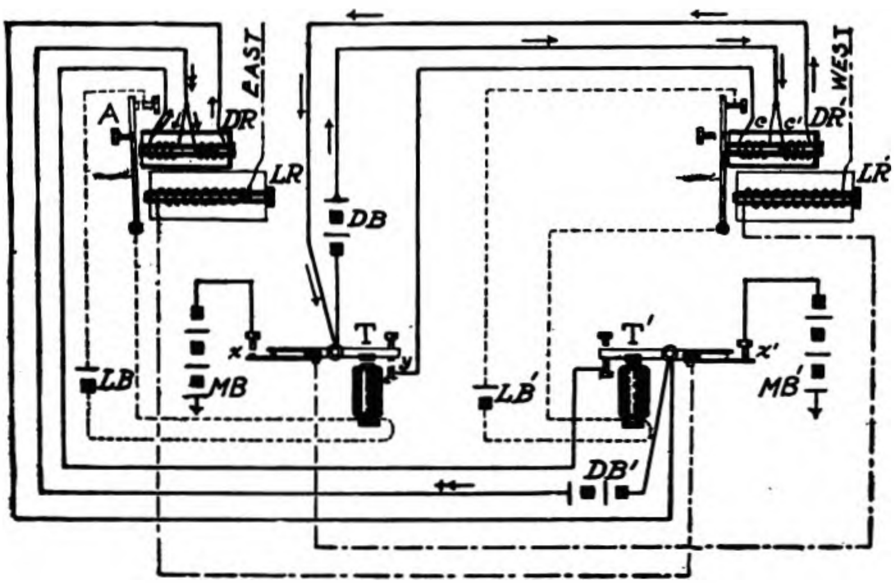


FIG. 52. PHILLIPS' REPEATER—DIAGRAM OF CIRCUITS

developed are equal and opposite and have no magnetic effect on the core. If, however, either C or C^1 be left out of the circuit, the remaining coil will immediately exert a magnetizing force on the core, and the armature will be attracted. When the coils are exerting equal and opposite magnetizing forces, the magnetizing influences are said to be balanced; any excess of current in one coil over the other necessarily upsetting this balance and producing magnetism.

In Fig. 52 the continuous lines represent the connections of the device used for the prevention of false breaks. The dot and dash lines represent the main circuit connections, and the dotted lines the local circuits. The line relays L R and L R^1 have extra differentially wound local magnets D R and D R^1 (Fig. 53), with independent adjustment, but armatures common to both, as shown in Fig. 54. The core of each local magnet at the end remote from the armature, is attached to an iron cylinder which encircles the coil and forms a kind of jacket for it, the object being to increase the magnetic strength of the core by means of the cover which reduces the air space (the permeability of air is unity) through which the lines of force pass, to the small gap shown in Fig. 55.

The action of the repeater is as follows: East opens his key, breaking the circuit of M B^1, and L R becomes demagnetized. D R is also inactive, owing to the current from D B^1 flowing through both coils. Armature A therefore opens, breaking the local circuit of L B, and opening the western wire at the contact spring x of transmitter T.

L R^1 is now demagnetized, but its armature must not open, or there will be a false break at x^1 of transmitter T^1. Here is where D R^1 comes in, however, for the moment the armature of T leaves its lower stop, the coil C of D R^1 is thrown out of circuit, and the remaining coil C^1 now attracts and holds the armature to its front stop. The local circuit of L B^1 is thus left intact, and T^1 does not open when L R^1 is demagnetized. When east closes his key, L R becomes energized, attracting armature A—D R being inactive owing to T^1 being closed—and T, responding, repeats into the western circuit via x and L R^1.

It is to be noted that by means of the contact spring, continuity is restored a little sooner at x than at y, and therefore L R^1 receives its energizing current a trifle in advance of coil C;—a very important point, for if both circuits were restored simultaneously there would be a tendency for the armature of L R^1 to be opened by its retractile spring before the magnetism in that relay attained its working strength.

When west breaks, the armature of L R^1 responds because C and C^1 of D R^1 are both in circuit, and the opening of T^1 breaks the eastern circuit.

The ingenious manner in which the transmitters are kept closed places this repeater ahead of the other forms previously described, but, since the extra local magnets are more or less influenced by line variations, it is questionable whether in bad weather it would maintain its superiority.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What is the effect of imperfect insulation upon a line and upon the battery supplying current to the line?

Why is the line current stronger in wet weather than in dry?

Why is it not stronger in the middle of the line?

How may the actual insulation of a line per mile, or other unit of length, be computed?

What should be the ratio of conductivity to the insulation resistance of a well-insulated line?

When there is an abnormal escape on a line near one end, at what end should extra battery be added in order to work over the fault?

Why is it that a battery is supplied at both ends of a line instead of one battery at one place?

What is a weather cross?

What is a "cross-fire"?

When "cross-fire" exists between different wires running on the same line of poles can the operation of one wire be improved by increasing the battery?

What would be the effect on adjacent wires of increasing the battery under such circumstances?

Why does "cross-fire" manifest itself soon after a sudden shower?

How may "cross-fire" be overcome?

At what parts of circuits are the results of defective insulation and "cross-fire" more detrimental, and why is the trouble more pronounced in large towns and cities?

What is the average resistance in wet weather of the pin-and-glass insulator, the cross-arm and the pole, as shown in the test given on page 133 of Pope's book on "The Electric Telegraph."

Does cleaning the surface of glass insulators improve the insulating power of the insulator?

(To be Continued.)

SPANISH TELEGRAPHS.—Statistics recently published by the Spanish telegraph authorities in Madrid show the total length of the telegraph lines in the country in 1911 to have been 27,298 miles, and the length of the wires 57,233 miles. There were eighty-seven permanent stations, 341 stations for day service only, and 1,474 stations for occasional service. The total receipts from domestic telegrams are given as $1,474,713, and from international telegrams $627,189. The total number of apparatus in use was 1,884, of which 1,440 were Morse, 249 Hughes, and 195 of other systems.

New Penzance Cable Office.

The accompanying illustration shows the new cable office of the Western Union Telegraph Company at Penzance, England.

The architecture, it will be seen, has a distinct English tone, and is in keeping with the general style of architecture in the vicinity. The building is of stone and fireproof, and is thoroughly up to date, the equipment being of the latest design.

Two cables to Canso, N. S., and one to Bay Robert, N. F., are operated from this building, and London is reached by means of underground cables. A large storage-battery plant has been installed to insure uninterrupted service at all times.

The distance between London and Penzance is about 275 miles.

VIEW OF WESTERN UNION CABLE STATION AT PENZANCE, ENGLAND.

Experiments on the Polarization of a Simple Battery Cell.

Place enough mercury in a jar to cover the bottom, and hang near the top of the jar a piece of zinc. Fill up the jar with a nearly saturated solution of salt water, and place the exposed end of an insulated wire in the mercury, the upper end forming the positive pole of the battery. If now the circuit is closed through a common telegraph sounder, of a few ohms resistance, the armature will at first be drawn down strongly; but, in the course of a few minutes, the time depending upon the total resistance of the circuit, the armature will be released by the magnet, and will be drawn up by the retractile spring. Polarization in the battery has then proceeded so far that the current is insufficient to operate the instrument.

Next take a small piece of mercuric chloride ($Hg\ Cl_2$), about the size of the head of a pin, and drop it in on the surface of the mercury. It will set up a spinning movement along the mercurial surface, and the sounder armature will at once be drawn down, indicating that the current has recovered its initial value. The mercuric chloride furnishes chlorine for the removal of the hydrogen, and so reduces the polarization. In a few minutes the chlorine will be exhausted and polarization will again set in. The introduction of a little mercuric chloride will again restore the cell to activity.

MR. J. L. LANEY, of the Western Union Telegraph Company, Dallas, Tex., writes: "Your publication is growing in favor rapidly in our great Southwestern country. It is so instructive that every beginner can gain valuable knowledge from its columns. The May 16 issue is the best which I have ever seen, and I have been a constant reader since the paper was first issued."

The Western Union Improved Quadruplex.

(Concluded from page 450, July 16)

This arises from the fact that currents of opposite polarity in passing through the fault, produce different electrolytic effects upon the conductor at that point; a positive current tending to oxidize and seal up the fault, while a negative current deoxidizes and further develops the fault. Hence the balancing of a circuit in which such a fault has appeared will be rendered more difficult by the changeable character of the resistance of the fault under the current reversals; a balance obtained with one polarity of current to line being immediately destroyed by the current of opposite polarity.

At each disturbance of the balance, the meter needle will first be suddenly deflected to one side or other of its previously assumed position (according to the current polarity), and then gradually move in that direction until it reaches some other point, where the needle will remain in a more or less stationary position. Symptoms of this character will indicate the particular nature of the trouble, to which the attention of the wire chief should immediately be directed.

THE NEUTRAL RELAY. In adjusting this instrument, its armature should not be brought too close to the main magnet cores. A sufficient air-gap should be maintained to prevent the armature from sticking or showing sluggishness of movement. It is far better to minimize the tendency to such faulty operation by increasing the air-gap and suitably reducing the tension of the retractile spring, than by using a small fixed minimum air-gap and making all adjustments by means of the retractile spring. The tension of the spring, however, should always be sufficient to pull the armature smartly against its back stop, whenever the magnetism excited by the "long end" of the distant battery or generator is reduced to the value corresponding to the "short end," the wider separation between the cores and armature will also lessen the amount of disturbance produced by the outgoing currents upon the home relays as a result of imperfect balances, and tend as well to counteract the effects of earth currents, voltage inequalities, or other irregularities which make an incoming current of one polarity greater or less than that of the opposite polarity.

The holding magnet of the neutral relay, shown at H in Fig. 1, should first be adjusted as close as possible to the relay armature without actually touching it. The attendant or operator at the distant station should then be instructed to close his No. 2 key, and dot with his No. 1 key. This will cause the distant transmitter to send reversals to line, each reversal consisting of a marking or heavy current, rapidly followed by a reverse or spacing current through the operation of the pole-changer at that end. While this is being done the neutral relay is, of course, exposed to the maximum "breaking-up" effect, and the holding condenser HC should be plugged up until just enough capacity has been inserted to keep the relay armature steady on its front stop during the reversals. One to two microfarads will usually be sufficient for the purpose.

THE REPEATING SOUNDER. This instrument is an additional safeguard against possible mutilation of incoming marking signals on the No. 2 side of the quadruplex, due to the operation of the distant pole-changer. The magnet coils of the repeating sounder are connected in a local circuit with the armature and back contact of the neutral relay; the local circuit containing the operator's reading sounder is controlled by the armature lever and back (i. e., upper) contact of the repeating sounder. When the neutral relay armature is on its front stop, the repeating sounder is not energized, and its armature lever being banked against the upper contact by the tension of a spring, keeps the circuit of the reading sounder closed. Any momentary unsteadiness of the neutral relay armature on its front contact, therefore, would not be communicated to the reading sounder, because the repeating sounder is operated only when the neutral relay armature actually reaches its back contact, as it does in response to a spacing signal from the distant transmitter. Under favorable conditions, it is possible to dispense with the repeating sounder, and connect the local circuit containing the reading sounder to the front contact of the neutral relay; and the insulated and contact stop-screws are made interchangeable, with this possibility in view.

As in the case of the neutral relay, the armature of the repeating sounder should be far enough removed from the magnet cores to eliminate any tendency to slow action, but not to unduly diminish the attractive force exerted upon the armature; and the retractile spring of the latter should be adjusted to suit these conditions. In this way the rapidity of action so highly essential in this instrument can be best attained, care also being taken to give the local or repeating contact points themselves as close an adjustment as may be required.

THE LINE RESISTANCE BOX. This box, shown in Fig. 5, contains two separate and independent sets of graduated resistance coils, each aggregating 1,250 ohms, and so arranged that resistances in equal amounts can be simultaneously inserted or cut out of both the main and artificial lines by one and the same movement of the double lever with which the box is provided. The primary object of the line resistance is to afford a means for increasing the electrical length of short quadruplex circuits, in order that the latter may be successfully operated on potentials ordinarily used in connection with comparatively long circuits. It may also be employed to advantage in reducing the strength of earth currents on lines, between the terminal ground plates of which potential differences exist that would be detrimental to the working—particularly of short quadruplex circuits.

The use of this resistance may occasionally be desirable on the longer circuits under such changeable weather conditions as might seriously affect the working by distributing the line balances. The insertion of the line resistance under these circumstances, would have the effect of removing the main-line

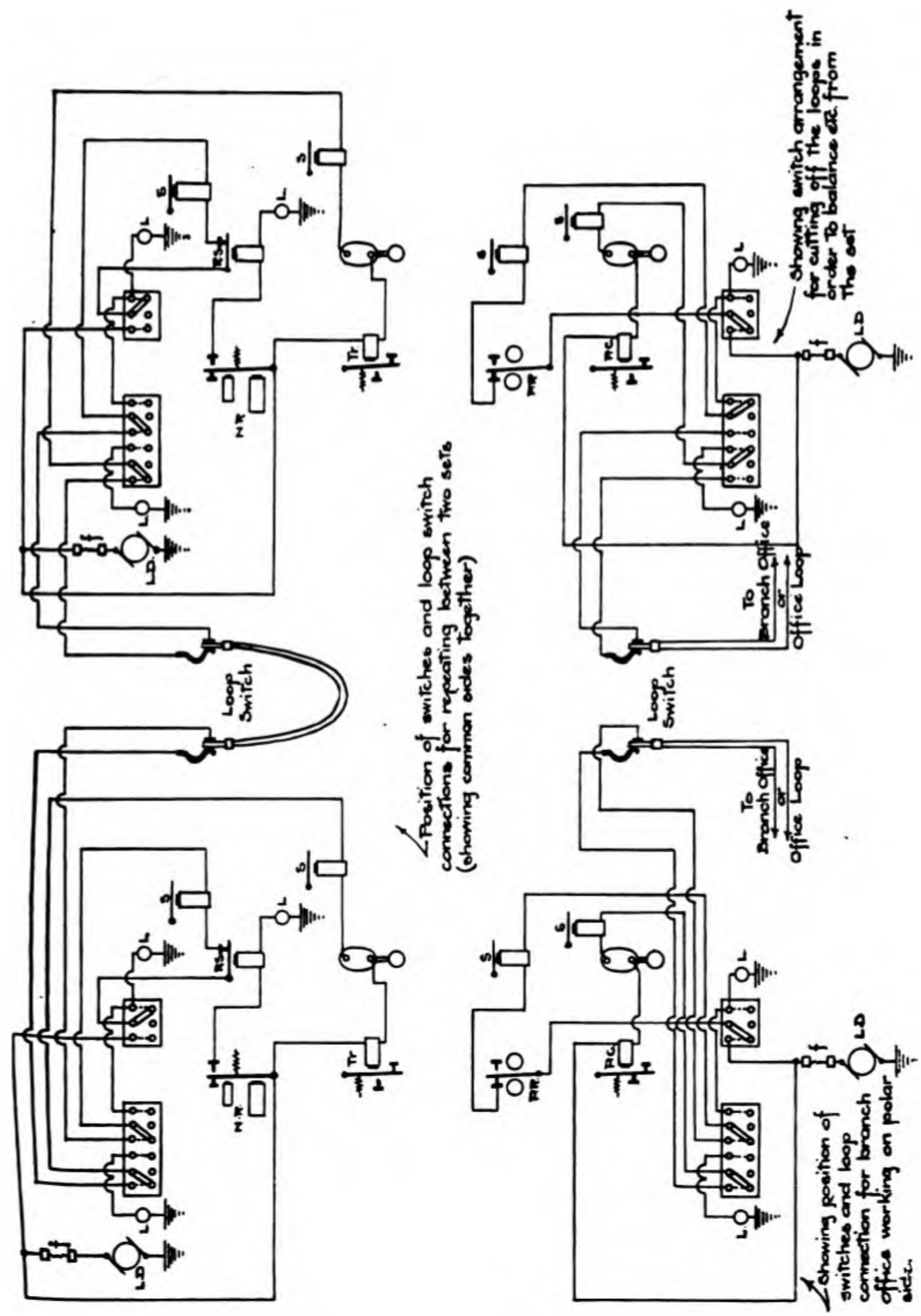


FIG. 4—ARRANGEMENT OF SWITCHES AND LOCAL CONNECTIONS FOR REPEATER AND TERMINAL SERVICE.

wire from the immediate vicinity of the home apparatus, which would then be less susceptible to the alterations in magnetism brought about by leakage variations. Whenever a change of this character has been made in the line resistance, the distant office should be apprised of the fact in order that any rearrangement of the balance rendered necessary thereby may be suitably effected at that office.

THE QUADRUPLEX REPEATER. The local circuits are so arranged that any two quadruplex sets may be connected together to form a repeater. The upper portion of Fig. 4 illustrates a case where the common or No. 2 sides of two sets are so connected for through repetition. It will be seen that this is accomplished by throwing to the right the 3-point local-repeating switch on each set, and joining together the jacks of the two sets at the loop switchboard, by means of a reversed patching cord. This connects the repeating sounder contacts of each set with the same local circuit as the transmitter magnet coils of the other set. As each repeating sounder is controlled by its own neutral relay, the incoming signals operating the latter are repeated into the circuit on the opposite side of the repeater. It is obvious that a similar arrangement may also be applied to the polar or No. 1 sides of the two sets, thus making a full quadruplex repeater; or a polar side may repeat into a common side, leaving the remaining common and polar sides available for repeating together or into other circuits, or for terminal traffic.

USE OF QUADRUPLEX SETS FOR DUPLEX WORKING. When extremely bad weather or other conditions render quadruplex working impossible, a circuit equipped with quadruplex sets may be operated as a polar duplex by closing the transmitter at each station. To avoid overheating of apparatus by excessive current, a sufficient amount of resistance should be inserted, by means of the line resistance boxes, to reduce the reading of each mil-ammeter to about ten milliamperes. If the leakage along the line is quite evenly distributed, the extra resistance should be equally divided between the two offices; but when the insulation of the line is low at one end and almost normal at the other end, the larger portion of the extra resistance should be inserted at the office nearest to the leakage.

BALANCING THE QUADRUPLEX. Successful quadruplex working depends largely upon skilful balancing, that is, upon the degree of accuracy with which the artificial line is made to resemble, in its electrical qualities, the main line and its connections to ground through the distant set. Formerly it was the practice, when "taking a balance" to have the apparatus at the distant station temporarily connected to ground instead of to a generator or battery. This was unsatisfactory, owing to the varying earth potentials which exist in different localities, and because much time was wasted in waiting for an attendant to reach the distant set and throw the grounding switch. The introduction of the mil-ammeter has greatly simplified balancing, which is now done with the distant battery or generator in circuit, as follows:

To take a resistance balance, i. e., to make the resistance of the artificial line equal to that of the main line and distant set:

FIRST. Ask the distant station to close both keys. This will cause the mil-ammeter at the home station to deflect to the left, or in what may be called a marking direction.

SECOND. Note the number of degrees obtained on the needle, first with your No. 1 key open, and then with it closed—the deflection in each case being taken after the needle has come to rest.

THIRD. While the key is in the closed position, adjust the balancing resistance until the needle reaches a point midway on the scale between the two readings above-noted. This point will represent the deflection required to secure the ohmic or resistance balance. If, for instance, the needle stands at 28° with the key open, and at 24° with the key closed, then the adjustment should be such as to bring the needle to a position corresponding as nearly as possible with the mean of these two readings, viz.: 26°.

FOURTH. It will be found that when the resistance in the artificial line is greater than that in the main line, the needle will swing somewhat deliberately in an upward, or spacing direction, upon closing the key. On the other hand, the swing of the needle will be in the downward, or marking direction, whenever the resistance in the artificial line is less than that in the main-line circuit.

A static balance should now be taken by giving the artificial line an electro-static capacity equivalent to that of the main line. Until this condition has been attained the mil-ammeter needle at the balancing station will give a sudden throw or "kick" in one direction just at the precise moment that its No. 1 key is depressed, and in the opposite direction at the moment the key is released; the needle instantly returning to its normal or steady position in the intervals following each movement of the key. To avoid confusion during these balancing operations it will be well to disregard the effects produced upon the needle at the opening of the key, and take note only of those observed at the closing thereof.

If, then, upon closing the key, the needle swings, or kicks in a spacing or upward direction, and then rapidly returns to its former fixed position, it will be an indication that the capacity of the condensers in the artificial or compensating circuit is not great enough, and the capacity should accordingly be increased.

If, on the other hand, the throw of the needle is in the downward or marking direction at the instant of depressing the key, the condenser capacity should be lessened.

The amplitude of the swing or kick in each case, will show the extent or amount of the static unbalance, the latter depending upon the difference between the strength of that portion of the current which suddenly rushes into, and charges any main line possessing electro-static capacity, and the strength of the current rushing into the artificial line to satisfy the "capacity" requirements of the

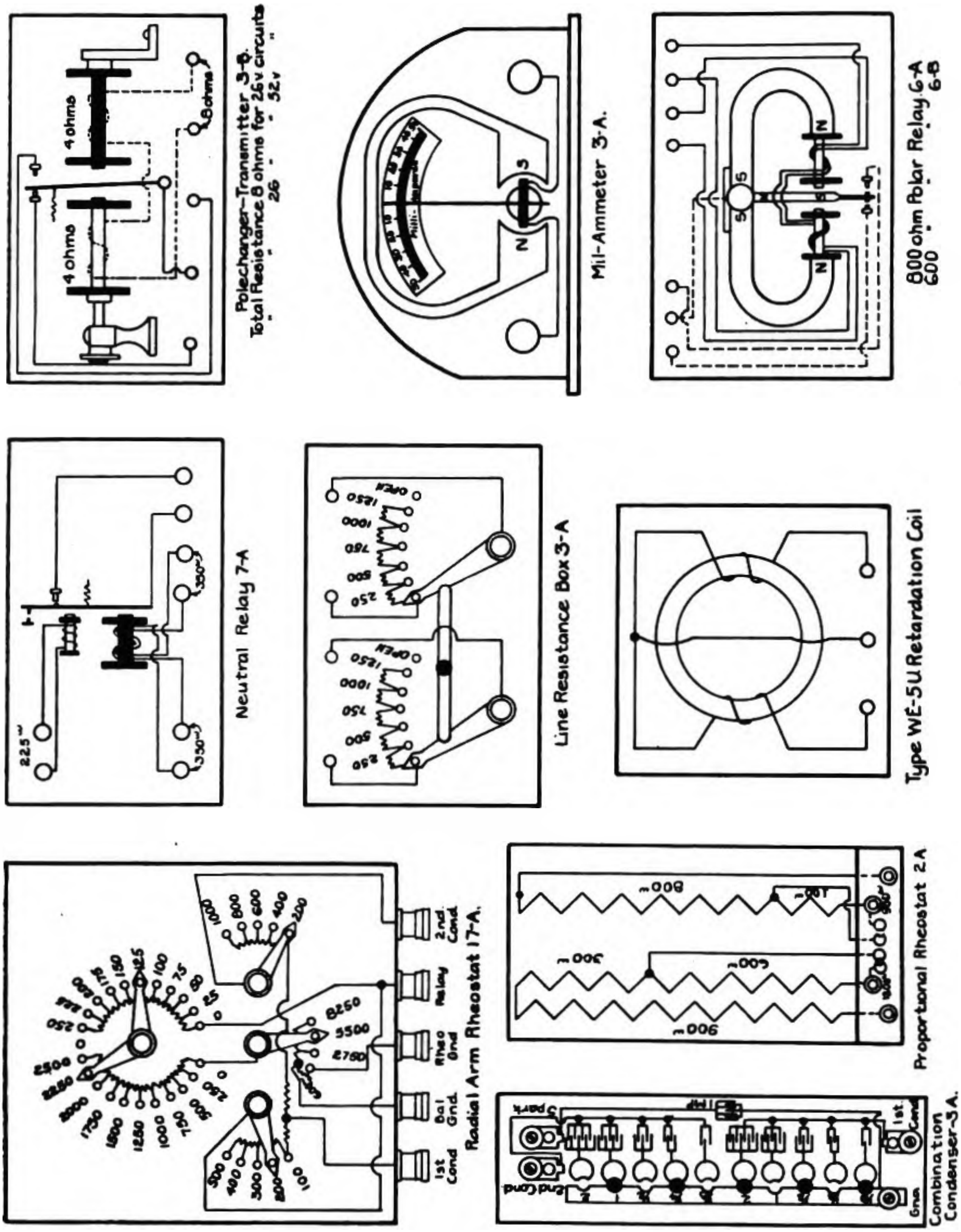


FIG. 5—QUADRUPLEX APPARATUS.

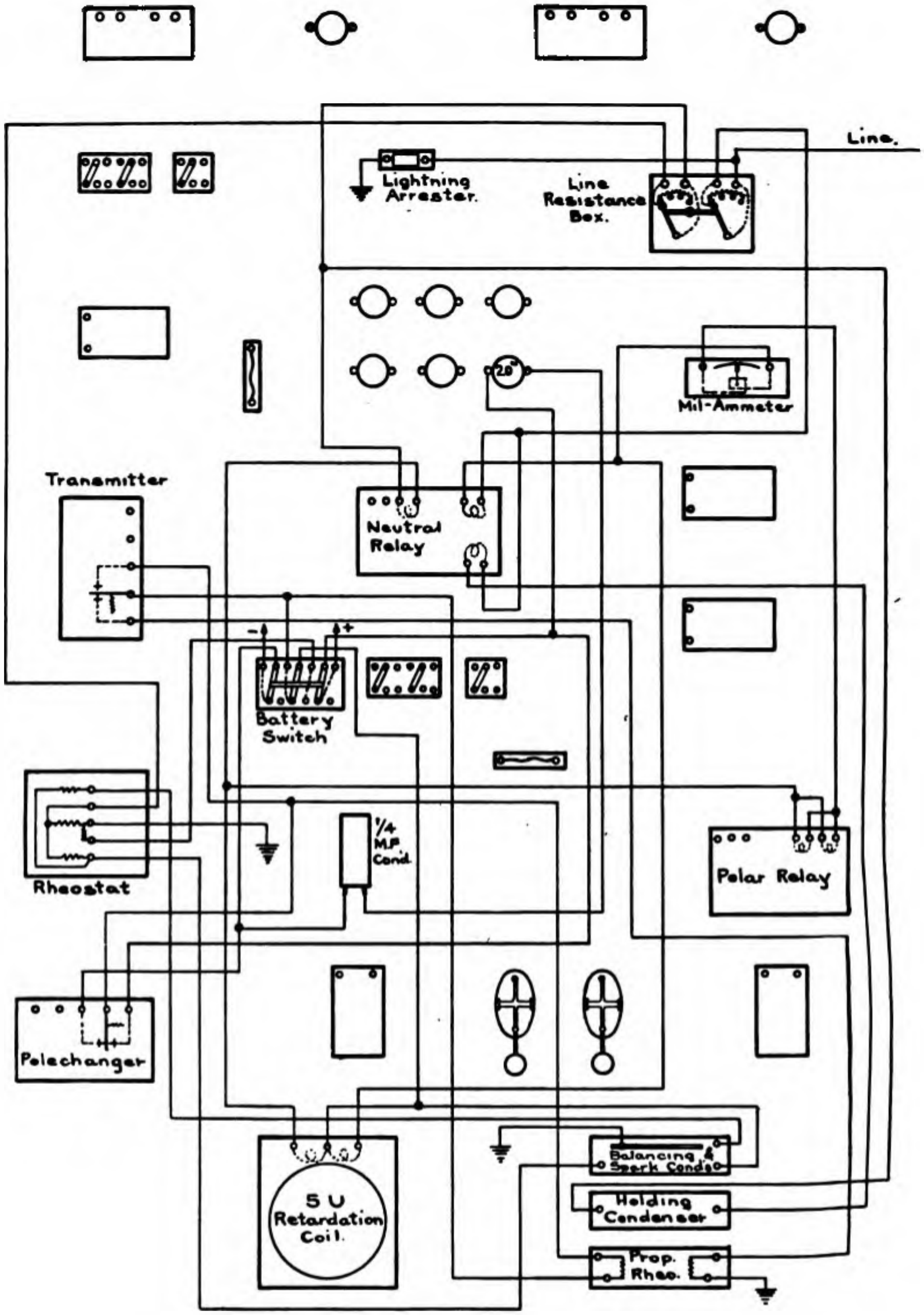


FIG. 6—WIRING OF MAIN-LINE CIRCUITS.

condensers which form part of the compensation circuit.

A retardation balance must also be secured, i. e., the "retarding" resistance in series with each of the two adjustable condensers in the artificial line must be given such a value that the time occupied in charging and discharging these condensers will closely approximate the period required to charge and discharge the distributed capacity along the main line. If the differences between the speeds of charging or discharging the main and artificial lines are very pronounced, the mil-ammeter needle will give a peculiarly characteristic double kick each time the key is opened or closed, this "kick" being readily distinguishable from that due to the ordinary static unbalance, in having a decidedly more jerky and lively motion during its exceedingly brief period of existence. It may, however, be somewhat difficult to differentiate between the two, on account of the constant vibration, to which the milli-ammeter needle is ordinarily subjected by induction from neighboring wires, the effects of such interference rendering accurate readings and close observations a matter of considerable difficulty. Under such circumstances, it may be well to make the final compensating adjustments by rapidly dotting on the No. 1 key, and at the same time making such alterations of the capacity—and particularly of the timing or retardation resistances—as will cause the needle to show the least amount of disturbance as a result of the changes thus made.

Approximate Balances. A perfect balance cannot be secured until the mil-ammeter needle shall have ceased to be influenced by the operation of the home keys, the steady condition of the needle denoting that the current through the polar relay is unchanged and unaffected by alterations in direction or strength of the outgoing current In other words, the difference of potential between the opposite ends of the bridge then remains the same both in quantity and sign, for all working conditions of the home transmitting appliances, and depends entirely upon the state of the transmitting appliances at the distant station. Fortunately, good quadruplex service does not, generally, require an absolutely perfect balance. It is usually only necessary to obtain a good working balance, that is to say, one in which the clearness and legibility of the incoming signals are practically unaffected by the outgoing currents. It should not be necessary in most cases to call in the aid, and await the appearance of any traffic or repeater chief at a distant station for the purpose of restoring a balance. This can usually be effected by making suitable "snapshot" re-adjustments calculated to meet the practical working requirements, without involving a stoppage of the circuit, or the delay incident to securing the attendance of the particular chief concerned at either the repeater or terminal office.

The Local Signaling System. This is arranged to enable an operator working either the No. 1 or No. 2 side of a quadruplex circuit to promptly call an attendant to the quadruplex set, in case of apparatus or line trouble, need of rebalancing, etc. For this purpose, each sending side of the local circuit is equipped with a low resistance signal relay and a two candle power lamp at the quadruplex sets, operated by a push-button at the operating table.

Siemens' Photophone.

BY SAMUEL WEIN, NEW YORK.

It is an old-established fact that if a telephone transmitter be connected in series with an arc lamp, the volume and intensity of the light varies in proportion to the amplitude of sounds uttered against the transmitter, and that these variations would affect a selenium cell in the well-known manner.

We know that it is possible to send a light many miles in a straight line by proper concentration with a parabolic mirror; hence arose the idea that it would be possible to establish by these means telephonic communication from one point to another without the need of any conducting wires between the transmitter and the receiver.

Although the idea is not new, it, however, has been taken up by Siemens Brothers, of Germany, who have introduced improvements by which the arrangement is made more sensitive. Their system

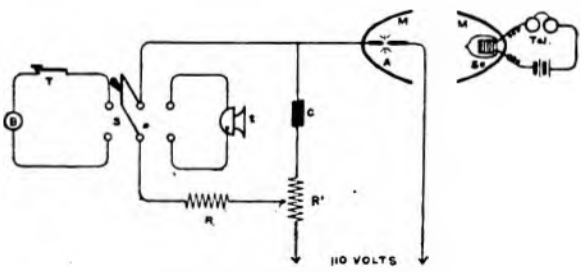


DIAGRAM OF THE SIEMENS' PHOTOPHONE CIRCUITS.

is diagrammatically shown herewith. The arc lamp A is placed at the focus of a parabolic mirror M; B is a mercury jet or other interrupter, and T is a telegraph key; A chocking coil C is connected in the main circuit to prevent short-circuiting. The regulating resistance R is connected in the circuit of the interrupter, and R_1 is a resistance in series with the arc lamp. The object of the two resistances is to enable the degree of sensitiveness to be regulated and for adapting the arrangement to every variable condition.

By the aid of switch S, the telephone transmitter t or the telegraph key T can be placed in circuit at will.

The receiving station is shown at the right of the diagram. A selenium cell Se is placed in the focus of the parabolic mirror M, and connected in series with a high-resistance telephone receiver and a battery.

By alternately opening and closing the telegraph key, the Morse signals, or any other code, can be transmitted, or the telephone may be used, according to which way the switch S is thrown.

The Weston Milli-Ammeter.

The Weston milli-ammeter, which is in general use by wire chiefs and others in the maintenance of telegraph circuits, consists essentially of a light rectangular coil of copper wire, usually wound upon an aluminum frame, pivoted in jeweled bearings, and mounted to rotate in an annular space between the soft iron core and the specially formed pole pieces of a permanent magnet. (See Fig. 2.) A light tubular pointer is rigidly attached to the coil and moves over a calibrated scale.

The movement of the coil is due to the dynamic action between the current flowing through the coil and the magnetic field of the permanent magnet. When a magnet, supported or suspended in such a manner that it may rotate freely, is brought near a conductor carrying a current, it will show the effect of some force acting upon it by tending to assume a position at right angles to the conductor. In such a case, the force exerted by the conductor tends to produce motion in the magnet, but the magnet also exerts a force on the conductor, and the latter will tend to move in a definite direction and with a certain force depending upon the strength of the current and upon the direction and density of the lines of force of the magnet. Part of the conductor in the milli-ammeter being in the form of a movable coil, its tendency will be to rotate upon its axes and place itself at right angles to the lines of force. The coil attains a position of equilibrium and the pointer becomes stationary when the torque caused by the tendency of the coil to rotate is equal to the opposing torque of the spring. Since the magnetic field is uniform and the torsion of the springs proportional to the deflection, the scale divisions are practically uniform.

The aperiodic or "dead-beat" quality is produced in this instrument by foucault currents generated in the aluminum frame when rotating through the magnetic field. These foucault currents have a sufficient influence on the movable system to cause it to come to rest almost instantly at any part of the scale when current is passed through the coil, and they also serve to retard its motion when the circuit is broken, and the pointer is returning to zero.

This dead-beat quality materially enhances the value of the instrument for quick measurements.

In order to show the value of the current in a circuit, the resistance of the instrument must be so small that it will not materially add to the resistance of the circuit when included in it, since any increase of resistance will diminish the current strength.

The total resistance of the instrument is exceedingly low. This result is obtained by connecting a resistor in multiple with the movement so that only a small part of the current flows through the latter. This resistor, which is a fixed part of the milli-ammeter, is called a shunt, and is made of a special alloy having a negligible temperature co-efficient. A movement or coil connected with any resistor in the manner described, is said to be shunted, any branch of a divided circuit being a shunt when taken separately, since it shunts or diverts part of the current from the other branch or branches.

A milli-ampere meter having a range of fifty

FIG. 1—COIL AND POINTER OF MILLI-AMMETER.

FIG. 2—MILLI-AMMETER DETACHED FROM CASE.

milli-amperes has a resistance of less than 0.4 ohms. If such an instrument is cut into any telegraph circuit it is obvious that its own resistance may be ignored when making any tests.

The milli-ammeter, when inserted in a circuit, shows by the deflection of its needle the current value in milli-amperes. The ampere unit is equal to the current generated through a resistance of one ohm by one volt pressure, but the current in telegraph circuits is so low that, for testing purposes, the milli-ammeter has been generally adopted in preference to the larger unit, since by its use the value of the current is obtained in whole numbers instead of fractional parts of an ampere.

Electrical Potential.

In an article on "Electrical Field Distribution," by Prof. W. S. Franklin, of Lehigh University, Bethlehem, Pa., printed in the *Journal of the Franklin Institute*, the author has something original to say regarding the use, or rather misuse of the word "potential."

His communication is in answer to inquiries from several of his former students as to where they could look up the electrostatic theory that would enable them to fully understand a paper read before the American Institute of Electrical Engineers on "Insulation Problems," by Mr. C. Fortescue.

Prof. Franklin's discussion is mathematical and does not admit of condensation. In concluding the communication, he says:

"One reason why Mr. Fortescue's paper is difficult to read and understand is that he follows the common practise in making almost exclusive use of the idea of *potential*, whereas the ideas of *field strength* and *lines of force* are more distinctly physical, and, therefore, more clearly intelligible in verbal discussions. The idea of potential is useful only when one is ready to proceed to the actual mathematical formulation of a problem. * * *

"The electrical potential at a point is the 'height' at that point of an imagined 'hill' whose 'slope' is everywhere equal to the electric field intensity.

"Some electric field distributions can be looked upon as *slopes* or *gradients*, and such electric field distributions have potential.

"Some electric field distributions cannot be looked upon as *slopes* or *gradients*, and such electric field distributions do not have potential.

"It is of the utmost importance, especially in discussions leading up to mathematical formulations, to use ideas which have direct connection with physical conditions and things. * * * * *

"And we believe with Heaviside that even the correct use of the word potential tends to turn one's attention away from physical things. Every one, and especially those whose ideas are mere thought-habits, will admit the fictitious character of the *velocity potential of a fluid*, namely the 'height' at a point of an imagined 'hill' whose 'slope' is everywhere equal to the fluid velocity; but with electrical potential it is different! The word potential (we say the word because very few indeed use the idea) has become an obsession. The magic word energy appears in one of the legitimate definitions of potential, and that settles the matter! Energy, 'the only real thing in the universe,' as one teacher exclaims! Let us cease talking energy and talk sense, and, above all, let us keep clear of such blunders as to say, 'Electric potential may be defined as the condition at a point in space which determines the direction in which an electrified body placed at that point would tend to move.' One might as well say that the height of a hill at a place is the condition which determines the direction in which water will flow at that place. The fact is that 99 per cent of those who use the word potential do not think of potential at all; they think of a vague-composite-of-field - intensity-and-energy-and-other-things-too-indefinite-to-specify. The generalized ideas of *height* and *slope* have never entered their heads. They do not know that potential is related to electric field as a slope is related to height of a hill; and they do not know that *the idea of potential is helpful only when one is concerned very particularly with the mode of distribution of an electric field in space.*"

Earth Currents.

Editor TELEGRAPH AND TELEPHONE AGE:

SIR:—I have read, with much interest, the communication in your issue of July 1, signed "D. B. Grandy," on the subject of earth currents.

Increased efficiency in methods of bonding has eliminated the earth currents about fifty per cent in the past five years. The electric railways are almost entirely responsible for this interference.

In 1908, we picked up from fifteen to twenty volts invariably during the day, from Springfield, Ill., and five to ten volts from Chicago, but after midnight, when few cars were running, there would be no difference in potential, except possibly a few milli-volts.

These earth currents always flowed toward St. Louis, because the electric railway area is small compared to that of Chicago. In fact, there are very few electric railways and power houses in Missouri, compared with Illinois, giving St. Louis an almost perfect ground.

E. A. MCKNIGHT.

St. Louis, Mo.

MR. EVERARD STARR, over 71 years of age, is a messenger for the Postal Telegraph-Cable Company in Philadelphia. His living expenses are kept within $3.50 per week, and his surplus earnings go toward paying a balance due on a chicken farm.

MR. A. R. LUCAS, chief operator, Western Union Telegraph Company, Charleston, S. C., writes: "I thank you for renewing my subscription for the AGE. I herewith enclose check for the amount and would not have my subscription lapse under any circumstances. I look forward to the paper's arrival and take much pleasure in reading it through before filing it away for future reference."

Traveling Belts for Message Distribution.

One of the latest developments in the equipment of a large modern telegraph office is the belt conveyor for the collection of telegrams from the receiving tables and their conveyance to the distributing clerks.

The most recent example of such a method of distribution is that provided in the new Omaha office of the Western Union Telegraph Company, which was described and illustrated in our issue dated June 1.

The main belt, which receives the messages from the operating-table belts, and conveys them to the distributing table, runs in a floor duct fifteen and one-half inches wide by seven inches high. The duct is built in sections of different lengths, and is covered with a metal cover with glass windows in it to permit the inspection of the interior. An eleven-inch cotton belt is used. Where the belt runs vertically in order to reach the distributing table, an ingenious arrangement is provided to carry the messages up with it. It consists of an auxiliary belt which moves in the same direction as does the main belt, and at exactly the same speed, the surfaces of the two belts coming together throughout the length of the auxiliary belt. This latter belt is of a length equal to the distance from the point where the main belt begins to turn to rise vertically to the point where it resumes its horizontal motion. It is evident, therefore, that the message blanks, as they lie on the surface of the moving main horizontal belt, are caught between the auxiliary and main belts, where the two come together, and are carried in a vertical direction to the next level.

The table belts run horizontally the length of the operating table, and are also eleven inches wide. The messages deposited upon them by the receiving operators are carried to the end of the table, where they fall into a chute, and are deposited upon the main belt, which carries them to the distributing table. The table belts run over a series of rollers, and are driven by a small electric motor. All of the belts travel at a speed of from five to ten feet per second. The ducts of the table belts are placed on top of the tables, the belt face being about seventeen inches above the surface of the table. The equipment was manufactured and installed by the Stresau Engineering Company, Brooklyn, N. Y.

When the Omaha office belt equipment was first put into operation some difficulty was experienced by the accumulation of static electricity thereon, which interfered more or less with the proper handling of the messages. This trouble, however, was overcome by keeping the belt constantly moist by the slow dripping of water upon it.

This belt system has proved so satisfactory that its use will no doubt be applied to all future large telegraph installations.

Elementary Telegraphy.

An excellent little volume on elementary telegraphy is that of H. W. Pendry, of the Central Telegraph office, London, England. The fundamental principles of electricity and their application to telegraphy are clearly explained, and, after the student has thoroughly mastered the contents of the book, he knows a great deal about the principles which are, afterwards, of easy application to practical work.

There are chapters on batteries, instruments, telegraph lines and telegraph systems, and, although the English practice is described, the principles are the same for all systems, whether American, English, French, or German. Principles are the important things to know.

The mathematics used are of the simplest kind, yet they are of the highest importance and value to the student, as they show how to arrive at results.

The price of this book is $1.50 per copy, and copies can be obtained of Telegraph and Telephone Age, 253 Broadway, New York.

NEW BOOK.

Telephone Instruments; Their Operations, Arrangement and Management, by W. H. Radcliffe, is the title of a new book just issued.

The object of the book is to give the reader a thoroughly practical and complete course of instruction in the operation, installation and maintenance of telephone instruments, in so far as they relate to private lines and small telephone exchanges. This is accomplished in the form of questions and answers, and, as each question has only one fact for its subject, the information given in reply bears directly upon the one subject and upon no other.

There are sixty illustrations in the book, and they are of real service, because they are clear and readable.

To give an idea of the character of the work, we quote a few of the questions and their answers, taken at random:

"Q. 54. What voltage is developed by the Leclanche cell?

"A. 1.47 volts, measured between the carbon and zinc."

"Q. 64. Which is preferable, a metallic-line circuit or a grounded-line circuit?

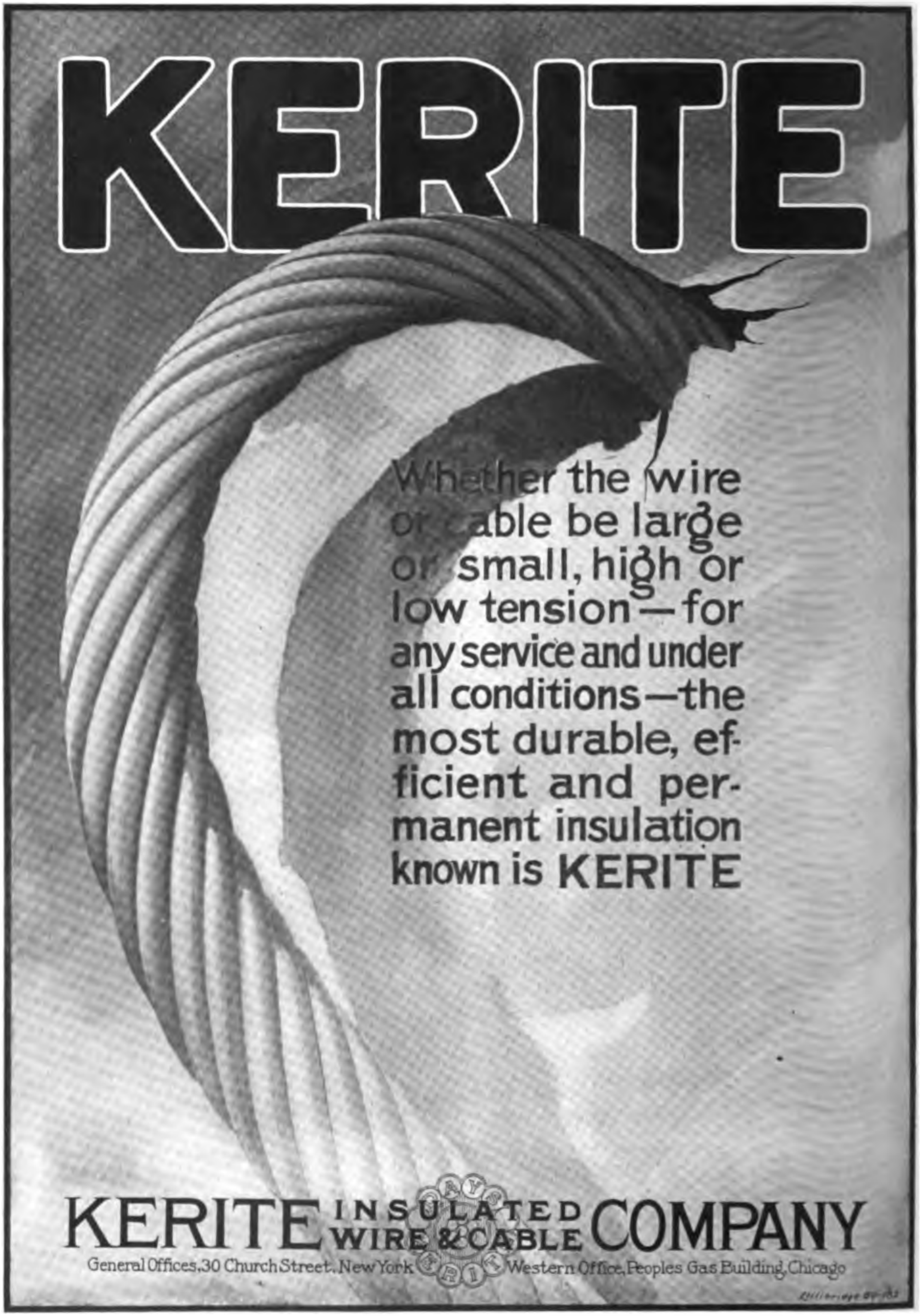
"A. A metallic circuit is preferable, especially if there are electric light or railway lines in the vicinity, on account of the electrical disturbances produced in the telephone circuit by the lighting or railway currents. On long lines there is almost certain to be trouble on grounded circuits, due to stray earth currents."

"Q. 93. Why are bridging telephones preferable?

"A. Because the voice currents do not have to pass through the coils of the bell magnets, and, consequently, are not weakened, as they would be in a series telephone system, where there are any considerable number of telephones connected."

The questions and answers cover practically every point in a telephone system, and this method of imparting information should prove attractive to the beginner and the student.

The book contains 125 pages, and the price is $1.50 per copy. Copies can be obtained of Telegraph and Telephone Age, 253 Broadway, New York.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THE RAILROAD.

Mr. E. C. Keenan, general superintendent New York Central Lines West, Chicago, Ill., was in New York July 23 and 24 on company business.

Mr. Charles A. Homan, an operator for the Philadelphia, Reading and Pottsville Telegraph Company, at Reading, Pa., has retired after a service of fifty-five years. Mr. Homan served as an operator during the Civil War.

Mr. M. W. Jones, well known in New York, but for several years past identified with the Guayaquil and Quito Railway, has been appointed superintendent of telegraph and telephone of that system, with headquarters at Huigra, vice A. R. Morris, resigned. Mr. Jones will take charge of that department, in addition to his duties as train master.

Train Dispatchers' Convention.—At the recent convention in Los Angeles, Cal., of the Train Dispatchers' Association of America, the president reported a net increase of 164 in membership, making a total of 1,189. Mr. J. P. Finan, of the Atchison, Topeka and Santa Fe Railroad, Needles, Cal., was elected president, and Mr. C. A. Connor, of the Boston and Albany, Springfield, Mass., vice-president. The next annual convention will be held at Jacksonville, Fla., June 16, 1914.

Meeting of New York Central Superintendents.—The regular quarterly meeting of the joint superintendents of telegraph of the New York Central Lines was held at the Grand Hotel, Mackinac Island, Mich., July 16 and 17. Discussion of ways and means for the benefit of the service occupied the time of the meeting. Among those present were Messrs. E. C. Keenan, general superintendent of telegraph of New York Central Lines West, Chicago; F. F. Riefel, Lake Shore and Michigan Southern, Cleveland, Ohio; J. J. Ross, Michigan Central, Detroit, Mich.; C. S. Rhoads, Cleveland, Cincinnati, Chicago and St. Louis, Indianapolis, Ind.; L. A. Lee, Pittsburgh and Lake Erie, Pittsburgh, Pa., and W. L. Connelly, Chicago, Indiana and Southern, Gibson, Ind.

Wire Crossings Specifications.

At the annual convention of the Association of Railway Telegraph Superintendents, held at St. Louis, Mo., last May, the Committee on Wire Crossings made its report and a committee was appointed to edit the manuscript. This work has been completed, and the specifications have been approved by the Western Union Telegraph Company and the American Telephone and Telegraph Company, and it is expected that the Postal Telegraph-Cable Company, and other wire-using companies, will also adopt it. The report will soon be issued, and it is expected that all railroads will adopt the specifications for low-tension wire crossings, and this, with the specifications for high-tension crossings adopted two years ago, will place the wire-crossing matter in a satisfactory condition. Mr. G. A. Cellar, Pittsburgh, Pa., chairman of the committee, and his colaborators deserve much credit for the able manner in which they handled this difficult subject, and brought it to a successful issue.

Protection Against Lightning and High-Tension Currents for Telegraph and Telephone Equipment.

In his paper on "Protection Against Lightning and High-Tension Currents for Telegraph and Telephone Equipment," read before the recent convention of railway telegraph superintendents at St. Louis, Mo., Mr. M. H. Clapp, superintendent of telegraph of the Northern Pacific Railway, St. Paul, Minn., said that, as a general proposition, he believed that there is a lack of adequate protection for the apparatus in railroad offices and that more attention should be given to the subject than has been given in the past. This lack of protection, he said, applies more particularly to the telephone circuits than to the telegraph circuits. This condition would be expected for the simple reason that the telephone has not been in use on the railroads as long as the telegraph and, therefore, its needs, from the standpoint of protection, are not as well understood as those of the telegraph. There has not been only a lack of protective apparatus provided, but lax methods in the installation of protectors have been allowed, so that, in a great many cases, the arresters installed have not been able to operate as intended. It is, of course, obvious that if an arrester is to protect apparatus from lightning an ample and satisfactory path to ground must be provided, yet no part of the installation of protectors is so often slighted and neglected as providing proper grounds. It is, of course, difficult in some cases to provide a satisfactory ground on account of various local conditions, but, in general, these conditions can be overcome and there is certainly no excuse for providing poor grounds under normal conditions. Poor and defective wiring, in connection with equipment in offices, he believed, had a considerable bearing on troubles arising from burnouts, caused by lightning or power circuits. This applies especially to ground wires.

Referring to the theory of proper protection, the author stated that for various reasons enumerated it is not practicable to design protectors for use in telegraph and telephone service that will be satisfactory in case of contact between telegraph and telephone wires and all classes of electric light and power wires. The safety of telegraph employes, buildings and equipment must, therefore, be obtained in two ways. First, by preventing the possibility of contact between telephone and telegraph wires and certain classes of electric light and power wires, known as high-tension wires, and second, by suitable protective apparatus which will protect against lightning and in case of contact between telegraph wires and low-tension electric light and power wires.

He believed that it is practicable to devise protection in connection with telegraph and telephone wires, which will provide reasonable safety to persons, buildings and apparatus in the case of lightning discharges, also in the event of contact between the telegraph and telephone wires and low-tension electric light and power wires.

From the information that I am able to gather from the various sources, from the experiences of the different railroads and from my own experience, he continued, I believe that the following is the correct theory of protection for telephone and telegraph apparatus containing delicate points and windings from the action of lightning and crosses with low-tension power and light circuits. The protection should consist essentially of three parts.

(a) A high-capacity line fuse.

(b) An open space cut-out or lightning arrester such as formed by the use of carbon or metallic blocks mounted with a separation either in the air or in a vacuum.

(c) A low-capacity fuse or heat coil.

Fuses provided in connection with protectors should have the following requirements:

(a) They should operate on a specified current within a given period of time.

(b) They should break any arcs likely to result from the operation of the fuses on a high voltage.

(c) They should be capable of withstanding without operating brief "flashes" of heavy current such as occur when lightning discharges pass through the arresters.

Special designs of the cartridge type of fuse have proved most satisfactory in meeting these requirements.

The most reliable form of open space cut-outs so far developed for telegraph and telephone service consists essentially of two conducting plates or blocks separated by an accurately regulated air gap. The thickness of the air gap and the material of which the conducting blocks are composed, determine the voltage on which the cut-out will operate. To maintain the proper thickness of the air gap mica separators are used to a large extent, the thickness of these separators being kept within close limits by careful manufacture and inspection. For low-voltage cut-outs, about 1,000 volts, or less, carbon is quite generally used for the blocks. For higher voltages various metals are available. With properly designed plates or blocks and mountings, the arresters of this type fulfill two most important requirements that can be specified for such devices, namely:

(a) They operate promptly at the proper voltage.

(b) They carry safely heavy currents if the operating voltage remains on the circuit.

In addition, well-designed arresters of this form have the property of clearing themselves after discharges of small or moderate intensity. After heavy discharges, however, it is necessary to clean or replace the arrester parts.

In general, the high-capacity fuse should have an amperage of about ten amperes. The open space cut-out should operate at a voltage as low as possible, consistent with non-interference with the operation of the apparatus protected; for if the voltage necessary to operate the cut-out is too high, the apparatus is more likely to burn out, or if too low, there will, of course, be interference to the operation of a high-voltage current, as a telegraph current on the circuit. Under present conditions, it would seem that it would be necessary to have the operating voltage of the open space cut-out at least 500 volts, and possibly 750 volts for use at the line end of cable conductors. The low-capacity fuse or heat coil should always be placed between the open space cut-out and the apparatus to be protected and the carrying capacity should be from 0.2 to 0.8 ampere, depending on the conditions. If choke coils are placed in the line, they should be placed between the open space cut-outs and the low-amperage fuses. The function of these coils is simply to choke back any lightning discharges that might go by the open space cut-outs, thereby helping the open space cut-outs to perform their function. Also, in some cases, it is apparently necessary to use two sizes of low-amperage fuses, one for very delicate apparatus, another for apparatus less delicate.

INDUSTRIAL.

The "Vac-M" Lightning Arrester.

All telegraph and telephone apparatus needs protection against lightning, but lightning is so erratic in its action that devices of many kinds have been developed with the view of diverting it to the ground before it reaches the instruments.

The "Vac-M" lightning arrester, manufactured by the National Electric Specialty Company, Toledo, Ohio, is particularly designed for telegraph and telephone work. The line and ground terminals are contained in a vacuum, the device closely resembling an incandescent lamp bulb, from which the air has been exhausted. The three terminals are of carbon, the middle one being connected to the ground.

These arresters are so designed that their starting and arcing can be regulated to any voltage, and they are adaptable to fire and police telegraph circuits, sprinkler and burglar supervisory circuits. An instance showing the value of the "Vac-M" arrester occurred in Cleveland, Ohio, recently, during a tornado. One of these arresters in the central office of the American District Telegraph Company suddenly glowed heavily, indicating a high-tension cross. The fuse did not blow, but was promptly disconnected by means of a stick. The crossed wire was located by the use of an improvised arrangement which enabled a lineman to test each wire on the pole with an insulated wire connected with a "Vac-M" arrester, and then grounded. When the defective wire was touched with the testing wire the arrester glowed. It was found that the wire was crossed with a telephone wire which was, in turn, crossed with a 4600-volt line. This method of locating a crossed wire is unique, and can be rendered perfectly safe by using proper precautions.

T. M. B. A. Assessments.—Assessments Nos. 555 and 556 have been levied by the Telegraphers' Mutual Benefit Association to meet the claims arising from the deaths of F. H. Gardiner, at Danvers, Mass.; C. H. Mead, at Ocean Grove, N. J.; H. Rosengarden, at New York; J. Fitzsimmons, at Chicago, Ill.; T. Carey, at New York; J. A. McDonald, at Cranbury, N. J.; W. H. Brockman, at Midway, Pa.; A. Winder, at New York; G. M. Dugan, at Louisville, Ky., and P. F. Depew, at Tonopah, Nev.

OBITUARY.

JOSEPH M. WINDER, a press telegrapher from Washington, D. C., died suddenly at the Southern Railway station, Danville, Va., just before a northbound train upon which he intended to return to his home drew into the station. He had just checked his baggage when he collapsed, and died before medical aid could be summoned. Mr. Winder was forty years of age, and had been a first-class operator since he was eighteen. His father, Alfred Winder, who was an operator during the Civil War, and well known in Indianapolis and New York offices, died one month ago. Deceased Joseph M. Winder worked for all the press associations at one time or another. He served the Government Signal service in Alsaka, and several months with the Marconi Wireless Company on Atlantic Coast ships.

Musical Talent in El Paso Telegraph Office.

Miss Vivian Bray, a perforator clerk in the Barclay printer department of the Western Union Telegraph Company at El Paso, Tex., is a noted composer of music and songs. She is eighteen years of age, and composed her first song when she was fifteen. In the daytime she plays sonatas and symphones on the Barclay perforator, and, at night, spends much time at her piano, playing over snatches of songs which have come to her during the day. She plays these over until she has the melody firmly fixed in her mind before she undertakes to put them on paper. Then she writes the song out and composes the words for it. In this way, she has written hundreds of songs since she started to compose. Many do not suit her and are consigned to the waste-basket. Others are sent to her publisher for his approval and she has had a number published.

The "Rio Grande March," which she wrote recently, has had a large sale and there have been more than 800 copies of it sold in El Paso and in other cities.

Miss Vivian does the punching for the Barclay-Dallas circuit, which is a heavy one, and does not let the work get ahead of her.

INFORMATION DESIRED ABOUT SAMUEL SHEPPARD.—Mr. C. B. Parsons, of Red Bank, N. J., a veteran of the Civil War, is desirous of securing information regarding Samuel Sheppard, who was in the employ of the American Telegraph Company in 1861, and lived in Hoboken, N. J. Mr. Parsons, in that year, rescued Mrs. Sheppard from drowning at Port Monmouth, N. J. Later he went to the war and since that time he has lost track of the Sheppard family.

MR. MURRAY C. ALLEN, division superintendent of plant, Western Union Telegraph Company, New York, writes: "My check enclosed for automatic renewal of my subscription to your publication."

MUNICIPAL ELECTRICIANS.

The Watertown Convention.

The final preparations for the annual convention of the International Association of Municipal Electricians, which will be held at Watertown, N. Y., three weeks, hence, August 19 to 22, are being completed, and the officials have every reason to believe that it will the most successful convention ever held by the association, both in point of attendance and character of papers to be read.

The papers to be presented to the convention will be of exceptionally high quality, and will deal with subjects of practical importance to the municipal electricians.

Among the subjects which will be discussed will be electrical inspection, municipal street lighting, fire-alarm and police signaling, joint use of poles, permissible voltage on overhead wires in cities, municipal ownership and electrolysis.

The headquarters of the convention will be at the new Hotel Woodruff, while the sessions will be held in the Odd Fellows' Temple, which is nearby. Ample space will be provided at the place of meeting for the exhibition of apparatus, and it is thought that this will be an excellent opportunity to display fire and police-alarm appliances and accessories, as there is a promise of a large attendance of municipal electricians.

Manufacturers wishing to secure exhibit space and hotel reservations should correspond with Mr. H. C. Bundy, superintendent of fire alarm, Watertown, N. Y., who is chairman of the executive committee, and will be glad to give any information desired. The rates at the new Woodruff Hotel are $3.00 per day minimum.

President J. W. Kelly, jr., is making extraordinary efforts to bring out a large attendance, and it looks as if his work will bear fruit in abundance.

An excellent program of entertainment has been arranged, especially for the lady contingent, and while it is, of course, based largely upon the idea of pleasure, it will, in a measure, be educational, as well, as several industrial plants are to be visited.

In a circular letter just issued to the members of the association, Secretary Clarence R. George says: "Come to this convention and exchange ideas with the other members, get information beneficial to your city. Learn how other cities handle their electrical departments, what other cities are doing in municipal street lighting, municipal electric inspections for the prevention of fires and modern fire-alarm and police telegraph systems. Show the other members what you are doing, and when you return home, show your mayor and commissioners the modern way of standardizing the electrical department of your city."

Any further information regarding the convention can be obtained of Secretary Clarence R. George, Houston, Tex.

James D. Reid Memorial.

One of Mr. Reid's early friends and pupils has offered to duplicate all subscriptions to the fund. Each and every dollar already contributed and hereafter contributed will, therefore, count for two.

If Mr. Reid's former friends and associates, and others of the fraternity who have not yet subscribed to the fund, and who agree that his memory should be fittingly perpetuated by telegraphers, many of whom individually owe much to his helpfulness and example, will forward the amounts of their subscriptions to the treasurer of the fund, Colonel Albert B. Chandler, 253 Broadway, New York, the committee will soon be able to close the subscription lists and proceed to the erection of the proposed monument.

Every member of the Telegraphers' Mutual Benefit Association should subscribe, because Mr. Reid was the association's first vice-president.

Every member of the Old-Time Telegraphers' and Historical Association should subscribe, because Mr. Reid was one of the organizers and one of the early presidents of that organization. In fact, everyone employed in the telegraph service should be a subscriber, because Mr. Reid was ever helpful to individuals and earnest in his efforts to promote the welfare of everyone in the business.

To Mr. Reid is due no small share of the credit for the organization of the telegraph service at the beginning. He was one of the able pioneers of the business based upon the invention of Morse, of whom he was the friend and associate, and in honoring his memory, telegraphers of to-day honor themselves and their craft as well.

HEMINGRAY INSULATORS.—The Hemingray Glass Company, Covington, Ky., has just issued a neat catalogue (No. 28) of its glass insulators. Every style of insulator is illustrated in half-tone and is accompanied by an outline sketch, drawn on the same scale, giving the dimensions. Other half-tone views show flash-over tests on various types of high-voltage insulators. The insulators shown include the pony, Western Union, long-distance telephone, street railway transposition, cable and various other types. Knobs and insulator pins are also included. The pamphlet contains fifty-four pages and is well gotten up.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

Miss Elizabeth Spear, formerly identified with this department, but for many years past occupying a position in the telegraph department of a downtown banking house, died June 29.

James F. Galvin, an old-time lineman, lately employed as a watchman in the plant section of the general operating department, died Saturday, July 12, after a brief illness.

Mr. Edward E. Brannin, chief of the Southern Division, has the sympathy of the entire force in the recent death of his father, at Red Bank, N. J.

REDUCTION IN PARCEL POST RATES.—Postmaster-general Burleson announces the extension, improvement and reduction in parcel post rates to take effect August 15. The maximum weight of parcels has been increased from eleven to twenty pounds, and a material reduction in the postage rates in the first and second zones will be made. The insurance fee for values up to $25 was, on July 1, reduced from ten cents to five cents. This information will be of interest to electrical supply dealers.

CHICAGO MESSENGER BASEBALL TEAM.—Twelve scalps now dangle at the belts of the Chicago Western Union messenger baseball team, the twelfth victory having been won on Sunday, July 27, their opponents being a picked nine of the auditing department. The score was 6 to 5. The cleverness of the "Speedy" boys and the enthusiasm of the army of young "rooters" who accompany them has attracted the attention of all lovers of amateur baseball in Chicago, and big crowds turn out whenever the boys play. A spirit of enthusiasm prevails in the entire messenger force and is reflected in their daily work.

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Silver-Aluminum Alloys.

A new white metal, claimed to be superior to other alloys, is being put upon the market by the North American Selling Company, 120 Liberty Street, New York. In color it resembles coin silver, and in weight it is about one-third that of silver. It is stated to be stronger than steel and is easily cast and machined, and is acid-proof. The basic metals used are silver and aluminum, and various alloys derived therefrom have been given distinctive names, according to the proportions of these metals and the uses to which the alloy is applicable.

This new alloy can be used for the manufacture of a great variety of articles, such as spoons, electric wire and tubing, telephones and telegraph instruments, electric light sockets, aeroplanes, etc., etc., and it is non-tarnishable.

The manufacturers claim that this new metal can successfully compete with silver, german-silver, aluminum, tin, nickel, copper, brass, bronze, magnalium, or any white metal on the market where weight, strength and price are taken into considera-

The Strike of 1883.

TELEGRAPH AND TELEPHONE AGE, in its issue of July 1, made reference to the telegraphers' strike which occurred on July 19, 1883, just thirty years ago.

Among the brilliant members of the profession in those days was Mr. John S. McClelland, a Canadian by birth. Like many other Canadians, he found his way to New York, and obtained employment with the Western Union Telegraph Company at 195 Broadway. Within a short time his unusual ability was recognized, and he soon found himself working one of the heavy press circuits out of the metropolis. His executive ability was soon recognized and he was elected to the position of secretary to the general executive board, which had complete charge of the telegraph organization at that time. After the strike had ended, Mr. McClelland returned to his native city, St. Catherines, Ont. He was editor of the *St. Catherines Star* for many years, and served as alderman for a number of years. He was then appointed city clerk, which position he held until his death, about five years ago.

HAM AND EGGS OR TELEGRAPH AND TELEPHONE AGE.—A subscriber in a western city informs us that owing to the fact that ham and eggs are so high and wages are so low he will be unable to renew his subscription for the ensuing year unless conditions change.

Telegraph and Telephone Age

No. 16 NEW YORK, AUGUST 16, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Electrical Terms.

Although all text books state that electricity is always the same, irrespective of its source, and that an electric current is electricity in motion, yet when current is referred to it is so frequently qualified by a distinguishing prefix or explanatory word that the unenlightened mind of the student is sometimes perplexed at what seems like contradictory statements.

For example, in one case he may read about a galvanic or voltaic current, followed by mention of a faradic current. He also reads of "natural" or earth currents. Now, the terms galvanic, voltaic, faradic and natural, in such cases are used to indicate the method of production of the current and not to its characteristics. Of course, the terms "earth" and "natural," being plain English words, readily convey the correct meaning, but the terms galvanic, voltaic and faradic require interpretation. Each tells a separate story of electrical exploits and discoveries in the electrical field by Professors Galvani, Volta and Faraday, which should be read and recalled to mind whenever an electrical effect is honored by the use of one of these names as a distinguishing term. If the story is not remembered the term becomes insignificant, and for that reason is often misapplied.

For illustration, while galvanic or voltaic and faradic electricity is of one and the same kind, each is produced in a different manner, and possesses different characteristics. Hence it is necessary to have different terms to distinguish the different methods of generating electric currents. Professors Galvani and Volta jointly discovered one way and Faraday another. Galvanic and voltaic currents are produced by chemical action, while faradic current is generated in a coil of wire by moving it to and fro in a magnetic field. Faradic currents are also called "induced" currents. When Faraday moved a coil of wire towards a magnet, the current induced in the coil flowed in the opposite direction to that of the current induced when he withdrew the coil. Consequently he produced what is called an alternating current. All currents generated by electro-magnetic action, such as in generators, induction coils, etc., are, broadly speaking, primarily faradic, but the term is most generally employed in therapeutics in reference to the induced currents derived from induction coils such as are used in medical outfits for producing shocks.

On the contrary, when one reads or hears the terms galvanic or voltaic current, he should understand that such current is produced by chemical action, and the source is some form of a battery consisting of one or more cells. A galvanic and a voltaic battery are one and the same thing. The credit of the discovery, which led to the development of a practical type of chemical battery, was first given to Galvani, and was later shared by Volta. The story is that when Galvani accidentally caused a piece of copper to touch a dead frog that was lying on an iron railing, the legs suddenly contracted from the effects of what he afterwards discovered was an electric current; hence the term galvanic was applied to the current. Prior to that time all currents used for experiments were produced principally by friction. However, Galvani did not discover the cause of the current. That was left for Volta to disclose. Galvani thought he had discovered animal electricity and erroneously announced such to be a fact. If Volta or some one else had not discovered the actual facts in the case, the battery cell might still be unknown. Volta proved that the current in the case of the frog was due to the chemical action which took place between two dissimilar metals when connected together through the moist nerves and body of the frog. Now this may seem like a very insignificant story to ask the student to remember, but if he will consider the suggestion seriously for a moment he will admit that a ready knowledge of what these experimenters discovered and did will tend to make the meaning plain whenever one of their names is used as a term to indicate the character of a current.

For instance, if a galvanic-voltaic current or battery is mentioned he will know that the current is due to chemical action. Such a current is a direct current. The cell or cells of battery producing it has electrodes consisting of two dissimilar metals, etc.

On the other hand, the term "faradic" suggests currents produced by mechanical means, and are primarily alternating currents; also induced currents. In a medical battery, sometimes called a galvanic battery, the only current that is galvanic is that which the few cells of dry battery generate and which flows through the primary of the induction coil, and is direct in character. The current which the patient feels is a "faradic" or induced current, is alternating in character, and flows out of the secondary winding.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, August 12.

American Telephone and Telegraph Co.	129⅜
Mackay Companies	80
Mackay Companies, preferred	66⅞
Western Union Telegraph Co.	68½

Telegraph and Telephone Patents.

ISSUED JULY 22.

1,068,076. Receiver of Electrochemical Telegraph Systems. To W. K. Queen and T. F. Pickett, Needham Heights, Mass.

ISSUED JULY 29.

1,068,521. Automatic Switch for Telephone Systems. To G. E. Mueller, La Grange, Ill.

1,068,869. Selective Telegraph System. To C. M. Edwards, Galveston, Tex.

1,068,871. Cooling Device for Telephone Transmitters for Strong Current. To C. E. Egner, Stockholm, and J. G. Holmstrom, Saltsjostorangen, Sweden.

1,068,949. Telephone Disinfectant Attachment. To J. Tichy, Chicago, Ill.

1,068,972. Register for Telephone Calls. To H. S. Brewington, Baltimore, Md.

PERSONAL.

Mr. Harry E. Dunham, formerly editor of this journal, who has been an examiner in the Patent Office at Washington, D. C., for over two years, recently joined the patent department of the General Electric Company, at Schenectady, N. Y. While in Washington, Mr. Dunham studied law and was admitted to the bar, and his journalistic experience, together with that obtained in the patent office, will make him a valuable addition to the General Electric Company's staff of patent experts.

Robert Pitcairn.—Colonel William Bender Wilson, Holmesburg, Pa., president of the Society of the United States Military Telegraph Corps, is the author of a book published in memory of the late Robert Pitcairn, one of the most prominent railroad men in the country in his time, a leading citizen of Pittsburgh, and a former telegrapher on the Pennsylvania Railroad. The story of Mr. Pitcairn's life is an inspiring and interesting one, and Colonel Wilson has handled his subject with masterly skill.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

Mr. Edward Reynolds, vice-president and general manager, on August 16 started on a business trip through the Mid-West. His intinerary will include Cleveland, Chicago, Cincinnati, Buffalo and other cities.

Mr. Charles C. Adams, vice-president of the company, on August 11 joined his family at Cobourg, Ont., where they are spending the summer. Mr. Adams will be absent from his office until September 1.

Mr. W. I. Capen, vice-president, New York, has returned from a business trip to Chicago, Ill.

Mr. Isaac Smith, superintendent of tariffs, is again at his office after having spent two weeks with his family at Rangeley Lake, Me.

Mr. J. F. Skirrow, associate electrical engineer, New York, is again at his office after a two weeks' rest.

Mr. E. P. Tully, manager, New York, has returned from a trip to Buffalo, Detroit and Chicago on matters pertaining to the messenger department.

Among recent executive office visitors were Mr. J. H. Wilson, assistant manager, Philadelphia, Pa., and chief operator J. J. Harrington, of the Chicago office.

The following appointments of managers is announced: L. H. Tucker, at Columbus, Neb., vice L. E. Shull, transferred; E. H. Stein, at Hastings, Neb., vice F. B. Noyes, transferred; C. R. Hughes, at Waco, Tex., vice Miss B. G. Feuts, transferred; G. P. Mallon, at Great Falls, Mont., vice R. J. Carey; W. S. Webb, at Brunswick, Ga., vice E. N. Brignoni, resigned.

New offices have been opened by this company at Durant, Okla., C. N. Jones, manager; Lamiston, Ala., J. M. Thornhill, manager; Kitchen Siding, Ga., J. P. Phillips, manager; Washington, Ga., J. J. Cooper, manager; Rutledge, Ga., H. L. Vining, manager.

New Albany Office.—This company will, on or about October 1, move its main office at Albany, N. Y., from No. 46 State street to No. 98 State street. This new location is in the center of the business section of the city, and the company has plans prepared, which, when completed, will make the new office one of the most complete and up-to-date in the system.

Mr. J. W. Weed, manager of the Syracuse, N. Y., office, is enjoying a well-earned vacation.

Frank E. McClelland, formerly manager of the St. Joseph, Mo., office of this company, died at Wallace, Idaho, July 19.

Miss Mattie Thompson, operator for the Mackay Telegraph and Cable Company, at Oklahoma City, Okla, has resigned and has been married to Mr. Thomas Gibson, a business man. Their home will hereafter be in Nashville, Tenn.

The Telegrapher's Future.

In an address at the dinner of the Postal Electrical Society, New York, July 29, Mr. Donald McNicol, of the electrical engineer's department, New York, pointed out some of the features which, in his opinion, will have important bearing upon the future of the telegraphers who desire to advance to positions in the service beyond that of the common operator.

"An intelligent and correct conception of his true interests will quickly convince the telegrapher that the more he knows about the theory and practice of the art, about its history and about its needs," said Mr. McNicol, "the greater will be his opportunities individually.

"Do not let any misguided friend induce you to believe that there is nothing left to accomplish," he continued, "or that public service corporations do not look favorably upon real improvements or practicable inventions."

He mentioned several cases of leading public service corporations donating a large sum of money and offering prizes for research work along special lines. "These facts," he said, "should make the pessimist and the chap who has concluded that there is nothing left to accomplish feel out of joint with the times.

"The Postal Electrical Society," he continued, "is in the business of disseminating telegraph knowledge. The educational work being conducted by this Society gives the ambitious telegrapher an opportunity to go as far as he likes. His enemies, if he has any, cannot hold him back. The company and his friends are behind him. Mr. M. M. Davis, our electrical engineer, once put the same matter in the form of a question: 'Does any one doubt that there is a field of useful service open to a man of good health, habits and address, who understands administrative methods, and who has a wide and thorough knowledge of the telegraphic art?'

"The only telegraph journal we have, said Mr. McNicol in conclusion [referring to TELEGRAPH AND TELEPHONE AGE], "would have a subscription list ten times as long as it is at present if every telegrapher who should read telegraph literature were a subscriber. The demand for up-to-date periodical telegraph literature will increase as the benefits to be derived from its study are made plainer, and that is likely to be brought about by the work which the Postal Electrical Society is doing."

MAGNETIC CLUB RESOLUTIONS ACKNOWLEDGED.—At a meeting of the Board of Governors of the Magnetic Club of New York, June 19, resolutions were adopted, thanking the Commercial Cable Company for its courtesy, and especially to Messrs. John Gott, engineer, and Frederick Ward, manager, London, England, and S. F. Austin, superintendent, New York, who personally conducted the first public exhibition of the Gott system of cable telegraphy on the occasion of the twenty-fifth anniversary of the club, held in New York, April 19. Messrs. Gott and Ward have acknowledged, with thanks, the honor as expressed in the resolutions.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

MR. NEWCOMB CARLTON, vice-president, who has been spending a short vacation cruising on his yacht, is expected back to his office September 2.

MR. WM. H. BAKER, secretary of the company, is absent on a vacation, and will not return to his office until September 2.

MR. R. G. STEPHENS, one of the travelling auditors of the Southern Division, was a recent New York visitor.

MR. W. C. MERLY, chief clerk of Mr. Belvidere Brooks, vice-president, has the sympathy of his many friends in the death of his three-year-old daughter on August 4.

The following changes in managers are announced in the district presided over by Mr. J. R. Terhune, district commercial superintendent, Nashville, Tenn.: Mr. E. H. Keyser, at Bristol, Tenn., has resigned and is succeeded by Mr. B. B. Murray; Mr. C. L. Tucker, at Winchester, Ky., has been transferred as manager at Ashland, Ky., and is succeeded at Winchester, Ky., by Miss L. B. Underwood.

MR. C. A. BOWEN has been appointed district wire chief for the second district, southern division, with headquarters at Atlanta, Ga.

NEW OFFICE AT DETROIT.—A new fire-proof building is being erected in Detroit, Mich., at the corner of Shelby and Congress streets by the Simon Murphy Estate, in which the new office of this company will be located. The office will be equipped with modern apparatus throughout.

OUTING IN NEW ORLEANS.—The commercial association of this company at New Orleans, La., held its annual outing at Spanish Fort, on July 20, over fifty persons being in attendance. The affair was in charge of Manager W. A. Porteous, who was assisted by Messrs. J. D. Felsenheld, J. C. Jung and A. Cohen. Various games, dancing, etc., were indulged in, and at the dinner Mr. Porteous made an address on "Cooperation and the Company we Represent."

THE CABLE.

NEW CABLE STATION AT NORTH SYDNEY.—The Western Union Telegraph Company has started the erection of a fire-proof building for its cable station at North Sydney, N. S.

CABLE CESSION.—According to the London *Electrical Review* the Black Sea Telegraph Company has transferred its cable between Constantinople and Odessa to the Eastern and Indo-European Telegraph Companies, and the cable is now being worked in common.

MEMORIAL WINDOW TO LORD KELVIN.—American, as well as English engineers and leaders in the field of electricity, were represented at the unveiling, on July 15, of a memorial window in Westminster Abbey, London, in honor of the late Lord Kelvin. The fund for the purchase of the window was drawn from both countries.

CANADIAN NOTES.

Mr. A. B. Smith, manager of telegraphs, Grand Trunk Railway System, and Grand Trunk Pacific Railway, Montreal, has returned from a trip of inspection of all lines west of Winnipeg. Substantial progress is being made in the extension of the telegraph system on the main line and branches. It is expected that through commercial service will be established on the lines of the Grand Trunk Pacific Telegraph Company from the Atlantic to the Pacific early in 1914.

Mr. Ernest M. Payne, whose appointment as superintendent of Canadian Pacific Railway Telegraphs at Winnipeg, Man., was announced in our issue dated July 16, was born at Port Stanley, Ont., in 1879, and entered the telegraph service at London, Ont., on May 1, 1899. After filling the position of operator he became repeater chief and then circuit manager. He was advanced to be inspector of telegraphs, his latest promotion being to the position of superintendent of telegraph.

THE TELEPHONE.

Frank M. Farwell, aged 45 years, division superintendent of traffic, at Kansas City, Mo., died on August 2.

Telephone Tolls in Vermont —The report of the commission appointed by Governor Fletcher, of Vermont, to investigate the telephone situation in that State, recommends a 20 per cent reduction of tolls within the State limits.

New Exchange for New Orleans.—The Cumberland Telephone and Telegraph Company has purchased property in New Orleans, La., on which it will erect a large exchange building.

Squirrels Like Lead Cables.—Even squirrels are finding a use for the telephone. In Gainesville, Ga., they gnawed through the lead covering of a telephone cable and put several lines out of commission.

Telephone Athletic Club Outing.—The New York Telephone Athletic Club will hold its annual outing at Witzel's Grove, College Point, L. I., N. Y., September 6. There will be various athletic events followed by a dinner. In the evening there will be dancing.

Telephone Earnings.—The total earnings of the American Telephone and Telegraph Company for the six months ended June 30, amounted to $22,731,942, as against $20,327,705 for the same period last year. The balance for dividends was $16,465,816, an increase of $1,164,733.

Telephone and Telegraph Society of the Pacific Coast.—At the recent meeting of the Telephone and Telegraph Society of the Pacific Coast, San Francisco, Cal., officers were elected as follows: President, J. H. Corcoran; vice-presidents, A. H. Griswold and F. H. Leggett; secretary-treasurer, A. C. Rogers.

Telephone Lectures in Newark Schools.—During the past school term, a number of lectures on the telephone were given in the high schools in Newark, N. J. Classes were brought to the Market Central Office, where they were shown the local and toll boards, operators' school, wire chief's department, the commercial department, etc.

Automobile Telephone Car.—The official press car which accompanies the Glidden automobile tour is equipped with a telephone outfit, and, as occasion requires, it is run to a telephone line and the car-apparatus is connected to a wire by means of a portable pole. In this way, communication is established wherever the car may be.

City Officials to Pay Full Telephone Rates.—About 150 city and county officials at Detroit, Mich., who have enjoyed a cut rate of about seventy-five per cent of the regular residence rate for telephones installed in their homes, have been notified by the telephone company that they will be required to pay full price after September 1. It will be interesting to note what the effect of this will be on future municipal legislation.

Reduction of Tolls in New York.—The New York Telephone Company has accepted the order of the Public Service Commission, Second District, adjusting the charges for toll calls from public telephones in New York City to points within the city, so that the public telephone rate and the subscribers' rate will be the same in all cases where the initial rate from a subscriber's telephone is ten cents or more.

Telephone Service in London.—The Council of the London Chamber of Commerce will make representations to the Postmaster-General on the questions of the terms of telephone contracts; the system of registering calls; the provision of additional junction lines; the desirability of modernizing the London telephone exchanges; improvements in the trunk line service; the need for greater efficiency and supervision of telephone operators; and the inconvenience of the "pillar" instrument.

Emergency Telephone for Forest Rangers.—Army bayonets now form part of the emergency telephone outfit of forest rangers, used chiefly in fighting fires. This emergency line consists of small instruments and a coil of fine copper wire. The wire is attached to the nearest telephone line, the bayonet is thrust into moist ground at the other end, and with the circuit thus completed the ranger can talk with headquarters, report his position, and summon fire fighters, if necessary.

RADIO TELEGRAPHY.

Mr. W. C. Pearse, chief wireless operator on the steamer "Pastores" of the United Fruit Company, called on his New York friends recently while the steamer was in port.

G. R. Guertier, construction superintendent in charge of the work on the new station of the Marconi Wireless Telegraph Company at Honolulu, Hawaii, was shot and killed on August 11.

Wireless and Droughts.—Gardeners and farmers in Sayville, L. I., and vicinity, attribute the lack of rain to the effect of the wireless station at that place. Rain has fallen at near-by towns.

First License for Great Lakes to School Girl.—Miss Alice McConaughy, a thirteen-year-old schoolgirl, whose father is a national bank examiner in Ohio, has been granted the first license under the new law to operate wireless on the Great Lakes.

New Transatlantic Wireless Service.—According to the London *Electrical Review*, Newcastle, N. B., is to be the Atlantic coast station of the Universal Radio Syndicate for the wireless service between the Dominion of Canada and Ireland. This syndicate will use the Poulsen system.

Government Cruiser on a Test Voyage.—The scout cruiser "Salem" has been detached from the United States Atlantic reserve fleet, and has sailed on a voyage across the Atlantic to undertake the most extensive wireless experiments ever carried on by the Navy Department. The purpose of the voyage is to test to the limit of its capacity if possible, the Government's new high-power station at Arlington, Va.—*The Marconigraph.*

The Imperial Wireless Scheme.—Mr. Herbert Samuel, postmaster-general of England, in the House of Commons recently stated that as the proposed Imperial wireless stations would be state-owned, it was very improbable that licenses would be granted to private companies to erect competing stations in the same countries; but where the question of competition did not arise, licenses would be granted to British companies of good standing.

Wireless in Peru.—The Lima and Iquitos, Peru, wireless towers, erected by the Telefunken Company, are identical in construction, 106 meters (348 feet) in height, and of steel. Messages are sent with a power of 10 kilowatts. The rate from Lima to Iquitos, a distance of 640 miles, is 20 centavos (9.7 cents) per word, and the press rate is 5 centavos (2.4 cents) per word. Federal decree forbids the installation of private wireless-telegraph stations.

Large Radio Station in the Canal Zone.—One of the greatest naval radio stations in the world is to be constructed by the United States at Caimito, in the Canal Zone. It will be known as the Darien station. All three of the towers will be 600 feet in height. The plant, it is thought, will be able to communicate with San Francisco as well as with Arlington, Va., and to reach into the southern seas as far the Valdivia, Chile, 421 miles south of Valparaiso, and Buenos Aires, Argentina. It is thought that the new station will also be able to communicate with the island of St. Vincent, 500 miles west of Africa.

Private Wireless Regulations in Germany.—The German Post Office and Interior Departments have promulgated secret regulations to prevent the owners of private wireless telegraph stations from engaging in traffic which might endanger the interests of the national defense. Private stations may be erected only on condition that the government has the right at any time to order their demolition. The owners must pledge themselves to guarantee the absolute secrecy of any messages their stations may happen to pick up. Officers of the army and navy are to have the privilege at any time to inspect these stations and order a temporary cessation of their activities The owners must also agree to render special service whenever they intercept messages relating to disasters ashore or afloat, and place their stations at the disposition of the government as often as occasion demands.

Wireless for Submarine Boats.—The navy department has adopted a "submarine violin" for the transmission of messages between submarine torpedo boats and shore stations or other vessels. The mechanism is explained to be an adaptation of the violin. From one side of the submarine project two steel stays. From the ends of these is stretched taut a piano wire. Touching the wire is the roughened rim of a wheel, which, when it revolves, sets up vibrations in the wire. The wheel is controlled by a motor inside the hull of the submarine, and the motor, in turn, is controlled by a Morse key. When the key is pressed the motor begins to revolve, the exterior wheel scraping the wire precisely as a bow agitates a violin string. The hull of the submarine acts as a sounding board. The key is used precisely as an ordinary Morse key, and dots and dashes are communicated on the wire as the key is depressed and released. About eight words a minute is the best speed so far attained. The receiving apparatus is the ordinary telephone receiver. The end under water may be connected by insulated wires to a fort, shore station or another vessel. Mr. Christian Berger, an Austrian, is the inventor of the "submarine violin."

Wireless Licenses.

The government regulations governing radio communication state that the act does not apply either afloat or ashore to (a) apparatus for radio communication which merely receives radiograms and is not equipped for sending; (b) apparatus for the transmission of radiograms exclusively between points in the same state, if the effect of such transmission does not extend beyond the state (so as to interfere with the radio communication of other states), or if the effect of such transmission does not interfere with the reception of radiograms from beyond the state (so as to interfere with the interstate radio communication of that state); (c) apparatus for radio communication which has been issued to the organized militia by the United States Army and is used for military purposes only.

The owner or operator of any apparatus who may be in doubt whether his apparatus, under this paragraph, is exempt from license, may write the facts to the radio inspector of his district, or to the commissioner of navigation, Department of Commerce and Labor, Washington, D. C., before applying for a license.

The third section of the act prescribes that every radio apparatus required to be licensed shall at all times while in use and operation be in charge or under the supervision of a person or persons licensed for that purpose by the Secretary of Commerce and Labor.

The New Telegraph Buildings in New York.

The new building on Walker and Lispenard streets, New York, erected for the joint use of the Western Union Telegraph Company, the New York Telephone Company and the American Telephone and Telegraph Company, is entirely finished and the equipment of these companies is now being rapidly put in place.

The operating department of the Western Union Company will be housed here when the installation work is completed, and then 195 Broadway will become a memory, as far as that department is concerned.

The new operating headquarters will be the most complete and modern of any in the world, and they have been planned with the view to taking care of the expansion of business up to the year 1920.

The building is seventeen stories high, and is L-shape, with a frontage of 88 feet on Lispenard street, and 125 feet on Walker street, with a total depth of 200 feet from street to street.

The operating department of the Western Union will occupy the seven upper floors, viz.: the eleventh, twelfth, thirteenth, fourteenth, fifteenth, sixteenth and seventeenth. The term operating department is used here in its broadest sense and does not mean the instrument rooms only, but includes every activity connected with the actual handling of messages.

The eleventh floor will be women's quarters, toilets, lockers, rest room, hospital and a "silence" room or library.

Similar quarters for the men will be provided on the twelfth floor, excepting the hospital and library, in the place of which, there will be a smoking room.

The bookkeeping department and general offices will be located on the sixteenth floor and on the seventeenth floor will be the telephone room, with thirty-two operating positions, a large telegraph school, lecture hall and an up-to-date cafetaria restaurant. The fourteenth and fifteenth floors will be the instrument rooms proper, and the thirteenth floor will be the terminal room, where will be located the main switchboard, power plant, pneumatic tubes, etc.

The iron frame work for the main switchboard on the thirteenth floor is now being erected, and part of the board is ready for the wiring.

In the power room the iron racks for the storage batteries are being placed in position. Every means possible is being adopted to insure perfect insulation and the cement floor is treated with an acid-proof top dressing.

The operating rooms will be provided with a complete system of traveling message belts similar to that in the new Omaha office, which was described in our issue of June 1.

A very efficient system of ventilation is provided throughout the building. Pure, washed air is forced into the rooms on the various floors through ducts and registers in the ceiling and the impure air is drawn out through registers placed in the floors. These exhaust ducts are provided with trap doors, which are held open by a chain in which a fusible link is introduced. In the event of a fire on the floor below the heat melts the fusible link, thus allowing the door of the register to close automatically and prevent the spread of the fire from one floor to another. It will be remembered that the disastrous fire at 195 Broadway in 1890 spread to the operating room through the openings in the floor through which the wires were conducted to the tables. The fire started in the battery room below.

All of the windows in the building are also provided with fusible links which insure their closing automatically in case of a fire on the outside. In this way the interior is protected against the admission of fire from without. The illumination is on the semi-indirect system, which diffuses a soft light without strong shadows, and is restful to the eye.

The floors are covered with linoleum one-quarter of an inch thick to deaden the noise of moving feet, and every convenience and appliance has been adopted to make this the most complete and up-to-date telegraph operating headquarters in the world.

It is expected that the transfer from 195 Broadway to the new building will be made about March 1, 1914.

In our issue dated February 16, 1911, we presented views of the two façades of the new building made from the architect's drawings.

THE NEW 195 BROADWAY BUILDING.

The first section of the new structure which will take the place of the present building at 195 Broadway, and the annex and adjoining property on Dey street, is nearing structural completion. It is at Nos. 14 to 18 Dey street, and the façade is sufficiently advanced to show that the completed building will be of imposing design and proportions. The front will be faced with massive fluted Doric columns of granite extending from the ground level to the third story. The steel frame and cement work is of unusually heavy and substantial character. The frame is now up to the full twenty-six stories, and the west side of the building is half enclosed with a white brick wall.

When this section of the building is ready for occupancy, the annex, adjoining, will be vacated and torn down, and the new structure extended up to the main building on the corner (195 Broadway). When the second section is finished the famous old 195 Broadway will be demolished and the new structure extended over the site.

The entire new building will be uniform as to design and when completed will be one of the most imposing "skyscrapers" in downtown New York.

Mr. R. T. Reid, general manager of the Instantaneous Alarm Company, at Seattle, Wash., in remitting to cover his subscription for another year, writes: "While I am no longer connected with the telegraph business, I find the Age as valuable as ever, and through it I am able to keep in close spiritual touch, at least, with my many old friends who remain in the business. I would like, at this time, to congratulate you on the good work of your paper in an educational way."

Slamming the Telegraph Operators.

BY WALTER P. PHILLIPS.

In a rambling and fulsome article by Roy W. Howard, in which his portrait is given in a frame designed to show, perhaps, that the screaming eagle is the emblem of the present United Press, this confident critic of press methods past and present says: "The old press association practice of making newsmen and bureau managers of superannuated telegraph operators was discontinued." The flaw in this amiable assertion absolutely annihilates its entire fabric, for none of the old press associations used superannuated telegraph operators for newsmen and bureau managers. In the New York Associated Press service, in which I made many changes, the newsmen and bureau managers were superannuated anything but telegraph operators. They were old printers, sailors, etc., and the telegraph operators by whom they were superseded were young men. Instead of being superannuated they represented the very highest type, both for expertness in their profession and as writers of education. Some of them have gone as far as the brilliant Mr. Howard himself—Richard Spillane, George Kennan, James Morgan and P. V. DeGraw in particular. Others of splendid ability and great achievements have passed onward—notably William T. Loper, W. H. C. Hargrave, William G. Jones and Fred N. Bassett. Before my time the man behind the gun, the great resistless power, the man with a head full of brains who strengthened the hands of James W. Simonton, the old-time Associated Press manager, was a telegraph operator from New Orleans named James C. Hueston. He became a lawyer, but died many years ago.

As for the news association with which my name was conspicuously connected for fifteen rather brilliant years in the business of news gathering, it employed no superannuated telegraph operators in any capacity. That is a fact that the self-sufficient Mr. Howard should know without my telling him. The original United Press, whose name his associates have now appropriated, was built up entirely by telegraph operators. Those in a position to judge often speak of the original United Press force as the finest that was ever assembled for any purpose whatsoever. When asked how the present United Press compares in respect of the quality of the news handled, its personnel, etc., the answer comes, usually with a smile, "The present outfit compared with the old one is a joke."

I have never done anything toward my fellowman that I was ashamed of, but of all the things with which my name has been associated, I am proudest of my connection with the United Press and of the many friends I made as its general manager. I came to know the men and women who were doing the world's work, including several Presidents of the United States, but the best men and women I have ever met were the telegraph operators who were my associates. They were on duty everywhere. They assisted me to plan our very successful campaign against the Associated Press; they furnished the most correct and picturesquely written matter that had ever been sent over telegraph wires, and they enabled me to divorce one paper after another from our firmly rooted opponents until, for example, we served all but one journal in the whole State of Connecticut. The present organization which Mr. Howard would have us believe is an overpowering combination which has sunk the Associated Press out of sight because it is conducted by very young men whose chief claim to an education consists in the fact that they do not know how to telegraph, has gradually lost one paper after another in New England, until quite recently when the *Bridgeport Farmer* went over to the Associated Press it was left with no daily paper of even ordinary importance in all Connecticut. The United Press that was built up by telegraph operators was a much more important organization than the one for which Mr. Howard is the official barker, and whose greatest merit lies in the fact that it has borrowed the name of a predecessor, ignoring the excellent advice to "never in borrowed plumage shine."

In spite of Mr. Howard's intimation to the contrary, there really is a going concern known as the Associated Press. It has a list of papers among which such as the *New York Herald, Times, World* and *Tribune*, the *Boston Globe, Chicago Tribune* and the *San Francisco Examiner* are numbered, each one of which is of national reputation, and a connection with any one of which means more than to be rendering a service to fifty of the inconspicuous and almost unknown journals, outside of a radius of a hundred miles from home, which largely compose the clientelle of the United Press of to-day. Very likely the Associated Press has quite a number of telegraph operators in its employ, and it would seem from these continued reprisals that such of them as have graduated from the wires and are handling news are by no means superannuated.

"Once, when nothing was going right upstairs," said General Taylor, of the *Boston Globe*, not long ago, "I hired a new man in some subordinate capacity, and when he had been on duty a few weeks, I opened on him thus:

" 'Is there anyone up on the editorial floor who knows *anything?*'

" 'Yes,' replied the newcomer.

" 'In God's name who is he?' I pursued and he replied:

" 'Morgan, the telegraph operator.' "

And thus it came about that James Morgan finally became the great man on the *Globe* that he is to-day, and the author of celebrated books on Lincoln and Roosevelt. Mr. Howard's conception of modern newspaper making would have kept Mr. Morgan where he was, but, luckily for journalism, history and the world in general, the Howard propaganda is, like his press association, somewhat restricted in scope.

Don't try to eliminate the old-fashioned virtues —many have tried it with indifferent success. No good substitute has yet been found for simplicity, frankness, sobriety, industry, and sincerity.—*The Philistine.*

The Wireless Engineer.

The development of wireless telegraphy to its present state has, says the *Wireless World*, resulted in a demand for a type of engineer to satisfy the requirements of this growing industry.

The nature of the work which a wireless telegraph engineer is engaged in is both interesting and varied, as will readily be judged by the fact that it covers the erection and maintenance, in all parts of the world, of stations whose power varies from ½ kilowatt to 500 kilowatts. In the case of a small ship station the installation is, comparatively speaking, a very simple matter. The accommodation and the power are provided by the ship, and the masts of the ship are available for the aerial wires.

But in the case of a high-power station, its erection in a comparatively uncivilized part of the world is a work which requires the resources of first-class mechanical, electrical and civil engineering. Such work includes the installation of boilers, with all their accessories, steam turbines, direct-current and alternating-current machines, accumulators, switchboards, transformers, etc., in addition to the wireless gear. It also includes the erection of a number of very large masts with the corresponding systems of aerial wires and earth wires.

It might very easily include the construction of buildings and roads, and, as a contrast to all the foregoing, requires the careful tuning and adjustment of the transmitting and delicate receiving apparatus, and, finally, the organization of a telegraph business which has to work as regularly as if it were on an ordinary land line.

It must not, of course, be supposed that a good training will necessarily make a good engineer, and, on the other hand, a capable man can sometimes acquire a good training by methods which differ considerably from those which are generally recommended. In certain cases, therefore, applications are entertained from men who have not exactly fulfilled the letter of the requirements.

The probationary period is ordinarily spent at a special training station, where instruction is given in the principles of wireless telegraphy and in their practical application. As this instruction is of a confidential nature, the probationer is required to sign a strict agreement framed with a view of determining the conditions of his employment, and of securing to the company the full benefit of his services and his knowledge.

As regards general conditions of life, reasonable arrangements are made to cover a man's expenses when he is moved from one place to another. He is expected to be prepared to move at short notice at any time. There is, consequently, a good deal of change in the early years of a man's service, which is agreeable to a single man, but which would not be likely to suit a married man. The service probably provides unrivalled opportunities to engineers to see the world. When engaged on work abroad, a man ordinarily has his living expenses paid, in addition to his salary, and if the climatic or other conditions are bad, he receives a larger salary, each case being decided on its merits.

Hand Set Inter-Phone.

The hand set inter-phone recently brought out by the Western Electric Company is a particularly convenient form of telephone instrument for interior use. The transmitter, receiver and ringing button are all mounted on one handle, so that while the inter-phone is held and operated entirely by one hand, the other hand is left free.

The button is mounted on the inside of the hand

FIG. 1—FLUSH HAND SET INTER-PHONE

set handle in such a position that when the instrument is taken up for use the index finger, in the natural position of the hand, can be placed directly on it for calling the party wanted.

The hand sets are so constructed that when not in use they can be placed in any position without

FIG. 2—THE HAND SET INTER-PHONE IN THE HOME

causing waste of battery current, as the current is shut off automatically when the pressure of the hand is released.

A flush type wall box, with face plate, the same as that used in electric light wiring for a push-button switch, is used to hold an apparatus unit which contains the line terminals and the signaling buzzer. For old buildings, where it is not convenient to mount the flush type, non-flush boxes are available.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, AUGUST 16, 1913.

Limiting the Hours of Labor for Women Operators.

In several States laws have been enacted, and in others are in various stages of formation, limiting the hours of labor for female employes. As women telegraphers come within the scope of these laws the telegraph, telephone and railroad companies are experiencing difficulty in adjusting their affairs to meet the requirements of the law. This is notably true of Texas, where such a law is in force. The telegraph companies which have small offices managed by women have been compelled to transfer these female managers to points outside of the State where such laws do not exist. To carry out the provisions of such restrictive measures where the companies are required to give their women employes periods of rest not enjoyed by the male employes, it can readily be seen that such laws work hardship upon the companies.

The closing of offices in small places at more or less frequent intervals in order to give the women a rest, and compel the public to wait until the expiration of these rest periods before their telegraph business can be forwarded or received, seems preposterous, but that is one of the effects of such laws. The companies realize the serious inconvenience such a condition of things would be caused to the public and are devising various methods to avoid this and yet keep within the law.

The Pennsylvania Railroad has a similar problem. It has women operators in several small but important way stations, where constant duty of an operator is imperative, yet in order to give these women operators the midday and other periods of rest required by the law means practically the closing of the offices for these short periods. Such drastic measures mean more to an operating company than the mere closing of the offices. The convenience of the public does not seem to have been considered in framing such laws, and certainly the people have a right to be considered.

The Old Timers' Reunion.

Old-time and military telegraphers will meet again in annual reunion on August 26, at Detroit, Mich., and everything is being done to give the veterans an enjoyable time.

Once a year these old-timers journey from all parts of the country and meet on common ground where they review the achievements of former days; renew old acquaintances and make new ones. These reunions are really in the nature of family gatherings, and there is no feeling of restraint when the members and their families get together.

The old-timers throw away all cares on these occasions and start out with the single purpose of having an enjoyable time, and they usually get it. They will receive a hearty reception in Detroit this year, and the enjoyment of the good things prepared for them will keep them busy during their stay.

By good fortune, the banquet on the evening of August 28 will, perhaps, be honored by the presence of Mr. Thomas A. Edison, who is touring through Michigan in his automobile. This famous veteran of the key spent his boyhood days in Detroit and vicinity, and the story of his career as a train newsboy between Detroit and Port Huron is well known, and has been woven into history.

The civil and military telegraphers did much for their country during the rebellion, and the country at large has always shown its appreciation for them by giving them a good time wherever they meet in reunion.

Your Duty to Your Employer.

Mr. Thomas Gosden, in an article in *The Commercial News*, of Pittsburgh, Pa., gives the following excellent advice:

Every person taking employment enters into a contract to perform certain duties for which he is to receive compensation, which is mutually agreed upon. This contract, though it be verbal, should be carried out by both employe and employer as faithfully as if it were a written agreement, and the one who would not respect a verbal contract would not do so with a written one.

The employe agrees to report at a certain time and work so many hours per day. It is understood that by reporting for duty he is to start work at that time and to work continuously until relieved at the close of the day, to do a full day's work and to give "value received" for his services. Much time is wasted by many, not only in starting work, but at odd times during the day. Every one should realize that "Time is Money."

Take a force of twenty-five men who agree to work between the hours of 8 a. m. and 5 p. m., with one hour for dinner, or eight hours work, and each person wastes twenty minutes per day by reporting late in the morning, after dinner hour, or during the day, this would mean a daily loss of five hundred minutes, or eight and one-third hours per day—the full time of one employe. In other words, if each one had performed his duty conscientiously, the force could be reduced one employe and the same volume of work performed. It can be readily figured what the loss would be at any of the large mills where from ten to fifteen thousand men are employed, each of whom wastes, say, ten minutes each day of his employer's time.

Many who deliberately neglect their work and throw away the time for which they are paid would feel that great injustice was done them if they were accused of robbing their employers. But it is a fact, nevertheless, that by taking from him his time you are taking from him so much money, which could be saved had each and every one performed his duty.

Be prompt, industrious, give your best efforts, and you will have performed your part of the contract and your duty to your employer.

Indications of Trouble in Storage Batteries.

Mr. J. R. Lane, division equipment engineer of the New York Telephone Company, gives, in *The Telephone Review*, some practical information regarding the care of storage batteries.

In the operation of batteries of this type, he says, there are many cases where close observation and inspection of the cells will indicate abnormal conditions which, if allowed to continue, would cause trouble. Some of the indications are given in the following article, which should not be understood to modify any of the existing instructions:

SHORT CIRCUITS.

The most frequent trouble is partial short circuit in a cell. Probably the earliest indications of this are the absence or deficiency of gassing during overcharge, or falling off in voltage or specific gravity as compared with surrounding cells. Another indication is positive plates lighter and negative plates darker in color than those in surrounding cells. The cause is usually one of the following: Lugs touching at the top of the jar or the supporting plate; a deposit of sulphate or sediment between the lugs at the same points; buckled plates; sediment touching plates; broken or missing separators. If the trouble is cleared at once, the cell affected may be used as a pilot cell for the next overcharge, which will usually bring it up to normal. If, however, the cell has become excessively discharged, an individual charge will be necessary.

IMPROPER CHARGING.

There are many indications, aside from the regular readings, which tell us whether or not the battery is being handled properly. The power may be so variable that the charging rate cannot be assured, especially in very small batteries. The attendant may be careless, instruments defective, variable load not allowed for, machine too small, and other complications may occur which indicate that the charging should be checked by other means than observing the readings. One of the best indicators of the condition of the battery is the light-colored deposit on top of the positive plates. If this deposit is light and "powdery," it is easily brushed off with a toothpick or pencil, and shows a rich brown color underneath, the battery is receiving sufficient charge. If it is hard and comes off in flakes or scales, the battery is not being overcharged long enough or often enough. If the former condition is found, the buttons in the positive plate should be tested by sticking a pencil or toothpick, or similar non-metallic point into them. If the point penetrates, or the button seems soft, the overcharge has been carried too far, or is too frequent, or the regular charge has been carried too far. The gassing should be observed during charge. If the charging rate is correct, the bubbles will be about the size of a dime when the battery has reached the regular charge (five points specific gravity below the overcharge when tanks are fully equipped). On the overcharge, of course, they will continue to grow larger until the level reading point is reached. If the charging rate is low, the cells will not gas freely. The gassing on the overcharge, by the way, has an important mechanical function, that of cleaning the positive buttons of the dead peroxide of lead. If the buttons have a "gummy" appearance or are comparatively smooth, it indicates that the overcharge is not correct. The buttons should have a clean, brown appearance and the points should be sharp.

A mossy growth on top of the negative plates is caused by excessive overcharging. If the negatives appear rough and full of pits and holes on top, it is caused by allowing the electrolyte to get so low that the plates project above it. The instructions should be strictly followed in regard to adding water.

BUCKLED PLATES.

This condition may be due to excessive overcharging, generally due to too high rate, undercharging or discharging at too high rate. In the first case, it is due to the excess of peroxide, causing undue expansion in the buttons. In the second case, it is caused by a deposit of sulphate on the buttons, clogging them so they cannot expand. At the first sign of buckling, the cause should be determined by the indications given and the condition remedied. Do not attempt to straighten the plates while in service.

IMPURITIES IN ELECTROLYTE.

This condition is usually indicated by the positive plates becoming very light in color and the buttons or active material bulging out of the positive plates and becoming soft.

In general, if any of these conditions are noted, the power plant supervisor should be notified.

Mr. S. J. Murphy, manager of the Postal Telegraph-Cable Company, at Erie, Pa., writes: "I always look forward to each issue of the Age, as I take much pleasure in reading about my fellow-workers and to know what is being done in the telegraph field."

Course of Instruction in the Elements of Technical Telegraphy—XLV.

(Copyrighted.)

(Continued from page 408, August 1)

[The Course of Instruction in the Elements of Technical Telegraphy, which has been running regularly in this journal since October 16, 1911, has met with wide-spread favor and is being studied diligently by thousands of telegraphers and others throughout the world. It is being translated into Spanish, and printed in South American electrical journals, and has attracted universal attention for its clearness of expression and its practicability. It has been endorsed by the officials of telegraph, telephone, cable and railroad companies, many of whom have acknowledged the improvement in the technical standing of their progressive employes, and they commend the course as being of the most practical kind of instruction.

This course was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, and is being published now for the benefit of those of our readers who desire to fit themselves for higher positions in the engineering branch of telegraphy, and it has been a valuable aid in this direction. It is elementary, and devoid of higher mathematics, yet it is fundamental in character and extremely easy to learn.

Each chapter is complete in itself, and the chapters are arranged in natural order so that the student acquires the knowledge step by step in logical sequence. Each chapter is followed by test questions on the subject of the chapter, thus enabling the student to review his progress from time to time.

Back numbers containing these valuable lessons can be obtained at 10 cents per copy.]

The Milliken' Repeater.

The student has no doubt observed from the preceding descriptions of repeaters that their only difference lies in the device used for preventing the opposite transmitter from breaking when, for instance, the eastern circuit is repeating into the western. A drawing of the device alone should therefore suffice for the illustration of any other form of repeater.

The Milliken' repeater was for many years the standard repeater in this country, but has lately been supplanted in many instances by the Neilson, Phillips and Atkinson. Fig. 56 shows the Milliken device for the prevention of false breaks. R and R^1 are the main line relays; E M and E M^1 extra magnets; T and T^1 transmitters.

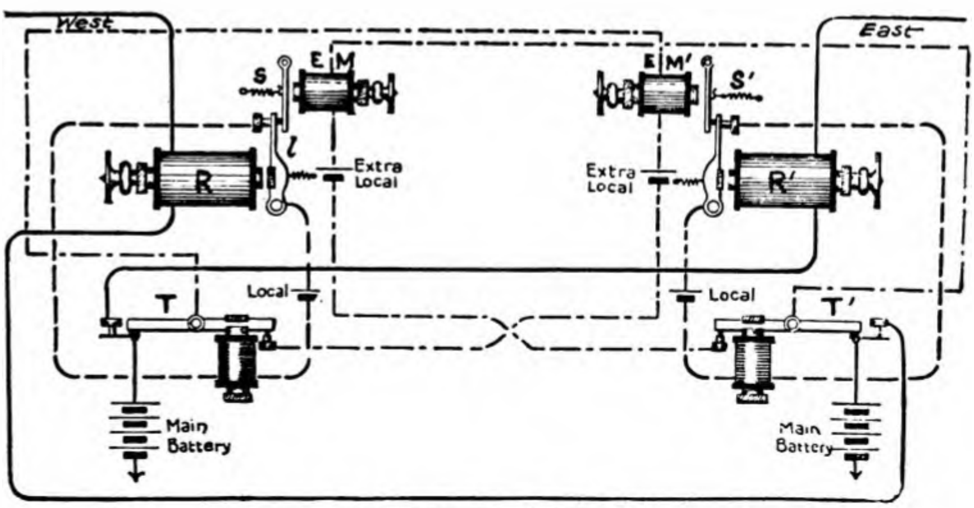


FIG. 56—MILLIKEN' REPEATER

The working of the repeater is as follows: East opens his key, and R^1 responds, its lever falling back and opening the local circuit of T^1 in the usual manner. The moment the armature of T^1 leaves its bottom stop the local circuit of E M is broken, and the retractile spring S pulls its lever against the armature *l* of R. Immediately following this action, the contact spring of T^1 breaks the western circuit, and R would open in response but for the fact that its armature is held to the front stop by the lever of E M. The local circuit of T, therefore, does not open when R becomes demagnetized. When East closes his key, R^1 closes. T^1 does likewise, closing the local circuit of E M, whose armature now leaves lever *l*, thus releasing the latter, and the western circuit having been in the meantime restored through the contact spring of T^1, R is magnetized and *l* remains closed.

Should West break, R, being demagnetized, opens T, which breaks the eastern circuit at its contact spring.

It is not intended that the student should endeavor to remember all the connections of these different repeaters. Remember the devices used, and there will never be much trouble about the connections. It is excellent practice, however, to trace out the different actions in their order of occurrence, and will prove beneficial later.

QUESTION PAPER.

1. Why are repeaters used on a circuit?
2. In Fig. 50 R^1 is open but S T^1 is closed. How do you explain this?
3. (*a*) In Fig. 51 R^1 is open. Why does T^1 not respond?

(*b*) If T^1 responded to R^1 how would A be affected?

(*c*) When station A opens his key why does R S^1 also open?

(*d*) Explain how R S^1 opens before the eastern circuit is broken?

(*e*) If R S^1 did not open before the eastern circuit, how would the working of the repeater be affected?

(*f*) Why are the transmitters T and T' provided with contact springs?

4. (*a*) Fig. 52. With T closed both coils of D R' are energized. How is the armature affected?

(*b*) Why does T' not respond to the opening of L R'?

(*c*) Explain what happens when East opens his key the western circuit being closed.

(*d*) Can East break when the western circuit is open?

5. (*a*) Explain the action of the repeater, Fig. 53, when East opens his key.

(b) Is the Milliken repeater reliable in bad weather?

6. Show by a diagram the device used in the Phillips repeater for the prevention of false breaks.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What is the name of the instrument used to produce audible telegraph signals?

Study the construction of the key, as described and illustrated on pages 138 and 139 of the textbook, "The Electric Telegraph," by F. L. Pope.

Study the construction of the sounder, as described and shown on page 141.

What is a box sounder?

What is the object of the "box"?

Study the construction of the relay, as described and illustrated on pages 144 and 145.

What is the function of the relay? Why cannot the relay be used to receive on?

What is a "register"?

What is an ink-writing register?

What apparatus comprises the equipment of a way station having only one wire?

Study the connections of this equipment, as shown on page 152.

What is a switchboard?

Referring to Figs. 123 to 127, on page 153, study the method of testing for disconnection, commonly called an "open circuit."

What is a "wedge cut-out"?

What is the "spring jack"?

What is a multiple-wire switchboard?

What is a universal switchboard, and in what points does it differ from other switchboards?

What is the chief advantage of the universal switchboard?

Practice the various changes on the universal board, as shown on pages 157 and 158.

Study the construction of the terminal switchboard illustrated and described on pages 159 and 160.

What is the purpose of the instruments shown on the shelf at the front of the board?

What is a lightning arrester?

Do lightning discharges follow the law of electric currents on wires? That is, do they follow the path of least resistance?

Describe the principle and general form of lightning arresters.

What other means are available for the protection of apparatus against damage by abnormal currents?

How does the safety fuse operate to protect instruments?

In caring for lightning arresters and other protectors what precautions should be observed?

(*To be Continued.*)

Modern Telegraphy.

Mr. C. F. Wright, wire chief of the Postal Telegraph-Cable Company, at Des Moines, Iowa, on July 16 addressed the Des Moines branch of the American Institute of Electrical Engineers at Highland Park College on the subject of modern telegraphy.

"Without the automatic, duplex or quadruplex, would the public be afforded cheaper telegraph rates?" asked Mr. Wright. "Pole lines could not carry the wires necessary to handle the volume of telegraph business if we were without these advantages.

"Mr. John Gott's invention," he said, "put the cable on the same plane as the land line telegraphs. Simplification meant speed and speed is the demand of the public. Could we have dreamed a few years ago of filing a message in London and its reaching San Francisco, New Orleans, Portland, or any other Western city, without passing through several hands? This is now an every-day matter of fact. Five or ten thousand miles in a few seconds is a reality."

Woodpecker an Operator.

James Mankill, an operator at the Berkshire, Mass., railroad station, relates a yarn of teaching a woodpecker to telegraph. He picked up an injured bird near the track one day and took it to his office and nursed it until it got well. It occurred to him that he might teach the bird some tricks, but how he did the trick himself is, for obvious reasons, kept secret. However, he taught the bird the Morse code and it repeated messages sent by Mankill by pecking an the table or the wall. Mankill then went a step further. He induced the bird to use a Morse key, and, in a short time, the woodpecker was able to write "O. K." on the key with its bill.

The inevitable fate is in store for the bird—its owner will take it on the vaudeville stage.

The Morse Telegraph.

As announced in our issue, dated July 16, a tablet marking the site of the first public telegraph office was unveiled in Washington, D. C., on July 4. Mr. George C. Maynard, a former telegrapher, and now connected with the National Museum at Washington, made the dedicatory address, in which were given many interesting facts connected with the early history of the telegraph.

After giving an historical sketch of the development of the electro-magnet by Sturgeon and Prof. Henry, and referring to the discovery by Prof. Ohm, in 1827, of the relations of the current, voltage and resistance in an electrical circuit, Mr. Maynard continued:

"Morse did not know of Ohm's discovery, but he had the benefit of Henry's explanation. Under these conditions he prosecuted his work on the invention. Lacking pecuniary means to procure materials or pay for the services of a mechanician, he took a common canvas stretcher from his studio, secured a second-hand, wooden clockwork to draw the paper through the register and with his own hands constructed his first telegraph machine.

"After much laborious effort, the apparatus was finished. During the years 1834-1836, it was frequently tested and exhibited to a few persons. On September 2, 1837, it was publicly exhibited in the College of the City of New York. The marvellous manner in which messages were sent over the line and correctly received filled the witnesses with amazement and enthusiasm and gave assurance of the entire success of the invention. It was a complete, practical, operative telegraph system, capable of extension to any distance. The apparatus then exhibited, and the descriptions and explanations contained in unquestionably authentic documents, previously placed on record, conclusively show that the invention embraced the following essential features: devices for the manual transmission of signals; for the automatic transmission of signals; for recording signals (by several practicable methods); the relay (which was the forerunner of the repeater); and a sound-receiving instrument. The first instrument for embossing the Morse characters on a strip of paper by a steel stylus, of which record has been found, was made by Gilbert Smith, in the summer or fall of 1843, in his instrument-making shop, and in the presence of Morse and some other interested persons. Various processes for recording telegraphic signs had been tried with more or less success, when the embossing method was suggested. It proved the best of all and was at once adopted.

"February 8, 1838, the telegraph was exhibited to the Franklin Institute, in Philadelphia, and was given unqualified endorsement by the officials of that institution, including some of the men who, not long before, had ignored the electromagnetic telegraph and recommended the adoption of the semaphore system by the Government. Morse then brought his apparatus to Washington and obtained permission to exhibit it in the rooms of the House Committee on Commerce where it was examined by many congressmen and others.

"On February 21, 1838, President Van Buren and his cabinet spent the afternoon thoroughly inspecting the apparatus and inquiring into all the details of its working. Every one who saw the telegraph was convinced of its practicability.

"Another long, wearisome delay ensued and finally, on March 3, 1843, an act was passed appropriating $30,000 'for testing the capacity and usefulness of the system of electromagnetic telegraphs invented by Samuel F. B. Morse, of New York, for the use of the Government of the United States, by constructing a line of said electromagnetic telegraphs under the superintendence of Prof. Samuel F. B. Morse, of such lengths, and between such points as would fully test its practicability and utility.' The bill provided that out of this appropriation a fair compensation for the services of Morse, and persons employed under him should be paid.

"The Secretary of the Treasury made the following appointments:

"S. F. B. Morse, superintendent, $2,000 a year; Leonard D. Gale, assistant superintendent, $1,500 a year; J. C. Fisher, assistant superintendent, $1,500 a year; Alfred Vail, assistant superintendent, $1,000 a year; Ezra Cornell, assistant superintendent, $1,000 a year.

"The preliminary work was promptly commenced. Morse had carefully considered the question of placing the line either underground or overhead, as might be found most expedient, and in all his preparations this alternative was kept in view. The underground plan was first tried.

"A copper wire, insulated with cotton-twine wrapping at the ropewalk of Ebenezer Chase, at Bloomingdale, N. Y., and incased in lead tubing at Tatum's, Philadelphia, by a process patented by James E. Serrell, of New York, was laid along the east side of the Baltimore & Ohio Railroad track, from Baltimore to the Relay House, a distance of about ten miles. The wire was paid out from a reel carried on the frame of a plow that opened a furrow. Levi S. Bartlett contracted for the 'trenching and covering' at $153 per mile. This work was done in December, 1843, under the immediate charge of Ezra Cornell. The insulation of the wire proved defective and the underground plan was abandoned before the end of the month. All the material was then shipped to Washington and taken to workrooms in the basement of the Patent Office building temporarily assigned to the telegraph project. The wire was removed from the lead tubing, poles were purchased and set and the work of stringing the line wire was commenced April 1, 1844."

The building of the line from Washington to Baltimore was then briefly reviewed, the work culminating in the sending, on May 24, 1844, of the first formal official message: "What Hath God Wrought."

"One of the receiving instruments used when this message was transmitted," Mr. Maynard goes on to say, "has been preserved and is in Cornell University. Contradictory statements regarding the manufacture of this apparatus have been made. On

April 1, 1843, the Government paid $150 *'for two telegraph registers,'* to Philip Schuyler. These were evidently the instruments in question.

"Morse's original recording instrument, now in the United States National Museum, is still in working order.

"The experiments on the line during this construction period were not confined to electrical tests to show the condition of the line. The operators constituted themselves as a voluntary information bureau and sent back and forth any items of news that promised to be of public interest. The representatives of the press were quick to take advantage of this opportunity and often offered reports on subjects of special importance. The railroad frequently used the telegraph to aid in the dispatching of trains. In some instances bank checks were informally certified; daily reports of weather conditions were sent. On June 10, 1844, Captain Charles Wilkes, of the United States Navy, with an assistant, made the first use of the telegraph in comparisions of time between Washington and Baltimore, taking their chronometers to the telegraph office for that purpose.

"The office remained in the United States Capitol until September 25, 1844. when it was moved to a building on Seventh street then standing on the site marked by the tablet now unveiled.

"The Sundry Civil bill, approved March 3, 1845, contained an item appropriating $8,000 'for defraying the expenses of the magnetic telegraph from the city of Washington to Baltimore for the current year, ending on the first day of February next,' and placed the line under the control of the Postmaster-General. That official appointed Professor Morse superintendent at a salary of $2,000 per year, Alfred Vail, assistant superintendent at $1,400, and Henry J. Rogers, assistant superintendent at $1,000, fixed the tariff on messages at 'one quarter of one cent for each telegraphic character,' and ordered the Baltimore office moved from the depot to the Post Office. The three persons named as superintendents were the practical, working operators, and it was some months before any other operators were added to the force. Vail generally worked in Washington, while Rogers was in the Baltimore office, although they frequently exchanged places and Morse rendered service anywhere and at any time he was needed. While the receipt of messages by sound was prohibited, Morse and Vail, at least, were in the habit of reading the sound signals made by the instruments. The business passing over the line, being limited to the two cities of Washington and Baltimore, brought in a very small revenue, not enough to pay the costs of operating.

"At the end of the period fixed by law, February 14, 1846, the Government and the telegraph came to the parting of the ways, and separated with feelings of mutual disappointment and regret. The Postmaster-General, and many other prominent officials, held to the opinion 'that an instrument so powerful for good or evil could not, with safety to the citizens, be permitted to remain in the hands of individuals.'

"Morse immediately organized a commercial company," said Mr. Maynard, in conclusion, "and started the business. The outcome proves that the intelligence, the enterprise and the integrity of the American citizen can be relied upon to carry forward an epoch-making, world-revolutionizing undertaking to complete success, with due regard to the best interests of the public with unfailing loyalty to the Government."

Telephone Pioneers of America.

W. T. WESTBROOK

Mr. William Thorn Westbrook, the subject of this sketch, entered the telephone service in Wilmington, Del., in April, 1878. Prior to that time he had been engaged in the telegraph service, starting as messenger in Wilmington in 1850, soon becoming an operator. In 1855 he went to the New York office of the New York, Washington and New Orleans Telegraph Company, as an operator. Professor Morse was a frequent visitor to this office at that time. Mr. Westbrook was manager of the Wilmington, Del., office between 1859 and 1880. In 1878 he became interested in telephone work, and in 1880 resigned as manager of the telegraph office to give his entire time to the telephone interests. He was manager of the Wilmington office of the Delaware and Atlantic Telegraph and Telephone Company between 1878 and 1883, and afterwards became general manager, vice-president and special agent for the same company in Philadelphia, and still holds the last-named position. Mr. Westbrook is an Englishman by birth, having been born in London, June 16, 1838.

W. T. WESTBROOK, PHILADELPHIA, PA. (1878)

BACK NUMBERS.—We desire to call attention to the fact that 25 cents per copy will be charged for back numbers of this journal more than one month old.

A Wire Chief.*

BY J. A. KICK.

A wire chief is the master hand between the construction and operating forces of a telephone or telegraph wire plant. High standards of construction will not prove sufficient to the operating department. Neither can unusual operating methods overcome losses sustained from inefficient maintenance under the direction of unskilled wire chiefs.

The duties of a wire chief are exacting, and, at the same time, fascinating, as a large part of his work consists in directing action based upon deductions from indications of conditions existing at great distances from his point of observation.

Imagine a wire chief directing a lineman to take a train to a certain point, thence by team to pole No. 11,545, and then to be finally notified that the break in the wire was only five or ten poles from the pole indicated. One then has an idea of a common everyday occurrence. Certainly error in listing would cause unnecessary expense and delay to the service, but it is the required accuracy that lends the fascination to correctness.

The field for wire chiefs grows better each day. This is not difficult to understand when one considers the increase in special telephone and telegraph mechanisms, such as selective signaling telephone circuits, and printing telegraph systems.

A single-line telegraph system is not difficult of maintenance, but, at the same time, it is readily agreed that it can be more efficiently operated if the maintenance is under skilled hands.

The position of railway wire chief should be very attractive, as it carries with it possibilities of promotion to dispatcher, and thence upwards through the line of operating officials.

Business of all departments must, to some extent, be handled over the telegraph and telephone wires, and a thinking wire chief can, in a short time, become well acquainted with the general methods of the various departments, and, by his actions in emergencies, demonstrate his capacity for bigger things. Skilled wire chiefs have been known to generally rehabilitate wire plants with little or no extra expense. To do this they have properly directed the efforts of maintenance forces which had previously worked without results, due to improper direction and lack of systematic action.

The ability and methods of a wire chief have a great deal to do with the efficiency and development of maintainers. Let the wire chief intelligently direct and the maintainer becomes interested in and studies his methods. Directing officials cannot but appreciate that the old methods of maintenance are no longer effective, and are giving more attention to developing high-class maintenance methods under skilled wire chiefs.

Operators and maintainers are eligible for the position of wire chief, and it is the aim of officials to promote them from their own organization. All operators or maintainers cannot hope to be wire chiefs any more than they can all hope to be dispatchers, but until one has tried hard to become worthy of such promotion, it is folly to apply for entry to the "Down and Out Club."

Ability to hold a higher position does not often fail to develop in a man who has the qualifications to become a high-class wire chief, for to become such he must have natural ability to direct men and handle material.

From the wire chief's standpoint, the telephone and telegraph business never before presented such a bright prospect for the future as it does at this time. Mechanisms are becoming more numerous and complex, standards are higher, and, as a consequence, men qualified for the positions are very near the level of the next advancing step.

Among operators who do not rise to the wire chief's position are two entirely opposite classes. While the members are not entirely hopeless cases, they need awakening before making progress.

To one class belong the men who look upon the wire chief's work as a form of legerdemain which is so mystifying as to forever keep them afraid to attempt its mystery. In another class will be found men who, through ignorance of the finer sense of responsibility, have a contempt for the so-called mystery, and thus never progress.

The man who is continually doing research work may cover the same ground that thousands of others have in detail, but there is always a little knowledge to be picked up by such workers.

When an operator continually complains that he does not receive promotion to wire chief, a little investigation will reveal the fact that he has not been willing to acquire the necessary knowledge, but has expected the position to come to him by right of service term or good fellowship.

*Telephony.

Diaphragm Telegraph Sounder.

Mr. R. A. Grout, of Davenport, Iowa, a railroad telegrapher, is the patentee of a device called a diaphragm telegraph sounder. The instrument is designed to magnify the sound of a relay armature lever in striking against the contact points, and is entirely mechanical in its operation. It resembles an automobile horn, at the base of which is a steel diaphragm. Against this diaphragm impinges one end of a hinged finger, the other end of which is moved to and fro by the motion of the relay armature lever, to which it is attached. The dots and dashes thus communicated to the diaphragm are magnified through the horn. The sound can be regulated to any degree, and the instrument does away with the necessity of local batteries.

It is being marketed my the Railways' Labor-Saving Device Company, Davenport, Iowa.

Act of a Drunken Lineman.—A lineman was discovered one morning recently in an Eastern city, lying on the wires in midair. Under the belief that the man had been shocked to death the fire department was called out with its ladders and other paraphernalia to get the body down, but on investigation it was found that the man was drunk and had unconsciously climbed the pole and laid down upon the network of wires.

The Molecular Structure of Insulators.

What gives mica, porcelain, ebonite, and insulators in general the property of insulation, is an interesting question propounded by Mr. H. M. Dowset, in the *Wireless World*. We may find an answer to this question, he says, if we examine their molecular structure.

In the course of a series of very interesting lectures recently delivered at the Royal Institution, London, England, Sir J. J. Thomson described the atom as consisting of a spherical positive nucleus, surrounded by a moving belt of equally spaced free electrons or negative charges. It is the motion of these free electrons which constitutes an electric current, and conductivity is the property of transferring them from one atom to another.

In a good insulator, therefore, this interchange does not take place.

The atoms of the inactive gases, helium, neon, argon, krypton and xenon, are not supposed to have any free electrons, but all other insulating elements have either (1) a very tight hold of them, or (2) the atoms are well spaced apart so that their mutual action tending to free each other's electons is weak.

Sulphur is an example of the first class. In its amorphous state, with its atoms fairly close together, it has a resistivity of 4×10^{16} or 2×10^{21} that of copper. This figure is so large that if it were not for its chemical activity, one would be inclined to think that sulphur has no free electrons.

Selenium is similar to sulphur. Measured in the dark, its resistivity is 2×10^{16} or 10^{22} that of copper.

The vapors of the good conducting metals and all gases are examples of the second class. They are all insulators.

If now we consider the effects of atomic groupings on insulation, we have to note that the free electrons in the molecule of a simple element, or in the molecule of a compound, are supposed to be the chemical bonds which hold the atoms together. They are, therefore, less free in this state, and for this reason the molecule is a better insulator than the atom.

Although there are many good insulators, such as mica and quartz, which have a structure, the structureless state, indicating molecular independence, is essentially that which gives best insulation.

When sulphur is changed from the amorphous to the crystalline state its insulation falls. The change is much more marked with silicon. As an amorphous brown powder it is a good insulator, but the steel grey crystals are conductors.

Again, selenium, in the dark, is an insulator, but when exposed to light it receives a structure, and becomes a conductor.

One of the best insulating materials is glass. The whole aim of its manufacture is to ensure that it shall be structureless. Glass is composed of a number of substances which are not chemically combined, but are in mutual solution. Ordinary window glass, for instance, consists of sand, limestone, salt cake, and a few auxiliary substances, silica and lime predominating.

Now, in a liquid solution the molecules of the different substances diffuse evenly all through the volume, as in a gas. Each molecule is as well separated from molecules of its own kind as it can possibly be, and there is no structure. Such is the case when glass is molten. The whole effort of the manufacturer is to retain this state when the glass solidifies.

As the temperature of the liquid falls, one constituent tends to solidify before another, as their freezing points are not all the same. This tendency must be checked, otherwise the material becomes crystalline.

The manufacturer, therefore, at a certain stage of cooling chills the solution rapidly, so that the particles of those substances which solidify first have no time to move together through the resistance of the liquid before the whole is solidified.

The congealed solid, therefore, has its molecules in the same relative position as when the material was in the liquid state. It remains a perfect mixture, and it is this discontinuity of similar substance which is principally responsible for its high insulation.

Glass can be made from a large variety of substances. Even the best conducting elements can enter into its composition and contribute to the production of a good insulator, simply due to the way their molecules are arranged in the material.

The different kinds of glass naturally show different degrees of insulation, according to the resistivities of the elements composing them. Those containing silica and lime are the best, having a maximum resistivity of 2×10^{14}, while those containing lead or alkali are the worst. What is known as conducting glass is very rich in alkali, and has a resistivity of 10^{8}, that is 2×10^{14} as much as copper, so that it is still very much an insulator.

Glass may either be cast in moulds, rolled, whirled into discs, or blown into cylinders. The cylinders may, later, be cut, opened out and annealed into flat plates. It is the blowing process, as we should expect, which produces the best insulator, for this method strains the material until the molecules very nearly part company.

Pitch, rubber, ebonite and procelain are other examples of insulators whose molecules show various degrees of independence in their arrangements. Pitch is an extremely viscuous fluid—structureless, like glass.

Caoutchouc, or rubber, in the raw state, consists of minute transparent globules, about 1/25,000th inch in diameter, suspended in the sap of various trees and shrubs.

When rubber is vulcanized by treating with sulphur, the sulphur appears to enter into the substance of the globules without breaking them down.

As the sulphur combines with each globule independently, when used in small quantities it does not alter very much the general character of the physical properties of the rubber. It increases the strength, flexibility and insulation. Excess of sulphur results in the hard, black insulating material, ebonite. The resistivity of rubber is about 2×10^{9}, and of ebonite about 2×10^{16}.

Reunion of Old Timers and Military Telegraphers.

The thirty-second annual reunion of the Old Time Telegraphers' and Historical Association and the Fifty-Second Anniversary of the Society of the United States Military Telegraph Corps will be held at the Hotel Cadillac, Detroit, Mich., August 26, 27 and 28, and the indications are that it will be well attended. Every inducement has been made to bring out a large number of the members and their families, and there is no doubt that advantage will be taken of the opportunity to visit the beautiful city of Detroit at this the most delightful season of the year.

While the complete programme for the reunion will not be ready to be given out before the meeting, some of the main provisions are as follows:

Tuesday, August 26, 10 a. m.—Business meeting of the Old Time Telegraphers' and Historical Association called to order by the retiring president. Address of welcome and response. Installation of the new president. Transaction of business, etc.

11 a. m.—Business meeting of the Society of the United States Military Telegraph Corps.

2.30 p. m.—Automobile ride about the city.

Wednesday, August 27, 10 a. m. to 5 p. m.—Boat ride. Luncheon on board. Music and dancing.

Thursday, August 28, 10 a. m.—Trolley and ferry rides.

6.30 p. m.—Banquet at the Hotel Cadillac.

The officers of the two organizations are as follows:

Old Timers—President, H. J. Kinnucan, Detroit, Mich.; vice-presidents, W. A. Jackson and A. L. Lafferty, Detroit, Mich.; secretary and treasurer, F. J. Scherrer, No. 30 Church street, New York.

United States Military Telegraph Corps—President, Col. William Bender Wilson, Holmesburg, Pa.; vice-presidents, W. L. Ives, New York; Chas. A Tinker, Brooklyn, N. Y.; M. H. Kerner, New York; secretary and treasurer, David Homer Bates, 658 Broadway, New York.

H. J. KINNUCAN, PRESIDENT OLD-TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION, DETROIT, MICH.

COL. WILLIAM BENDER WILSON, PRESIDENT SOCIETY UNITED STATES MILITARY TELEGRAPH CORPS.

The membership of the various committees and the programme was given in full in our issue dated June 16.

One of the principal features of the reunion will be the presence of Mr. Thomas A. Edison at the banquet on the evening of August 28. He will be in the vicinity of Detroit at the time and has promised to be in attendance at the reunion. Mr. Edison, besides being an old-timer, is acquainted with most of the members through former association, when he was a worker at the key.

Those members who contemplate attending the reunion should not wait until the last moment, or until they reach Detroit, to engage accommodations. The hotels are crowded at this season of the year, and President Kinnucan strongly advises that members secure accommodations in advance so as to be sure that all will be properly taken care of. The Committee on Hotels consists of Messrs. C. H. Cadwallader, chairman; W. M. Hayes, W. A. Jackson, E. W. Malloy and L. C. McCormick, and any one of these gentlemen will be glad to receive applications for hotel accommodations and see that proper attention is given them.

Following is a list of the places and dates of the reunions of the old timers and military telegraphers since the organizations of the two societies, together with the names of the presidents elected at the meetings:

First meeting of old timers, Cincinnati, Ohio, September 8, 1880. O. H. Booth, of Mansfield, Ohio, elected president.

There was no reunion in 1881 on account of the death of President Garfield.

Second meeting, Niagara Falls, N. Y., September 20, 1882. The military telegraphers held a meeting at the same time and place and effected an organization. Mr. W. R. Plum, of Chicago, was elected president of the twin organizations.

Third meeting, Chicago, September 19 and 20, 1883. President, G. M. Dugan, Jackson, Tenn.

Fourth meeting, St. Louis, Mo., September, 1884. President, C. W. Hammond, St. Louis.

Fifth meeting, New York, August 20, 1885. President, James D. Reid.

Sixth meeting, Cleveland, Ohio, August 19, 1886. President, C. C. Hine, New York.

Seventh meeting, Philadelphia, August 17, 1887. President, Prof. David Brooks.

Eighth meeting, Chicago, August 15, 1888. President, Charles E. Taylor, Frankfort, Ky.

Ninth meeting, Louisville, Ky., September 11, 1889. President, Day K. Smith, Kansas City, Mo.

Tenth meeting, Kansas City, Mo., September 16, 1890. President, George C. Maynard, Washington, D. C.

Eleventh meeting, Washington, D. C., August 19 and 20, 1891. President, E. Rosewater, Omaha, Neb.

Twelfth meeting, Omaha, Neb., 1892. President, A. H. Bliss, Chicago.

Thirteenth meeting, Chicago, 1893. President, Charles Selden, Baltimore, Md.

Fourteenth meeting, Baltimore, Md., 1894. President, E. C. Cockey, New York.

Fifteenth meeting, New York, 1895. President, S. A. Duncan, Pittsburgh, Pa.

Sixteenth meeting, Pittsburgh, Pa., 1896. President, James Compton, Nashville, Tenn.

Seventeenth meeting, Nashville, Tenn., 1897. President, J. J. Dickey, Omaha, Neb.

Eighteenth meeting, Omaha, Neb., 1898. President, H. J. Pettengill, Boston, Mass.

Nineteenth meeting, Boston, Mass., 1899. President, H. C. Hope, St. Paul, Minn.

Twentieth meeting, St. Paul and Minneapolis, Minn., 1900. President, L. B. McFarlane, Montreal, Que.

Twenty-first meeting, Montreal, Que., 1901. President, G. H. Corse, Salt Lake City, Utah.

Twenty-second meeting, Salt Lake City, Utah, 1902. President, U. J. Fry, Milwaukee, Wis.

Twenty-third meeting, Milwaukee, Wis., 1903. President, C. C. Adams, Atlanta, Ga.

Twenty-fourth meeting, Atlanta, Ga., 1904. President, John C. Barclay, New York.

Twenty-fifth meeting, New York, 1905. President, W. H. Young, Washington, D. C.

Twenty-sixth meeting, Washington, D. C., 1906. President, H. D. Reynolds, Buffalo, N. Y.

No meeting was held in 1907.

Twenty-seventh meeting, Niagara Falls, N. Y., 1908. President, G. A. Cellar, Pittsburgh, Pa.

Twenty-eighth meeting, Pittsburgh, Pa., 1909. President, W. J. Lloyd, Chicago.

Twenty-ninth meeting, Chicago, Ill., September 8, 1910. President, W. B. Wilson, Holmesburg, Philadelphia, Pa.

Thirtieth meeting, Atlantic City, N. J., September 5, 1911. President, Hon. W. S. Jordan, Jacksonville, Fla.

Thirty-first meeting, Jacksonville, Fla., October 22, 1912. President, H. J. Kinnucan, Detroit, Mich.

How few there are who have courage enough to own their faults, or resolution enough to mend them.—*Poor Richard's Almanac.*

Field Day of Boston Plant Chapter.

The Boston Plant Chapter of the Telephone and Telegraph Society of New England held its sixth annual field day at Point of Pines, Revere, Mass., on August 9, and the event was highly successful in all respects. The Western Union Telegraph Company and the Western Electric Company were largely represented, over 5000 persons being in attendance, and the successful handling of so great a crowd reflects much credit upon the managers of the affair. Everything passed off smoothly.

The character of the prizes contested for is especially noteworthy, consisting of gold and silver watches and medals, gold and silver cuff links, gold bracelets for the lady contestants, and bronze medals. Such liberality is unusual, and, no doubt, the valuable prizes proved to be a powerful incentive in bringing out so large a crowd.

Novel events on the programme were heavy line construction and installation of substation. These contests were participated in by teams of five men, representing the Lowell, Springfield and Worcester districts and the Central Division. Their work was photographed on a moving picture machine. The first prize was won by the Lowell team under foreman Ralph Hardy, each member receiving a gold watch and a president's medal. The second prize was won by the Central Division team.

The substation installation event was won by R. L. Turner, of Lowell, Mass., with H. L. Crawford, of Manchester, N. H., second.

The Lowell team beat the Springfield team at baseball, 11 to 1.

The other events included a mile run; 50-yard dash for daughters of employes; 100-yard dash for fat men; jumping; tug of war; tennis, swimming; bowling; billiards and pool.

President P. L. Spalding and Vice-president E. K. Hall, of the New England Telephone and Telegraph Company, were competitors in the tennis contests, but were defeated. Every department of the company was represented and much enthusiasm prevailed.

Mr. F. X. Colleton was general chairman of committees and Mr. P. L. Spalding was chairman of the honorary committee.

Mr. Gordon S. Wallace, 125 Milk street, Boston, is secretary of the Boston Plant chapter, which is one of the nineteen chapters composing the Telephone and Telegraph Society of New England.

Mr. W. G. Peebles, manager of the Western Union Telegraph Company, Atlanta, Ga., writes: "I shall take advantage of this opportunity and state to you that I regard the Telegraph and Telephone Age as one of the best telegraph and telephone periodicals in existence, and especially do I refer to the technical information appearing in each issue. I have gained many valuable points from it, and think it should be in the hands of every up-to-date manager, as well as the rank and file."

Mr. Worl's Reminiscences of the Early Days of the Telegraph and Some of his War Experiences.

Mr. James N. Worl, the well-known old-time telegrapher, and now Justice of the Peace at Westfield, N. J., in a recent communication gives some interesting reminiscences of the early telegraph days.

"When I entered the service of the Magnetic Telegraph Company at Philadelphia, September, 1848," he says, "we had two wires from Washington to New York, and four operators—Joseph F. Beaty, Wm. P. Westervelt, Louis Zantzinger and John Warrington. I was employed as clerk to file away the messages sent and received each day. Less than one hundred messages were sent daily, and about the same number received. Mr. Westervelt and I acted as batterymen. He was afterwards made chief operator, leaving me to take care of the batteries alone, for which I received an increase of salary. The operators had to do linemen's work when there was a cross or a break on the wires. Later, the company employed James Carnahan, a sailor, as lineman. I showed him how to take care of the sixty cells of Grove battery, and I was thus relieved of that duty.

"Mr. W. P. Westervelt took a great interest in me, and taught me telegraphy. John D. Parks was manager of the Philadelphia office. He arrived at the office every morning about 10 o'clock, looked it over quietly for about an hour, and then disappeared for the rest of the day. Professor Morse frequently visited the office with the president, Hon. B. B. French, of Washington. The next president was Hon. Amos Kendall. He appointed his son, John Kendall, as superintendent. The young man had no knowledge of telegraphy, but could issue many ridiculous orders. He prohibited reading by sound; fined operators $5.00 for each error, and ordered that no operator should send faster than thirty words per minute.

"When the Magnetic Company was merged and the name changed to the American Telegraph Company, Mr. M. Swain, proprietor of the Philadelphia *Ledger*, became the president and Mr. Westervelt acting superintendent. John Kendall took a back seat then.

"Z. Barnum, of Baltimore, succeeded Mr. M. Swain as president, and he appointed Wm. H. Heiss superintendent of the New York and Washington division. The boys liked and respected him.

"When the American Company merged and the Western Union Telegraph Company came to the front Mr. Heiss resigned, and was appointed superintendent of the Cuba cable, then in course of construction through Florida. Marshall Lefferts, of New York, then became the general superintendent, and when the Independent Telegraph Company came into existence and built lines from Portland, Me., to Washington, in 1860, I went over to it. The Morse patent for the register not having expired, we were compelled to use the sounder, and employ operators that could receive by sound. The American Company was paying operators $50.00 per month, and to induce them to come with us, we gave them $75.00. We got all their best talent, because most of the American Company operators received by paper.

"In extending our line from New York to Washington, we encountered some obstacles presented by the American Company and its superintendent, Marshall Lefferts. To cross the Delaware River at Trenton, N. J., the American Company used the bridge there, and to prevent us from placing our wires thereon, it purchased from the bridge company the exclusive right for its wires. We evaded the bridge, and contracted with the Bishop Gutta Percha Company to make and lay us a cable across the Delaware at Trenton, much to Lefferts' confusion. When we continued to Washington another obstacle presented itself. We found the American Company had obtained the exclusive right for its wires to the District of Columbia. We were compelled to establish a temporary telegraph office on the outside of the limits. Learning that the United States Government does not encourage or recognize monopolies, we succeeded in having a resolution passed by Congress giving our company, or any other company, the right and privilege to extend its wires in and through the District of Columbia. Again we had Marshall Lefferts, the superintendent of the American Company, jumping up and down with rage.

"While constructing our line we had five offices, in first-class locations, fitted up, and when we opened we did a great business from the start.

"Knowing that the American Company would not, or did not, have any branch offices, I secured space in all the principal hotels and public buildings, rent free, to establish branch offices in them. Then Lefferts got active again and followed us; but he was too late to get in. He was compelled to rent hallways and small spaces as near us as possible, and called them 'The People's Line' offices. It did not work, however. We advertised as the 'Only Opposition to the Monopoly,' and got the business every time and all the time, especially in July, 1863.

"When the affair of the 'Old Capital Jail,' in Washington, was settled, and our line was honorably exonerated from all blame, etc., I was made press censor for our line at Baltimore. The order of the War Department was that no press news relating to the war should be sent by telegraph or published without being passed by the censors. When Mr. Chapman, the war correspondent of the *New York Herald*, arrived in Baltimore the Sunday morning after the battle of Gettysburg with the first report and news of the battle for the *Herald*, I passed it, and our line got the report of the fight and kept it for two days."

Mr. Worl, in an interview with a *New York Herald* reporter, recently told about the "Old Capital Jail" affair referred to.

"Speaking of those times," said Mr. Worl, "reminds me how I was arrested and my interview with President Lincoln. It was in May, 1863, when a forged proclamation got over the wires that two men came to the Washington office of the Independent Company, with which I was then connected, and told me that I was under arrest. Simultaneously, I learned afterwards, every office of the company was closed. I was taken along to the Old Capital Jail. It was a mighty fine fix to be in. But I thought I'd take things easy.

"I had about fifteen hundred dollars of the company's money, and when I looked around the place I found that they put me in the same room with half a dozen of General Mosby's guerrillas, who were prisoners. One of them was a lawyer and a couple of others looked like decent chaps. I had hardly been there a half an hour when the warden got word from the Secretary of War to 'give Mr. Worl the best quarters in the jail.' I was taken out of the room and I told the warden that I'd like to give him my valuables and the bunch of money. 'You'll be looked after, all right,' he said.

"Pretty soon a negro came up and announced that he was my servant. I told him that I might want him to do quite a lot of work for me if he could cook. 'Cook, he said; 'I just guess I can.' So we went out into a big room, where I saw some of the guerrillas hovering around with hungry eyes, and so that they could hear me, I told the negro to go out and get some beefsteak and ham and eggs. You ought to have seen those fellows when I talked of that food. I had a table prepared, and when the cook came back there was enough for them all. I did that once or twice, and how those fellows did eat!

"Then two days afterwards I got word of my liberation, and I had another meal and the gueril-las actually picked up the scraps and wrapped them up. I wore a gray suit and I saw a nice looking girl just before I was released waving her handkerchief from a window. 'Who's the lovely dame?' I asked one of the keepers. And who do you think it was? None other than Belle Boyd, the celebrated spy. Before I got out of the jail I called the guerrillas around me, and said: 'Boys, I know you won't take a gift. But I want to make you all a loan, and you can give it to me back in fifty years.' Then I handed each of them a ten dollar bill. They were mighty glad.

"I got back my money and went to see Colonel J. J. Speed, and we talked of the forged proclamation. I told him that he ought to go to see the President. He thought I ought to go. So I went around to the White House, and I remember that there was an aged Irishman cleaning the steps. He handed my card to another man, who told me that he did not think that I could see the President. I just told him that I'd got to. 'You take that card up to him,' I said.

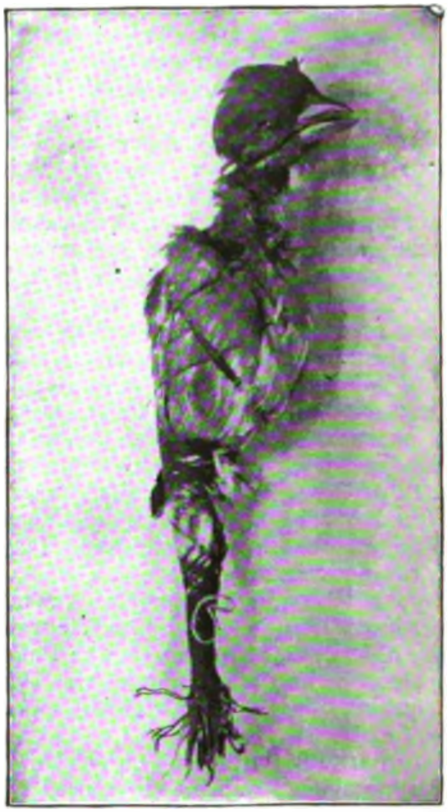
"I recollect now, like a picture before me, how President Lincoln was sitting when I was ushered into the room. His right leg was hung over the arm of his chair and he was rubbing his fingers through his hair. 'Mr. Worl, he said, 'what can I do for you?' I told him that I'd been in jail and about the closing of the offices. Then he said: 'You think now that you got over the fence and have got the big bull by the horns, eh? But I've got a telegram here. It says that a newspaper man forged that proclamation and tells how he did it. I'm sorry you were arrested, Mr. Worl.'

"I told Mr. Lincoln that it had cost me about $150, being in prison. Mr. Lincoln then instructed Edward M. Stanton, the then Secretary of War, to give the Independent Company a complete and satisfactory exoneration. Mr. Lincoln further gave the company permission to place wires in public buildings, and I opened a station in the Seventh Street Post-office in Washington. It may be there now, for all I know."

Mr. Worl is now eighty years of age, but is so well preserved that he appears to be many years younger.

Bird in a Wire-Braiding Machine.

An odd accident to a bird is recorded in the *Western Electric News*. It seems that a colony of sparrows make their home in the crevices among the roof trusses in the cable, rubber and insulating shops at the Hawthorne works of the Western Electric Company, and have become quite tame. They have



BIRD AFTER PASSING THROUGH A BRAIDING MACHINE.

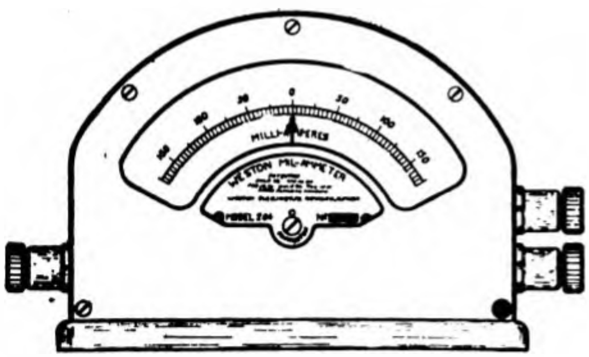
no fear of the machinery, and fly around the rotating spindles with impunity. One of the birds recently got caught in the interweaving threads of one of the braiding machines, and was slowly drawn up through the guide ring. The braiding first stilled the beating of the wings, then enveloped the body and finally wrapped its fatal coils about the bird's throat, thus ending its misery. The work of the braiding machine is plainly shown in the accompanying illustration.

Postal Telegraph-Cable Company's Balance Indicator.

BY JOHN F. SKIRROW, ASSOCIATE ELECTRICAL ENGINEER, NEW YORK.

The Postal Telegraph-Cable Company recently began to use a standard "Balance Indicator," which takes the place of the differential galvanometer formerly used on multiplex sets.

Chief operators are familiar with the operation of the differential galvanometer, which, notwithstanding its many advantages, has, however, many shortcomings. The new balance indicators are, in effect, differential milli-ammeters. They are provided with three binding posts and placed at the split in multiplex sets, the center post being connected to the wire to the battery, and the other two posts to the line and artificial line, respectively. These instruments are extremely sensitive, and, by their use, a practically perfect ohmic and static balance can be obtained. These instruments also show the value of the working current of the line, and are useful in various tests. The instructions issued in connection with these instruments, a copy of which appears herewith, indicate the many uses of these new instruments.



FRONT VIEW OF BALANCE INDICATOR.

The instruments are made by the Weston Electrical Instrument Company, Newark, N. J., and were developed by it on lines indicated by the Postal engineers.

OHMIC BALANCE.

With distant station on ground, adjust rheostat until pointer indicates zero.

With distant station's negative (closed) pole to line: If, when home station puts negative (closed) pole to line, pointer moves toward zero, decrease resistance of rheostat; if pointer moves away from zero, increase resistance of rheostat until pointer is unaffected by reversals.

With distant station's positive (open) pole to line: If, when home station puts negative (closed) pole to line, the pointer moves toward zero, increase resistance of rheostat; if pointer moves away from zero, decrease resistance of rheostat until pointer is unaffected by reversals.

Either home or distant station's negative pole moves pointer to right, positive to left.

STATIC BALANCE.

With distant station on ground and condenser retardation resistances cut out at home station: If, upon closing key (sending negative current to line), pointer kicks to left, increase capacity; if pointer kicks to right, decrease capacity until minimum kick of pointer is observed. Then adjust retardation resistances until pointer is unaffected by reversals.

With negative (closed) pole to line at distant station and condenser retardation resistances cut out at home station: If, upon closing key (sending negative current to line), pointer kicks toward zero, increase capacity; if pointer kicks away from zero, decrease capacity until minimum kick of pointer is observed. Then adjust retardation resistances until pointer is unaffected by reversals.

With positive (open) pole to line at distant station and retardation resistances cut out at home station: If, upon closing key (sending negative current to line), pointer kicks away from zero, increase capacity; if pointer kicks toward zero, decrease capacity until minimum kick of pointer is observed. Then adjust retardation resistances until pointer is unaffected by reversals.

MEASURING CURRENT.

Received current: Throw ground switch to left and open artificial line by moving radial arm of rheostat marked "Thousands" to "Open" stop, then the pointer will show the received current in milliamperes.

Outgoing current: Have distant station ground. Open home artificial line, as stated, then pointer will show outgoing current to line in milliamperes.

If the distant station is on ground and the ground coil is open, the balancing resistance in the rheostat will show abnormally high. The same is true if the coil circuit of the distant battery that is in contact with the armature is open.

If the line is open, the pointer cannot be made to point to zero by adjusting the rheostat.

If line becomes grounded, pointer can be made to point to zero by adjusting the rheostat.

To locate an open battery coil at the home station: Open the artificial line, as instructed, and have distant station ground. If pointer moves to zero when key is closed, the negative battery coil is open; if pointer moves to zero when key is open, the positive battery coil is open.

Dinner of the Postal Telegraph Electrical Society.

The Postal Telegraph Electrical Society of New York held its first annual dinner in Atlantic Inn, Grant City, Staten Island, on July 29, the president, Mr. R. G. Post, acting as toastmaster. Among the invited guests were Messrs. D. McNicol and A. J. Eaves, of the Postal Telegraph-Cable Company's electrical engineer's staff. Both gentlemen are honorary members of the society.

The feature of the evening was an address on "The Telegrapher's Future," by Mr. Donald McNicol, which was greatly appreciated. An abstract of this address will be found in another column of this issue.

Important and Valuable Electrical Books for Study.

"Electrical Instruments and Testing," by Norman H. Schneider, is the latest work on this important subject, and has been brought up to date. It is an extremely practical book, and every telegrapher who is preparing himself to fill positions in the engineering branch of the service should make a copy of this work his text-book in testing. It is thoroughly reliable, and was written by a practical engineer. The section on the testing of telegraph wires and cables was written by Mr. Jesse Hargrave, a well-known telegraph engineer, and the illustrations, of which there are many, are very clear and understandable. The price of this book is $1.15 per copy.

"American Telegraph Practice," by Donald McNicol, is the other book to which we desire to call especial attention. This book contains the latest information and descriptions of telegraph apparatus and systems, and it constitutes a complete course in telegraph engineering. It is well illustrated and a careful study of its contents will give the student an immense advantage in the line of promotion. The more a man knows of it, the more will he be sought when a vacancy occurs. The book deals with every detail of the telegraph engineering and construction services and is written in so clear English that anyone with average intelligence can readily grasp the facts set forth. The telephone in its relation to telegraph operation is also covered to a liberal extent. It is a book that gives one a desire to know it from beginning to end, and, with patient effort, this result can be easily attained. The price of this book is $4.00.

"Handy Electrical Dictionary," by W. L. Weber. This little book, which is of vest-pocket size, is a necessary companion of the two books referred to, as it supplies the key which unlocks the meaning of the technical terms met with in these volumes. To the beginner this little dictionary is really indispensable. It will remove all doubt as to the meaning of technical words and phrases and is a guide post in the study of electricity. Progress in study is much more satisfactory and really enjoyable when one knows that he is on the right road and thoroughly understands what he is reading. This book is a library in itself, and is complete, concise and convenient. The price is 25 cents per copy for cloth binding, and 50 cents for leather binding.

Wireless Telegraphy and Telephony.

Although there are many books on the subject of wireless telegraphy, one of the most comprehensive and practical is Mr. A. Frederick Collins' "Manual of Wireless Telegraphy and Telephony," the third edition of which is now on the market. Mr. Collins is a well-known wireless expert, inventor and author, and has kept ahead of wireless development from its earliest days; he is, therefore, qualified to write intelligently and clearly on this interesting subject.

In his latest book Mr. Collins treats wireless telegraphy and wireless telephony in considerable detail, and by the aid of clearly drawn illustrations and views of apparatus, he has succeeded in treating the subject in so clear a manner that the novice will readily grasp the information and the expert receive new light.

The contents by chapters are: A Simple Wireless Telegraph System; Elementary Theory; Apparatus of a Commercial Station; The Aerial Wire System; Wiring Diagrams for Transmitters; Wiring Diagrams for Receptors; The Apparatus in Action; Adjusting and Operating the Instruments; Different Makes of Equipment; Suggestion to Operators; Wireless Telephony. The appendix gives a list of books on wireless and a glossary of terms, words and phrases. The book covers much ground and will be of great value as a text-book in study and for reference. The price is $1.50 per copy.

Telegraphers of Today.

An excellent opportunity is offered to telegraph people in general to become acquainted with over 600 prominent telegraph officials and others identified with the telegraph, the railroad, the submarine cable and press associations of the past generation, through their portraits and sketches of their careers as published in "Telegraphers of Today."

This work was issued in 1894 and includes photographic engravings and biographical sketches of all the individuals connected with the interests mentioned at that period, many of whom have passed away from their earthly labors. The younger generation, however, will find much of interest in looking upon their portraits and reading of their achievements in life. Many of them are still alive and in harness in the telegraph and other fields of activity.

Mr. J. J. Ghegan, president of J. H. Bunnell & Co., New York, who recently received a copy, expresses his appreciation of the work as follows: "Copy of 'Telegraphers of Today' received. I casually saw a copy of the book when first published, but never had I an idea that it was so beautiful, interesting and historically accurate. It should be of great interest to telegraphers with any sentiment in their make-up. It is magnificent, unique, and I truly pity those of the fraternity who fail to secure a copy before the edition is exhausted. Kindly send me five additional copies. I can use them to good advantage."

This book, which is 11½ x 14 inches in size, was originally published at $5 per copy, but in order to close out the remaining copies we offer them at $1 per copy by express, charges collect.

Address orders to J. B. Taltavall, Publisher, Telegraph and Telephone Age, 253 Broadway, New York.

For Sale.—Bound volumes of Telegraph and Telephone Age for 1912. Price $3.50. Sent by express, charges collect. This price covers the bare cost of binding and handling in addition to the regular subscription price of the paper. The binding is of substantial black cloth, with neat gilt lettering.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THE RAILROAD.

AMONG RECENT NEW YORK VISITORS were Mr. S. L. Van Akin, assistant superintendent of telegraph, New York Central and Hudson River Railroad, Syracuse, N. Y.

CONVENTION OF RAILWAY SIGNAL ASSOCIATION.—The annual convention of the Railway Signal Association will be held at Nashville, Tenn., October 14 to 17.

MR. E. E. BACKUS, of the Hall Switch and Signal Company, Chicago, Ill., was a recent New York visitor. Mr. Backus was formerly with the United States Electric Company, and later superintendent of telegraph and signals on the El Paso and Southwestern Railroad.

RAILROAD TELEGRAPH AND TELEPHONE OPERATORS AND THE NEWLANDS ACT.—A bill has been introduced in the House of Representatives at Washington, to bring telegraph and telephone operators under the scope of the Newlands act, which provides for mediation and arbitration in the case of disputes between railroads and their employes.

REST FOR RAILROAD OPERATORS IN NEW YORK.—The New York Commissioner of Labor has taken action against the railroads of the State to compel them to comply with the Dorst law, which requires railroad companies within the State to give two days' rest each month to telegraph operators and station agents without loss of pay. It is stated that four thousand operators and station agents will be affected.

WOMEN OPERATORS ON PENNSYLVANIA LINES.—The new Pennsylvania law, limiting the employment of women, which will take effect November 1, if approved by the Governor, has created a situation on the Pennsylvania lines in that State which is puzzling the officials. The problem is how to retain over fifty women telegraphers and comply with the provisions of the law. As these operators are employed mostly in small stations, with trains passing frequently, the company is at loss to figure how the women can be allowed to leave for the forty-five-minute rest period at noon prescribed by the law, or how they are to get each Sunday off.

Multiplex Telegraphy and Telephony on Railroads.*

BY W. R. BIRT.

During these times, when so much is being said about economy, efficiency and conservation of various forms of energy, it might not be amiss to consider some of the ways that savings may be effected in the telegraph department of a railroad.

Railroads generally have long lines of copper multiplex telegraph circuits extending from their general offices to their many divisional headquarters. These circuits are used exclusively for the movement of long haul commercial and executive business of the railroad company. The message load they are expected to protect rarely exceeds the capacity of a polar duplex circuit. On a railroad having 6,000 miles of operated road, this class of circuits is frequently in excess of 3,000 miles. The cost of line construction of such circuits, based on the cost of wire, insulators, pins, tie-wires, sleeves and labor is \$38.79 per mile. Assuming a 50-year life, a net scrap value of \$21.30 per mile, maintenance \$1.00 per mile, taxes at one per cent, interest at 6 per cent, and \$2.00 per mile for taking down, would cause an annual charge of \$4.06 per mile to be assessed against these circuits. The utilization of this existing plant when equipping divisions with telephonic train-dispatching and message circuits will make possible a saving of from \$116,000 to \$135,000.

The telephone train-dispatching circuit, as usually constructed, is composed of No. 9 B. & S. gauge, hard-drawn copper wire. The average length of a train-dispatching circuit is 130 miles. In the valley and desert districts the separation between telegraph offices is between twelve and fifteen miles; while in the mountain districts, is generally between five and six miles. The requirements, therefore, are that this circuit shall have a transmission margin sufficient to admit of from ten to twenty-two way-stations simultaneously listening in on the line.

The selective calling equipment now generally employed on these circuits is of the electromechanical step-by-step type of selective relay, the essential features of which are a combination wheel and a time wheel, suitably governed by magnet, levers and detents. Just as a combination lock will open only to its own setting, so the selector can be operated only by impulses of a predetermined number and sequence. The combination wheel differs in teeth cutting in every selector on a circuit, and while the calling impulse sent over the wire actuates every selector, yet it will not go to the contact position and operate to call an office unless its individual combination is made. The selector is wound to 4,500 ohms, and is connected with the proper taper resistance so as to produce equal current in all bridges.

The receiver circuit on the best type of railway telephone equipment developed for this class of service has an impedance of 2,500 ohms, therefore each receiver that is off of its hook occasions a transmission loss of approximately one cable mile for offices beyond that are receiving from the dispatcher.

The first distinct advantage of the telephone, and one that is noticeable as soon as a circuit is placed in service, is the time saved in calling offices for the purpose of putting out orders. An operator having outside duties, such as delivery of freight, baggage or express, etc., has his attention immediately called to the fact that he is wanted by the ringing of the bell, while by telegraph he is called until he happens to come within hearing limits of the telegraph instrument; in the meantime, even though only five minutes may have elapsed, this may have made the combination the dispatcher had in mind valueless, and the set back his train received may result in its having a number of bad delays before reaching the end of its journey. In telegraphic train dispatch-

* Extracts from paper read before the San Francisco Section of the American Institute of Electrical Engineers.

ing, the dispatcher copies the order in his book as it is first repeated; while in telephone dispatching, the order is written in his book as it is transmitted to the interested stations, thus making possible its repetition at about the rate of ordinary conversation.

The bridge type multiplex apparatus is very efficiently operated over circuits of the composite type; one of the greatest advantages claimed for it being in the arrangement of the bridge coils. Instead of being ordinary non-inductive resistances, as in the old type of multiplex apparatus, there are two 500-ohm coils wound upon a ring-shaped core of soft-iron wires. The theory is that because of its closed magnetic circuit, this coil offers great impedance to any current passing through it from one end terminal to the other; consequently, a current coming in over the main-line wire at first meets with considerable opposition in its attempt to flow through the bridge coil, and, as a result, almost all incoming current rushes into the polar relay. This effect lasts only for a small fraction of a second, during which time the opposition to the current in the bridge coil gradually disappears, thus allowing the currents in the various branches to reach their steady values. The brief initial rush of current through the polar relay is sufficient to pull the armature of that instrument over with a speed and precision out of all proportion to the smaller steady current passing through the relay during the remainder of the signal. It is in connection with the operation of the holding coil, which holds the neutral relay closed during the interval of no magnetism due to the current reversals of the distant pole changer, that this coil is particularly beneficial in quadruplex working, because its magnetic discharge is not only utilized to energize the holding coil, but owing to the gradual manner in which the closed core parts with its magnetism, the discharging current is lengthened out, and it is thus possible for it to act upon the neutral relay armature for a period more nearly equal to that represented by the interval of no current at the distant pole changer. Rapidity of action in the pole changer is made possible by its having two electromagnets, one on each side of the armature, and both connected in series in the local circuit. The cores of the front magnet are laminated, which make that magnet quick-acting, while solid cores, surrounded by copper sleeves, are used in the rear magnet to make it slow acting. A light retractile spring is attached to the armature to hold it on the back contact and prevent shivering when the local circuit is open. When the local circuit is closed, current flows through both of the magnets of the pole changer, but the front magnet exerts its attraction slightly in advance of the rear magnet and thus pulls up the armature to the front contact. Soon afterwards, the rear magnet becomes fully energized, but cannot pull back the armature, because the latter is now much closer to the front magnet. When the local circuit is open, the magnetism in the front magnet falls away very rapidly, while that in the rear magnet dies away gradually; as a result, the front magnet releases the armature, while the rear magnet is still capable of pulling it back and the armature is thrown over to its back contact much more swiftly than if the retractile spring alone was depended upon for this action.

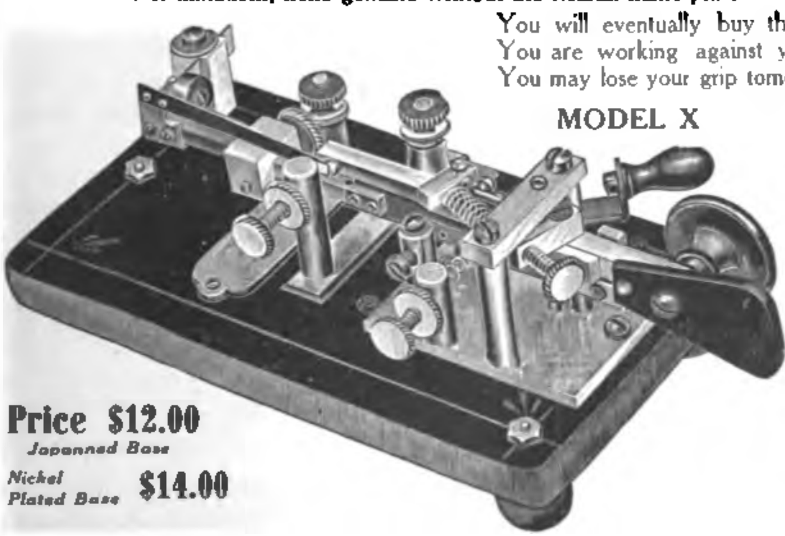
The arrangement of the apparatus heretofore used for repeating from one multiplex set to another was that whereby the receiving relay controlled the sending transmitter through local connections, but the mechanical inertia of these instruments and the increased number of local contact points through which the operation is controlled was not conducive to high efficiency. As the local contact points of the polar relays are now employed to deliver line currents, special devices are provided to control the local circuits for operating reading sounders. When the direct-point repeater was first introduced the polar relays were equipped with double armatures, mechanically jointed together, but electrically separated, one contact controlling the line potentials, and the other the local circuit. The present practice is to use the leak arrangement, whereby a single tap is taken off of the armature of each polar relay and led to the ground through an adjustable 15,000 or 20,000-ohm rheostat. Another method of accomplishing the same result is to substitute a 0.5 mf. condenser for the leak coil, thus obtaining the same response in the polar relay without any loss of current through the leak coil to the ground. The facility of operation, therefore, of the present type of multiplex repeaters contributes in no small measure towards removing the limitations formerly placed on the permissible number of multiplex repeaters in a circuit.

Upon the completion of a dispatching circuit over a busy division, there is usually a demand for a like message circuit. When a division has both a dispatching and message circuit in service, it is obvious that the wires may be used not only for local station-to-station dispatching and message purposes, but for two through multiplex telegraph circuits and a phantom talking circuit as well.

Protector for Cross-Arms and Pins.

It is well known to telegraph and telephone line builders that the entrance of water at the joint between the cross-arms and insulator pins hastens the decay of these parts. Obviously, the way to avoid this decay is to prevent water from finding lodgment at these points.

Mr. H. G. Newell, of Le Raysville, Pa., has recently obtained a patent on a means of accomplishing this result. The device consists of a washer of galvanized iron or other material, preferably with an upturned flange next to the pin and a turn-down flange at its periphery for engaging the pin and arm to thoroughly shut out the water, and thus prevent the decay of both pin and arm. The opening in the washer admits the shank of the pin, which, when in place, rests upon the washer, instead of the cross-arm. The upturned inner flange of the washer is serrated, as is also the turn down outer flange, and in placing a pin in position it is driven in so that the teeth of the flange will enter the shoulder of the pin. The teeth on the outer flange at same time penetrate the wood of the cross-arm, thus a water-tight joint is effected.



A Movable Ground.

We have heard of buffaloes knocking telegraph poles down on the plains by using them as back-scratchers, and of bears climbing poles in search of honey, which they, taking the humming of the wires to be the humming of bees, thought would be found at the top, but we have never heard of wires becoming grounded by ground hogs.

Mr. O. M. Screws, wire chief for the Western Union Telegraph Company at Memphis, Tenn., tells of a very peculiar case of wire trouble, which he claims happened on a wire between Memphis and New Orleans.

The wire became grounded in his testing territory, and he proceeded to measure for the trouble. The measurement showed the ground to be eighty and one-half miles south of Memphis and a lineman was promptly notified, but the lineman found nothing. Later in the day Mr. Screws again measured for the trouble. This time it proved to be only forty miles south of Memphis, and another lineman was notified, with the same result. The following morning Mr. Screws again measured the line, and the trouble appeared to be only three miles south, so he started a Memphis lineman afoot to meet the rapidly approaching trouble.

In a short time the trouble cleared and the lineman returned with the report that he met a groundhog walking the wire and coming toward Memphis. This explained the movable nature of the ground. Wire chiefs should make a note of this.

INDUSTRIAL.

The Hall Switch and Signal Company, New York, announces the opening of a sales office in the new Birks Building, Montreal, Que., with Mr. B. H. Richards, sales engineer, in charge. Heretofore, all Canadian business has been handled through the New York office, and with the idea of better service to the company's Canadian customers, the Montreal sales office has been opened.

Telephone Selector System.—The General Railway Signal Company, Rochester, N. Y., in bulletin 114-B, just issued, gives a very complete description of its train dispatcher's telephone selector system. The value of the descriptive matter is greatly enhanced by many excellent half-tone and line illustrations, showing the apparatus assembled and in detail, and of circuits. After a general description of the system, the switchboard, line motor-generator set, dispatcher's key cabinet, selector, bell and adjuncts of the system are dealt with in separate chapters. At the back of the pamphlet is a folding sheet, containing a typical wiring diagram for a selector circuit, and it has the merit of being very clearly drawn, which cannot be said of all technical illustrations.

Public Service Commission in Pennsylvania.—The bill providing for a new public service commission in Pennsylvania has been signed by Governor Tener, and is now law.

MUNICIPAL ELECTRICIANS.

Annual Convention of Municipal Electricians, Watertown, N. Y., August 19 to 22.

The International Association of Municipal Electricians will hold its eighteenth annual convention at Watertown, N. Y., August 19 to 22, and every preparation has been made to make the meeting both profitable and enjoyable. The headquarters will be at the new Woodruff Hotel and the meetings and exhibits will be held at the Odd Fellows Temple, near the hotel.

President J. W. Kelly, Jr., has done a great deal of work during the year in behalf of the Association, particularly in the way of acquainting municipal electrical engineers of various cities throughout the country with the advantages to be derived from membership in the Association. The effect of this missionary work will be shown at the Watertown meeting in the addition of many new members.

J. W. KELLY, JR., PRESIDENT.

Besides the many papers to be read at the convention, other matters of importance will come up for consideration. Among these will be the report of the special committee to prepare a new constitution and by-laws. This report will be acted upon at this meeting.

The programme for the convention was published in detail in our issue dated April 16. Briefly, it is as follows:

Monday, August 18—Meeting of the Executive Committee at 8 p. m.

Tuesday, August 19—Business sessions.

Wednesday, August 20—Fifty-mile automobile ride for the ladies. In the evening there will be a "Rejuvenation of the Sons of Jove," after which all will join in a midnight luncheon.

Thursday, August 21—Business sessions. The ladies will be entertained by the merchants of Watertown. In the evening the annual banquet will be held at the new Hotel Woodruff.

Friday, August 22—All the members and their wives will visit the paper mills, after which they will be taken on a trip through the Thousand Islands returning by moonlight.

The official announcements, programmes, menu cards, etc., will be printed on paper especially made in Watertown for the purpose, and the ride on Wednesday will be in automobiles built in Watertown.

The meeting of the executive committee, which will be held in the new Woodruff Hotel, Monday evening, August 18, will consider matters of importance, and it is requested that members arrange their plans so as to be present at that time.

A number of members will take the 9.35 p. m. train over the New York Central Road from New York, Sunday, August 17. A special sleeper on that train will run direct to Watertown.

Mr. H. C. Bundy, superintendent of fire alarm, Watertown, N. Y., has charge of the arrangements for hotel accommodations and exhibits. The minimum rates at the New Woodruff is $3.00 per day.

Following is the official programme of the meetings:

Tuesday, August 19.—9.30 a. m.—Registration of members and guests in Convention Hall.

10.30 a. m.—Address of welcome, by the Mayor of Watertown; Response for the Association, by J. B. Yeakle, past-president; President's address; Appointment of Committees.

2.00 p. m.—Police signalling session. "Improvements in Police Signalling Boxes," by Price I. Patton, electrical bureau, Philadelphia, Pa.

Wednesday, August 20.—10.00 a. m.—Fire-alarm session. "Operating Fire-Alarm Systems in Smaller

Cities," by A. C. Farrand, Atlantic City, N. J.; "Central Energy for Fire-Alarm Circuits," by George McD. Johns, superintendent fire and police telegraph, St. Louis, Mo.

2.00 p. m.—Muncipal inspection session. "Moving Picture Risks," by R. A. Smith, city electrician, Norfolk, Va.; "The Electrical Wiring Standard and the Efforts to Maintain It," by William S. Boyd, Chicago, Ill.

Thursday, August 21.—10.00 a. m.—"Allowable Voltages in Overhead Construction in Cities," by Clayton W. Pike, chief electrical bureau, Philadelphia, Pa.; "Grounds," by H. P. Liversidge, electrical engineer, Philadelphia Electric Company; Report of committee on "Grounding of Boxes," by Timothy C. O'Hearn, city electrician, Cambridge, Mass.

2.00 p. m.—Electricity in Municipalities," by Howard Joslyn, city electrician, Seattle, Wash.; "Street Lighting," by Leon Taylor, city electrician, Dallas, Tex.; Report of Committees; Election of Officers; Selection of place for holding next convention.

President Kelly expects to give the members of the Association several surprises in the way of short papers and addresses by distinguished delegates who are not on the announced programme.

There is also the possibility of a special session on Tuesday evening, of which suitable announcement will be made.

This convention will be the eighteenth held by the Association. The officers for this year are: John W. Kelly, Jr., Camden, N. J., president; O. C. Trusler, Indianapolis, Ind., first vice-president; W. R. Arbuckle, Bayonne, N. J., second vice-president; A. G. Sangster, Saskatoon, Sask., Can.; third vice-president; C. R. George, Houston, Tex., secretary; C. E. Diehl, Harrisburg, Pa., treasurer.

The places and dates of meeting of all of the conventions since the organization of the Association, together with the names of the officers, are as follows:

1896—Brooklyn, N. Y., September 15. Frank C. Mason, president; L. Lemon, secretary.

1897—Nashville, Tenn., September 14. W. Y. Ellett, president; H. F. Blackwell, Jr., secretary.

1898—Elmira, N. Y., August 9. John W. Aydon, president; H. F. Blackwell, Jr., secretary.

1899—Wilmington, Del., September 5. William Brophy, president; H. F. Cottrell, secretary.

1900—Pittsburgh, Pa., September 25. Morris W. Mead, president; Frank P. Foster, secretary.

1901—Niagara Falls, N. Y., September 2. A. S. Hatch, president; F. P. Foster, secretary.

1902—Richmond, Va., October 7. W. H. Thompson, president; F. P. Foster,secretary.

1903—Atlantic City, N. J., September 2. A. C. Farrand, president; F. P. Foster, secretary.

1904—St. Louis, Mo., September 13. Walter M. Petty, president; Frank P. Foster, secretary.

1905—Erie, Pa., August 23. Jerry Murphy, president; Frank P. Foster, secretary.

1906—New Haven, Conn., August 15. T. C. O'Hearn, president; Frank P. Foster, secretary.

1907—Norfolk, Va., August 7. R. A. Smith, president; Frank P. Foster, secretary.

1908—Detroit, Mich., August 19. J. B. Yeakle, president; F. P. Foster, secretary.

1909—Atlantic City, N. J., September 14. J. B. Yeakle, president (re-elected); Frank P. Foster, secretary.

1910—Rochester, N. Y., September 6. H. C. Bundy, president; Clarence R. George, secretary.

1911—Atlantic City, N. J., September 12. J. W. Kelly, Jr., president; Clarence R. George, secretary.

1912—Peoria, Ill., August 27. J. W. Kelly, Jr., president (re-elected); Clarence R. George, secretary.

Mr. J. E. Albright, of New York, sole agent for the Martin Vibroplex, has entirely recovered from severe injuries received by being violently thrown out of his automobile on Long Island through the carelessness of telephone linemen.

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, Telegraph and Telephone Age, 253 Broadway, New York.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

E. L. Johnson, an operator formerly of this office, died suddenly at Jamaica, L. I., July 30.

W. C. Applegate, formerly of this office, was accidentally killed by a train in Jersey City on July 29.

PHILADELPHIA POSTAL.

Among the recent visitors at this office were Messrs. H. W. Hetzel and D. F. Mallon, of New York, and N. C. Courter, of the engineering department of the Morkrum Printing Telegraph Company, Chicago.

Mr. L. E. Olmsted, printer attendant, has resigned to enter other business. He is succeeded by Mr. C. H. Krewson.

SAN FRANCISCO, CAL., WESTERN UNION.

John A. Lowery, aged fifty-five years, for over thirty years a chief operator and wire chief for the Western Union Telegraph Company on the Pacific Coast, died of heart failure at San Francisco, August 2. He was well known to the telegraph fraternity throughout the country. He is survived by his wife and a young son. The remains were buried at Marysville, Cal., which was the birthplace of the deceased.

Telegraph and Telephone Age

No. 17. NEW YORK, SEPTEMBER 1, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Electrical Terms and Apparatus.

No doubt, nearly every ambitious wire chief and multiplex attendant at times dreams of bettering the service and his own position by inventing some new apparatus, or devising a simpler method of obtaining the same results as with existing apparatus, but he usually soon becomes discouraged because he finds that nearly every scheme he thinks of has been tried before by others.

Now, the reason success so seldom crowns such efforts is that, as a rule, these persons rarely use new material in their inventions. They simply attempt to reconstruct existing apparatus, and operate the new model without adding anything new. If they will examine almost any modern apparatus they will find that the resulting improvement is brought about by a new use of electricity.

The trouble with most of us is that we confine our studies of electricity too strictly to the electric properties and manifestations that are used as the basic principle in operating the particular apparatus we handle. For that reason we do not suspect the presence of other effects which may be silently interfering, or of others, possibly as yet undiscovered, which might be applied to useful purposes. In other words, if most of us were better informed about those qualities and effects of electricity which are not required in our own particular line, but are useful otherwise, our chances for accomplishing something would be greatly enhanced.

A fact worth remembering is that nearly every new improvement that has been utilized was discovered accidentally in the by-ways and not in the beaten highway. It would be foolish to believe that there is nothing more to discover, in the face of the many inexplicable influences that interfere with the operation of our telephone and telegraph apparatus. We should get out of the rut.

An electric current and its resulting magnetism are looked upon as practically the only effects of electricity that can be used for telegraph purposes, but is that necessarily true?

CATHODE RAYS.

Cathode rays, for instance, produce luminous effects under certain conditions, and when caused to strike upon the hard glass walls of a Crookes' tube produce waves of a different kind, called X-rays, which are capable of photographing concealed objects that ordinary sunlight cannot reach. X-rays, in turn, produce a secondary wave of still another kind under certain conditions. The velocity of cathode rays, or electrons, is about one-twentieth that of sun rays and invariably carry a negative electric charge. Thus, we see that electricity is constantly doing other work along with the task we give it, where the necessary conditions exist. The question then arises, is it not just possible that many of these effects are harmfully at work in a somewhat weakened state but unsuspected because the conditions, though possibly present, are not sufficiently favorable to cause some manifestation? Who can deny that the commingling of telegraph currents with backfire electrons of opposite direction and velocity may not account for many troubles met with. If such is the case the wisdom of studying the action of electricity in fields other than our own cannot be denied. Electricity possesses many properties not measured in amperes and volts.

X-RAYS.

X-rays are a radiation possessing several qualities of light, yet are invisible to the naked eye. They seem to be produced by the cathode rays when the latter impinge on a hard substance. In other words, they are a secondary effect of cathode rays. They were discovered accidentally by Professor Roentgen while experimenting with cathode rays, and because he could not explain their nature he named them X-rays, the "X" signifying "unknown." X-rays and Roentgen rays, therefore, are identical.

The value of X-rays in photography lies in their ability to pass through most bodies which are opaque to ordinary light, and still, like light, affect a photographic plate or a fluorescent plate.

When a physician wishes to see the condition of a bone or locate the position of a bullet or other solid substance within the human body he causes the X-rays to first pass through the body and then fall on a plate coated with a fluorescent substance which lights up to a degree in proportion to the intensity of the rays that reach it. The fleshy part of the body is almost transparent to the rays, but the bones and solid portions obstruct a sufficient number of rays to cast what is equivalent to a shadow on the plate. This shadow constitutes a visible picture to the eye of the physician, who holds the plate between himself and the person placed in front of the rays.

FLUOROSCOPE.

An instrument used for intercepting X-rays is called a fluoroscope, and was invented by Edison. It consists of a darkened box having an eye-hole at one end and a plate coated with some fluorescent substance at the other. The fluoroscope is excited by X-rays and reveals objects that are opaque to the rays.

Of course, the foregoing effects of electricity cannot be utilized in our present system of telegraphy, and possibly may never be available for that purpose, but a knowledge of them suggests the possibility of photography at a distance, by which the facsimile of an entire message or sheet of press matter may be instantly made. In other words, ideas make for progress, no matter how seemingly impracticable they appear at first. One idea always suggests another. Cathode and X-rays are mentioned here merely to bring out this point.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, August 25:

American Telephone and Telegraph Co.	130⅜
Mackay Companies	86
Mackay Companies, preferred	67
Western Union Telegraph Co.	67¾

Telegraph and Telephone Patents.

ISSUED AUGUST 5.

1,069,307. Telephone Receiver Holder. To A. Wetzel, Los Angeles, Cal.

1,069,458. Telephone Locking System. To W. A. Morse, North Grosvenor Dale, Conn.

1,069,535. Fac-simile Telegraph. To F. De Bernochi, Turin, Italy.

ISSUED AUGUST 12.

1,069,811. Telephone Apparatus for Trains. To P. Robinson, Sudbury, Ontario, Canada.

1,069,899. Microphone. To G. A. Nussbaum, London, Eng.

1,070,104. Telephone System. To G. A. Betulander, Saltsjo-Nacka, Sweden.

1,070,289. Telegraph Apparatus. To A. Rappenecker, Bremen, Germany.

1,070,290. Developing Apparatus for Writing Telegraphs and the Like. To A. Rappenecker, Bremen, Germany.

1,070,291. Device for Locking Desk Telephones. To C. D. Rhinehart, Jr., and L. P. Saponoff, New York, N. Y.

1,070,371. Signaling System. To E. R. Gill, Yonkers, N. Y.

PERSONAL.

MR. THOMAS A. EDISON is spending his vacation on an automobile trip through New England with his family.

MR. FRANK F. FOWLE, the well-known telegraph and telephone engineer, of New York, has been appointed chairman of the committee on telegraphy and telephony of the American Institute of Electrical Engineers.

MR. Y. RIKO, who has been, for many years, an assistant engineer of the Japanese telegraphs at Tokyo, Japan, has been appointed chief engineer of that service to fill the post vacated by Dr. S. Oi, retired. It is believed that Mr. Riko, being a man of energetic character, will find ample opportunity to further develop and improve the service.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. E. KIMMEY, district superintendent, New York, is spending his vacation on a motoring trip in Canada.

AMONG recent executive office visitors were Mr. W. Y. Nolley, manager of the Dallas, Tex., office of the Mackay Telegraph and Cable Company, accompanied by his wife and Mr. E. L. Kearney, assistant manager, Pittsburgh, Pa.

MR. C. P. COBB has been appointed acting manager at High Point, N. C., vice L. I. Nance, who has been granted leave of absence.

MR. F. H. ELSOM's position as manager at Hendersonville, N. C., has been filled by Theodore Maddox.

The following appointments of managers are announced: F. E. McCutcheon, at Willows, Cal., vice O. L. Ely; G. P. Mallen, at Great Falls, Mont., vice R. J. Carey; L. M. Isley, at Fremont, Neb., vice R. T. Stearn; I. C. Hart, at Cadillac, Mich., vice R. J. Stephenson.

AN ODD CAUSE OF WIRE TROUBLE.—In our issue dated August 16, was printed a story of a ground hog walking on a telegraph wire near Memphis, Tenn., thereby causing a ground on the wire. A peculiar case of grounding is reported in Texas. A dead cow lying under the lines of the Mackay Telegraph and Cable Company, between Houston and Beaumont, Tex., attracted many buzzards. The birds alighted on the wires and their combined weight caused them to sag the wires to such an extent as to cross them.

The difference between a progressive and a nonprogressive telegrapher is that one reads TELEGRAPH AND TELEPHONE AGE, and the other does not.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

MR. THEO. N. VAIL, president of the Western Union Telegraph Company, and of the American Telephone and Telegraph Company, has been made a member of the executive committee of the New York, New Haven and Hartford Railroad.

MR. NEWCOMB CARLTON has been elected president of the American District Telegraph Company of New Jersey to succeed Mr. Theo. N. Vail, resigned.

MR. WILLIAM H. BAKER has been elected president of the American District Telegraph Company of New York to succeed Mr. Theo. N. Vail, resigned.

MR. J. C. WILLEVER, United States manager, cable system, New York, will return from his vacation on September 2.

MRS. W. F. BAKER, manager of the Cartersville, Ga., office for twenty-two years, has retired.

MR. W. S. FOWLER, chief clerk to Mr. E. M. Mulford, general manager of the Gulf Division, Dallas, Tex., was a recent New York visitor.

MR. THOMAS A. AUSTIN, of the office of general manager H. C. Worthen, Atlanta, Ga., was a recent New York visitor. He was accompanied by Mrs. Austin.

J. E. FENN, aged sixty-six years, assistant division wire chief at Atlanta, Ga., died in that city August 17. Deceased was born in Cleveland, Ohio, and entered the telegraph service at Hudson, Ohio. He served in the Civil War as a soldier in one of the Ohio regiments, and after his discharge he re-entered the telegraph service. He was identified at various times with the United States Telegraph Company, the Atlantic and Pacific Telegraph Company, the Gallagher Gold and Stock Printing Company of New York, and, in 1876, re-entered the service of the Western Union Telegraph Company. He was division chief for the Postal Telegraph Company at La Junta, Col., for several years, and returned two years ago to the Western Union as electrical engineer of the Southern Division, with headquarters at Atlanta, which position he held until his death. Mr. Fenn was well known in the East and other parts of the country, and was an electrical engineer of high standing.

THE CABLE.

MR. GEORGE R. SHULTZ, manager of the cable office at Punta Rassa, Fla., is on a leave of absence until October 1. He spent some time in New York during August and attended the reunion of the old-timers at Detroit, Mich., August 26.

MR. R. R. HOBBS, superintendent of telegraph of the Louisville and Nashville Railroad, Louisville, Ky., writes: "Thank you very much for continuing my subscription to the TELEGRAPH AND TELEPHONE AGE. Can't get along without it."

THE TELEPHONE.

MR. E. J. HALL, vice-president of the American Telephone and Telegraph Company, New York, is rapidly recovering from an attack of acute indigestion which seized him while he was on his yacht in eastern waters. He is at his home in Morristown, N. J.

NEW EXCHANGE IN ST. LOUIS.—The Southwestern Telephone and Telegraph Company has opened a new exchange in St. Louis, Mo. It is known as "Colfax."

MR. MONTAGUE FERRY, engineer in the electrical department of the Chicago city government, has been appointed telephone supervisor in charge of the new telephone complaint bureau established by the city council.

ROAD TELEPHONE FOR AUTOMOBILISTS.—A public telephone has been placed on Pelham road bridge, the Bronx, New York, for the convenience of automobilists. As many as 6,000 automobiles cross this bridge in a day.

TELEPHONE DEVELOPMENT IN ITALY. — The Italian Parliament has authorized the Minister of Posts and Telegraphs to spend $10,800,000 in the construction of overhead and underground telephone lines.

TELEPHONE APPARATUS FOR SERVIA.—Tenders are invited by the Directorate of the Servian Telephones, Belgrade, Servia, for supplying telephone apparatus and instruments, including 225 common-battery wall telephones, 200 common-battery portable telephones, 200 table telephones, etc.

THE LONDON TELEPHONE SERVICE.—Much complaint is made of the London telephone service, and it is stated by many to be worse now than it was before the government took the business over. *The Daily Mail* of that city has, for nearly a year, led a campaign for the betterment of conditions and frequently prints accounts of its own experiences and those of others. The records form a strong indictment against the telephone service. In one instance it took thirty-eight minutes to get an out-of-town connection.

TELEPHONY IN AUSTRALIA.—In the early stages of telephone construction in New South Wales, some 300 lines were erected by private users before the Government assumed control of the system, and the owners of these lines were granted the right in perpetuity to retain them on payment of $25 per annum. An Act was passed in 1911 to empower the Government to resume the lines on payment of compensation, to be settled by arbitration, and these powers are now being enforced.

Convention of Telephone Pioneers.

The third annual convention of the Telephone Pioneers of America will be held at the Congress Hotel, Chicago, Ill., October 16.

The business meeting will be held at 10 a. m. In the afternoon addresses will be made by Messrs. Thomas A. Watson, N. C. Kingsbury, Thomas B. Doolittle, and Michael J. Carney. In the evening there will be theatrical entertainment by telephone talent.

October 17 will be devoted entirely to entertainment and in the evening there will be a banquet at the Congress Hotel.

Parties of ten or more can obtain special railroad rates if Secretary Henry W. Pope is advised. Such rates from New York one way, including berth and meals, are $23.90. Further information can be obtained from Mr. Pope, whose address is 15 Dey street, New York.

RADIO TELEGRAPHY.

MR. "JACK" IRWIN, the well-known wireless operator, has been appointed superintendent of the northern district of the Pacific Coast division of the Marconi Wireless Telegraph Company, with headquarters at Seattle, Wash.

D. C. PERKINS, first wireless operator of the steamer "State of California," which sank off the Alaskan coast on August 17, was among those lost in the disaster. Mr. Perkins was the son of a wealthy San Francisco family. Forty persons lost their lives in this wreck. It is said that Mr. Perkins, who was off duty and asleep at the time the steamer struck the rock, hastened to the operating room and ordered Walter Chamberlain, the operator on duty, to seek safety. He then sat down at the key, and, while he was sending the distress call, a falling mast crashed through the wireless room and crushed Perkins to death.

O. L. CLARK, an electrician at the Arlington, Va., wireless telegraph station, died recently of injuries received by falling against the spark gap disc which was making 1,250 revolutions per minute at the time.

WIRELESS STATION FOR CHICAGO.—A large wireless station is to be established at the United States Naval Training Station, at Lake Bluff, near Chicago, Ill. It is stated that the station will be able to communicate directly with New York and San Francisco.

WIRELESS IN BOLIVIA.—The Bolivian government, in June, 1912, signed a contract with the Marconi Wireless Telegraph Company for the erection of wireless stations in that country. The contract was for $165,000, and it is expected that this amount will be increased by a further grant of $180,000 for the erection of additional stations.

NEW STATIONS IN INDO-CHINA.—The most powerful wireless telegraph station in the East has just been opened at Bac-Mai, near Hanoi, Indo-China. This is one of a chain of stations of which three others are already in operation, and which will be joined to the central station at Saigon, work on which has already begun. The Bac-Mai day signals have been received by ships 1,600 miles distant. Its range by night is not yet determined, but, it is said, will probably be 2,500 miles.

RADIO ENGINEERS INCORPORATE.—The Institute of Radio Engineers, Inc., filed organization papers at Albany, N. Y., August 23. The incorporators are: Robert H. Marriott, of Dumont, N. J.; Lloyd Espenschied, of Brooklyn; Alfred N. Goldsmith and John Stone, of New York; Emil Simon, of New Rochelle; Roy A. Weagant, of Roselle, N. J.; Greenleaf W. Pickard, of Amesbury, Mass.; John Hays Hammond, Jr., of Gloucester, Mass.; and John L. Hogan, Jr., of Neponsit, L. I.

APPREHENDING AN EMBEZZLER AT SEA BY WIRELESS.—George Geza, accused of embezzling $25,000 in Vienna, was arrested recently, in Philadelphia, upon the arrival of the steamer "Breslau," from Bremen, says *The Marconigraph*. When it was learned that Geza had sailed from Bremen, the German police officials sent a wireless to Captain Mietzloff, of the "Breslau," describing Geza and asking if the man were on board. They were unable to reach the "Breslau," which was a week out, and the message was relayed to the Eiffel Tower at Paris, whence it was transmitted to the "Breslau." Word was sent back to Vienna that the man they suspected was on board.

NEW BRITISH-MARCONI CONTRACT.—The British House of Commons, on August 8, approved the government agreement giving a contract to the Marconi Wireless Telegraph Company for the erection of wireless telegraph stations on British territory encircling the world. Among the provisions of the agreement are that the Marconi Company will no longer possess the exclusive right to erect long-distance stations for the Government during the five years from the date of the agreement. A time-limit for the construction of the work is now provided for, with a penalty of $750 for each month's delay. The speed of automatic working to be demonstrated is raised from fifty to seventy-five words per minute, except in the presence of temporary atmospheric disturbances, and provision is made that if the Government is using a non-Marconi patent at a station on terms arranged with its owners, the Marconi Company may not, by purchasing it from those owners, convert it into a Marconi patent within the meaning of the agreement. Reports by the engineer-in-chief of the Post Office and the Inspector of Wireless Telegraphy indicate that, in their opinion, it is not desirable to invite tenders from either the Goldschmidt or the Poulsen companies at present.

The Reunion of Old-Time and Military Telegraphers.

The thirty-second annual reunion of the Old-Time Telegraphers' and Historical Association and the fifty-second anniversary of the Society of the United States Military Corps was held at the Hotel Cadillac, Detroit, Mich., August 26, 27 and 28, and was a very successful affair. There was a large attendance and the weather was fine.

The following officers of the old timers were elected: President, George M. Myers, Kansas City, Mo.; vice-presidents, A. B. Richards, E. Dickinson and G. W. Brownson, all of Kansas City; secretary, F. J. Scherrer, New York. The next reunion will be held at Kansas City, Mo., in September, 1914.

Our issue dated September 16 will contain a full account of the proceedings, etc.

Mr. Vail on the Telephone Situation.

Mr. Theo. N. Vail, president of the American Telephone and Telegraph Company, in discussing the Government suit against his company in the Pacific Northwest, as well as the pending telephone investigations of the Interstate Commerce Commission, has outlined the policy and purpose of the company in the conduct of its business and the relations of the Bell system and the public.

"We believe in and were the first to advocate state or government control and regulation of public utilities," he said; "that this control or regulation should be by permanent quasi-judicial bodies, acting after thorough investigation and governed by the equities in each case; and that this control or regulation, beyond requiring the greatest efficiency and economy, should not interfere with management or operation. We believe that these bodies, if they are to be permanent, effective and of public benefit, should be thoroughly representative; they should be of such character and should so conduct their investigations and deliberations as to command such respect from both the public and the corporations that both will, without question, accept their conclusions.

"We believe that the public would, in this way, get all the advantages and avoid all the manifest disadvantages of public ownership.

"We believe that the highest commercial value of the telephone service depends on its completeness. We believe that this highest commercial value can only be attained by one system under one common control, and that it cannot be given by independent systems unless they are operated under agreements which result in one common control and one common interest, in effecting making them a single system.

"We believe that rates should be so adjusted as to afford the company sufficient revenue to pay such wages and compensation as will secure the most efficient service and to maintain the very highest and most advanced standards of plant and apparatus. We believe, that, in addition, such fair charges should be paid upon the investment in plant as will enable the company at any time to obtain money necessary to provide the plant required to meet the continuing demands of the public.

"We believe that any surplus beyond that necessary to equalize dividends on a fair basis should be used by the company for the benefit of the public, and should be inalienable for any other purpose, and should be either invested in revenue-earning plant until it is necessary to replace a plant which may become inadequate or obsolete, or should be used to make the service cheaper or better.

"We believe that, under proper governmental control and regulation, the profits from promotion or operation allowed to be distributed should not be so large as to warrant or tempt complete duplication of plant and organization, with its duplication of its capital charges and its organization, operating, maintenance and depreciation expenses, and we do not believe that utilities, giving at fair rates, an efficient and sufficiently comprehensive universal service should be subject to limited competition, not giving such service. Competition which ignores the obligation to furnish a complete and comprehensive service is not competition, is not for the benefit of the public, in that it does not reach the whole public interested.

"If, therefore, complete duplication, with its dual exchange connection and dual bills for service, is a prerequisite to complete competition, government control and regulation cannot go hand in hand with competition."

Meeting of English Marconi Company.

Mr. Guglielmo Marconi, in his address at the annual meeting of the shareholders of the Marconi Wireless Telegraph Company, in London, August 22, made some pointed remarks regarding the company's recent experience with the British Government. He said he would not for a moment have believed that the spirit of fair play in England could have reached so low an ebb, nor would he have believed that for such considerations, which had obtained in connection with the whole campaign, a British industry such as theirs should have been so imperiled. It should not be forgotten, he continued, that while the company was carrying on a remunerative business, it was also accomplishing work of the highest importance for civilization. He could not learn of an instance where Parliament ever before had had recourse to the sledge-hammer power which it possessed of placing a private enterprise in such a position that its only alternative to making further concessions was the imperiling of its reputation and business throughout the world.

Mr. Marconi announced that wireless telegraphy would soon be fully established between the United States and the South American republics. A fifty-year concession, he said, had been granted by the Brazilian Government, which would enable the company to inaugurate wireless communication between that country and New York and elsewhere in the United States. This, he added, would be followed by a network of communication between South America, the United States, and Europe.

With no intention of belittling attempts made by others to establish communication by means of wireless telegraphy across the Atlantic, Mr. Marconi pointed out that no other system had succeeded in establishing a wireless service of any kind across that ocean.

Mr. Godfrey Isaacs, managing director of the company, made some remarks in which he ventured the prophecy that the date was not far distant when, with the morning cup of tea on board ship, passengers might hear the ring of a wireless telephone and talk to friends on shore.

It is stated, in this connection, that the Marconi Company has acquired the rights of the Betulander automatic telephone system.

Magunna Tuning-Fork System for Wireless Telegraphy.

Mr. H. Magunna, an engineer of Paris, France, has devised a system of wireless apparatus which is of interest on account of the new method employed for producing musical sparks by the use of continuous vibrations, says the *Electrical Review and Western Electrician.* His recent idea in the way of wireless telegraphy embodies the use of a tuning-fork device in order to furnish proper low-voltage current for operating the primary of the induction coil for the wireless circuit.

Perfecting his previous tuning-fork apparatus, he now succeeds in making vibrators which convert direct current into vibratory current. The forks serve to break a direct current of five amperes at 220 volts so as to secure an oscillating current whose period is very constant. Using such current for wireless telegraphy apparatus he secures the advantage of the musical spark and at the same time has a less complicated outfit than usual, so that it is well adapted for light and portable plants.

The principle which he uses is out of the ordinary, for instead of employing the usual electro-magnetic method for setting up the vibration of the tuning fork, he first fixes the fork firmly in place, then disposes a small belt running between a pair of pulleys, so that the outer sharp angle of one of the prongs bears somewhat against the belt, and in this way the latter acts on the same principle of a violin bow in order to keep the fork in constant vibration. A small electric motor serves to drive the first pulley so as to maintain the belt in motion. In this way the usual electro-magnet method for vibrating the fork is dispensed with, and all that is needed is an electric contact which the fork breaks regularly, using for this purpose a fixed contact screw working against one of the prongs in the customary way.

The tuning-fork break is connected in series with the transformer primary and telegraph key to the terminals of a small direct-current generator, using a condenser at the break to suppress the sparks. The frequency of the current thus obtained in the secondary of the transformer is equal to that of the fork and in consequence it is quite constant and does not depend on the speed of the mechanical parts or motor. In practice he mounts two forks against the same belt, one for 640 and the other for 760 double vibrations, standard pitch, and can use one or the other for the wireless transmission by throwing a two-way switch.

The parts of the portable military field station are remarkably light, and are also applicable to aeroplanes and airships, small boats and the like, and in some cases for cavalry pack use. The present army field posts outfits are contained in four boxes, the first one holding the generator set and including a 1.25 horsepower gasoline engine for driving the generator by belt. The weight of this group is only 100 pounds. The generator furnishes 220 volts direct current, which is then transformed to oscillating current in the tuning-fork device, the standard current in the vibrator being five amperes, corresponding to about 300 watts in the primary of the induction coil. Such wireless posts will work at a range of fifty miles in the daytime. Using a telephone receiver there is heard a musical note, of quite constant pitch, and thus the sound is remarkably clear and is less interfered with than usual by outside disturbances.

Ampere-Turns.

The difference in the strength of two magnets varies directly with the resistance of their coils. The greater the difference of the resistances of the magnets the greater will be the difference of the ampere-turns, and consequently the strength of the magnets. In theory it would vary in direct proportion with the resistances, so that the strength of the 16-ohm sounder would be four times that of the 4-ohm sounder. Such, however, is not the case. Although the resistance of the 16-ohm sounder is four times that of the 4-ohm sounder, the number of turns of wire in the 16-ohm sounder is not four times that of the 4-ohm sounder, and consequently the number of ampere-turns is not four times as great. This is due to the following reasons: In order to obtain more turns of wire and the necessary resistance for the 16-ohm sounder on a magnet of the same size as that of the 4-ohm sounder it is necessary to employ finer wire. This finer wire is insulated in the same manner as the coarser wire of the 4-ohm sounder and the thickness of the insulation is very nearly the same. Inasmuch as there are many more turns and therefore many more feet of this finer wire than there are of the coarser, more room is taken up by the insulation in the 16-ohm magnet than in the 4-ohm magnet. It is also more difficult to wind the finer wire so that the turns and layers will lie closely together and regularly, and some space is lost in this manner. Consequently, in order to obtain the required resistance of 16 ohms a wire a size smaller than would be indicated theoretically must be used, with the result that the resistance increases more rapidly than do the number of turns of wire, that is, in comparison to the winding of the 4-ohm magnet.

The Telegraph and Telephone Life Insurance Association.

On August 18, the time-honored name, "Telegraphers' Mutual Benefit Association," passed out of existence, as a result of changed conditions, and the new title, "Telegraph and Telephone Life Insurance Association" was substituted therefor. The older members who have grown up with the Association will no doubt find it hard to become accustomed to the new name, but they have the satisfaction of knowing that the business of the organization is in no wise affected by the change, except that greater effort will be put forth to make the association fit its new title.

Telephone Pioneers of America.

H. A. McCOY.

Mr. Hugh Angus McCoy, division superintendent of plant, New England Telephone and Telegraph Company, Lowell, Mass., starting as an operator, has steadily risen to his present post through all the intermediate positions. He entered the telephone service at Fall River, Mass., in 1883, as an operator, afterwards becoming an inspector, lineman, switchboard installer, foreman and general foreman. Thus, backed with a large experience in the technical, mechanical and operating details, he was appointed district superintendent, and afterwards construction engineer, finally becoming division superintendent of plant, which position he still holds.

H. A. MCCOY, LOWELL, MASS. (1883).

Engineering and Educational Articles Which Have Appeared in "Telegraph and Telephone Age" Since January 1, 1913.

Quick-Acting Repeaters. By W. H. Jones. January 1.

Electricity in Municipalities as Applied to Fire-Alarm, Police Signaling, etc. By J. W. Kelly, jr. January 1.

Method of Calling on Telephone Party Lines. January 1.

Determining the Size of Magnet Wire for Coil Windings. By A. B. Smith. January 16.

Hand Sending Machines. By W. H. Jones. February 1.

Description of Western Union Bridge Duplex. December 1, December 16, 1912, January 1, January 16, and February 1, 1913.

Gottschalk Telephone Transmitter. February 1.

Rectifiers. By W. H. Jones. February 16.

Cable Splicing. February 16.

Use of Milliammeter for Testing Wires. By J. A. Kick. February 16.

Electro-static Capacity of a Circuit. Febuary 16.

Directive Wireless Telegraphy. By F. Addey. February 16.

Concrete Telegraph and Telephone Poles. By J. W. Lee, jr. February 16.

New Method of Making Concrete Poles. March 1.

Facts About the Modern Dry Cell. February 16.

Care and Selection of Telephone Dry Cell. March 1.

Variation in Wireless Signals. March 1.

Early Telephone Development. By C. E. Scribner. March 1.

Local Absorption in Radio-Telegraphy. By A. H. Taylor. March 16.

Care of Callaud Battery. March 16.

Care of Railroad Telephone Apparatus. March 16.

Concrete Poles. March 16.

Management of Automatic Repeaters. March 16.

How the Telephone Talks. April 1.

London Radio Conference. April 1.

The Berne International Telegraph Bureau. April 1.

Machine Telegraphy. April 1.

How to Become a Successful Manager. April 1.

Care of Storage Batteries. April 1.

Telegraph Cables. By W. H. Jones. April 16.

Intercommunication Between Cables and Land Lines (Gott System). April 16.

How Telephone Cable is Made. April 16.

A Way to Study. By M. M. Davis. May 1.

Balsera Rapid Telegraph System. May 1.

New Western Union Main Switchboard. May 1, May 16, June 1, June 16.

Relay Windings. By W. H. Jones. May 16.

The Arlington Radio Station. May 16.

Selective Signaling Circuit. By J. A. Kick. May 16.

Kleinschmidt Keyboard Perforator. May 16.

New Western Union Office at Omaha. June 1.

Heterodyne Wireless Receiving System. June 16.

New Western Union Improved Quadruplex. June 16, July 1 and July 16.

Cable Relays. July 1.

Creed Automatic Printing Telegraph System. By R. J. Young. July 1.

Inductive Disturbances on Telegraph and Telephone Lines. By P. J. Howe. July 1.

Bug Catchers. By W. H. Jones. July 16.

The Bell System. By C. G. Dubois. July 16.

Resistance of Bridge Duplex and Quadruplex Sets. By H. W. Drake. July 16.

The Weston Milli-Ammeter. August 1.

Traveling Belts for Message Distribution. August 1.

Copies of these issues may be obtained of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, at 25 cents per copy for issues older than one month. The usual price, 10 cents, is charged for copies one month old or less.

Important and Valuable Electrical Books for Study.

"Electrical Instruments and Testing," by Norman H. Schneider, is the latest work on this important subject, and has been brought up to date. It is an extremely practical book, and every telegrapher who is preparing himself to fill positions in the engineering branch of the service should make a copy of this work his text-book in testing. It is thoroughly reliable, and was written by a practical engineer. The section on the testing of telegraph wires and cables was written by Mr. Jesse Hargrave, a well-known telegraph engineer, and the illustrations, of which there are many, are very clear and understandable. The price of this book is $1.15 per copy.

"American Telegraph Practice," by Donald McNicol, is the other book to which we desire to call especial attention. This book contains the latest information and descriptions of telegraph apparatus and systems, and it constitutes a complete course in telegraph engineering. It is well illustrated and a careful study of its contents will give the student an immense advantage in the line of promotion. The more a man knows of it, the more will he be sought when a vacancy occurs. The book deals with every detail of the telegraph engineering and construction services and is written in so clear English that anyone with average intelligence can readily grasp the facts set forth. The telephone in its relation to telegraph operation is also covered to a liberal extent. It is a book that gives one a desire to know it from beginning to end, and, with patient effort, this result can be easily attained. The price of this book is $4.00.

"Handy Electrical Dictionary," by W. L. Weber. This little book, which is of vest-pocket size, is a necessary companion of the two books referred to, as it supplies the key which unlocks the meaning of the technical terms met with in these volumes. To the beginner this little dictionary is really indispensable. It will remove all doubt as to the meaning of technical words and phrases and is a guide post in the study of electricity. Progress in study is much more satisfactory and really enjoyable when one knows that he is on the right road and thoroughly understands what he is reading. This book is a library in itself, and is complete, concise and convenient. The price is 25 cents per copy for cloth binding, and 50 cents for leather binding.

Wireless Telegraphy and Telephony.

Although there are many books on the subject of wireless telegraphy, one of the most comprehensive and practical is Mr. A. Frederick Collins' "Manual of Wireless Telegraphy and Telephony," the third edition of which is now on the market. Mr. Collins is a well-known wireless expert, inventor and author, and has kept ahead of wireless development from its earliest days; he is, therefore, qualified to write intelligently and clearly on this interesting subject.

In his latest book Mr. Collins treats wireless telegraphy and wireless telephony in considerable detail, and by the aid of clearly drawn illustrations and views of apparatus, he has succeeded in treating the subject in so clear a manner that the novice will readily grasp the information and the expert receive new light.

The contents by chapters are: A Simple Wireless Telegraph System; Elementary Theory; Apparatus of a Commercial Station; The Aerial Wire System; Wiring Diagrams for Transmitters; Wiring Diagrams for Receptors; The Apparatus in Action; Adjusting and Operating the Instruments; Different Makes of Equipment; Suggestion to Operators; Wireless Telephony. The appendix gives a list of books on wireless and a glossary of terms, words and phrases. The book covers much ground and will be of great value as a text-book in study and for reference. The price is $1.50 per copy.

Telegraphers of Today.

An excellent opportunity is offered to telegraph people in general to become acquainted with over 600 prominent telegraph officials and others identified with the telegraph, the railroad, the submarine cable and press associations of the past generation, through their portraits and sketches of their careers as published in "Telegraphers of Today."

This work was issued in 1894 and includes photographic engravings and biographical sketches of all the individuals connected with the interests mentioned at that period, many of whom have passed away from their earthly labors. The younger generation, however, will find much of interest in looking upon their portraits and reading of their achievements in life. Many of them are still alive and in harness in the telegraph and other fields of activity.

Mr. J. J. Ghegan, president of J. H. Bunnell & Co., New York, who recently received a copy, expresses his appreciation of the work as follows: "Copy of 'Telegraphers of Today' received. I casually saw a copy of the book when first published, but never had I an idea that it was so beautiful, interesting and historically accurate. It should be of great interest to telegraphers with any sentiment in their make-up. It is magnificent, unique, and I truly pity those of the fraternity who fail to secure a copy before the edition is exhausted. Kindly send me five additional copies. I can use them to good advantage."

This book, which is 11½ x 14 inches in size, was originally published at $5 per copy, but in order to close out the remaining copies we offer them at $1 per copy by express, charges collect.

Address orders to J. B. Taltavall, Publisher, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

FOR SALE.—Bound volumes of TELEGRAPH AND TELEPHONE AGE for 1912. Price $3.50. Sent by express, charges collect. This price covers the bare cost of binding and handling in addition to the regular subscription price of the paper. The binding is of substantial black cloth, with neat gilt lettering.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

CHANGES OF ADDRESS.—In ordering a change of address the old as well as the new address must be given.

REMITTANCES to Telegraph and Telephone Age should be made invariably by draft on New York, postal or express money-order, and never by cash loosely enclosed in an envelope. By the latter method money is liable to be lost, and if so remitted is at the risk of the sender.

NEW YORK, SEPTEMBER 1, 1913.

Progress and Character.

Progress, as defined by the Standard dictionary, is "advancement in growth, development or orderly course—specifically, advancement toward a higher or better state, as in civilization." Progress, therefore, concerns the individual and public welfare, and must, necessarily, be based upon good. Nothing based on evil or wrong contains the elements of progress. Hence, true progress must be based on truth and right thinking. A person progresses in the acquirement of knowledge and the useful application of such knowledge becomes an element in general progress. In this way the world is constantly advancing in civilization and humanity is enjoying greater benefits by reason of such progress.

True progress, to be enduring, must be based on sound principles and the exercise of such virtues as justice, honesty, and a regard for the rights of others. When a situation is thoroughly analyzed the conclusion is forced upon us that these virtues are still vitally potent in the world to-day, notwithstanding the seeming appearance of the power of evil, as reflected in the columns of the average daily newspaper.

If a man is unjust and dishonest, and has no respect for the rights of others, his character is soon found out and he is shunned by the community. His life is based on wrong principles, therefore his actions and relations toward his fellow men must be wrong.

It is really hopeful to see so much attention given by the press to the inculcation and practice of truth and virtue in our daily lives. It shows an awakening to the necessity of the upbuilding of character and will ultimately exert a powerful influence for good in the minds of men, who, through external circumstances, have been misguided as to their duties toward society.

It is not necessary to preach virtue at all times; the important thing is to practice it; practice is the best preacher; and it is refreshing to contemplate in our sober moments that virtue is still supreme in the world, although in spots it seems to be a minus quantity.

Touching upon the subject of uprightness of character, a recent correspondent says: "Notwithstanding the many false notions that are current in the telegraph world, what is right always appeals to the better thought of the great majority, and the value of a journal such as yours rests more in that appeal than from any other consideration. The moral ethics that should govern the employe and the employer in their relations with each other is a good thing to be well understood and when properly set forth captures the good will of both sides, for, after all, I think doing the right thing is something more to the average man than any other consideration; it is the only thing of any lasting, permanent value."

All telegraphers—and everyone else for that matter—should firmly fix in their minds that truth and virtue alone will survive when everything else fails and that with the practice of these will come what we are all looking for—happiness.

Punctuation of Messages.

It appears from recent correspondence that there is a practice among a certain class of operators to sprinkle punctuation marks promiscuously through the body of the messages they receive. Such employes, of course, are ignorant of the rules of punctuation, and they should be taught that punctuation marks have a meaning and use quite as important as the letters of the alphabet.

The misuse of such marks has caused much trouble to the recipients of messages, and frequently led to law suits against the telegraph companies. It is better and safer to leave out punctuation marks altogether, unless the sender especially requests that they be inserted as written. It is the rule of telegraph companies not to transmit punctuation marks in messages, and receiving operators should be made to adhere to this rule.

A message bristling with commas and periods certainly does not reflect very favorably upon the intelligence of those handling the business. The reaction is most severe upon the telegraph company, because the public deals with the company and not with the operators, and naturally it censures the company for presumably maintaining such a grade of service.

TELEGRAPH UNION MONUMENT.—The monument which is to be erected in Berne, Switzerland, to commemorate the founding of the International Telegraph Union will not be finished until 1915. It will be placed in the Helvetia Platz in Berne.

Mr. Vail's Advice to Graduates.

Mr. Theo. N. Vail, president of the Western Union Telegraph Company and of the American Telephone and Telegraph Company, made an address at the recent commencement exercises at Lyndon Institute and Lyndon School of Agriculture, Lyndon Centre, Vt., in which he gave some excellent advice to the graduates.

He pointed out that, as they go along in the world, many of their ideals will be shattered, and their hopes dampened. "It is from your failures and your disappointments, if rightly used," he said, "that you will get your valuable experience. It is by overcoming and rising above them that you will achieve your successes."

Touching upon the subject of labor, Mr. Vail said: "We hear much of the dignity of labor, the nobility of labor, that the laborer is worthy of his hire, that labor is entitled to what it produces.

"Labor performed in a shiftless, unthinking, unintelligent, instinctive way is neither dignified nor noble and never is profitable.

"The only thing that makes labor profitable, dignified or noble is the intelligence that is used in directing it, and that intelligence which directs it may be either your own or that of others, and to the extent that it is yours, you will get the full value that is produced by both your labor and your intelligence, and to the extent that it is the intelligence of others which directs your labor, you must share with the others the value of what is produced.

"You can't get something for nothing," he continued, "you can't live by your wits and feel comfortable or respectable—any gain at another's loss will react on you. All the great and permanent gains in this world come through constructive work, creating new values to old things by making them better and more useful, by creating new things of value to the world, or by the organization of those forces which bring about these results."

Among other things Mr. Vail said: "Don't fall into the mistake of forming your own opinion of your own intelligence or capacity—let others do that. It is only in politics that your own claims to your own greatness are taken seriously and where promises will be taken sooner than a good record. In real life it is reputation that obtains confidence for you, and reputation is based on performance, not on promise.

"Don't fall into the error of thinking that in these days there is no opportunity—there is more now than ever. Look at the list of names that control or are interested in the great constructive work of the world, those who have accomplished something, and you will find ninety-nine or more of every hundred started at the bottom rung of the ladder and unaided, except by their ability, enterprise, persistency, climbed up from rung to rung to their present position. I have to do with many thousands of young people starting life, and it would astonish you to see the quickness with which the to-be-successful attract attention to themselves. Bear in mind the words, attract attention. The to-be-successful ones attract attention—it is never necessary to have attention called to them."

Dr. S. Oi, Chief Engineer of the Japanese Telegraphs, Retired.

Dr. S. Oi, who retired from the service of the Imperial Japanese telegraphs in June last, was graduated in 1882 with honor from the Tokyo Engineering College, and joined the service of the Government telegraphs. His natural ability and educational advantages soon brought him advancement, and, in 1893, he was appointed the chief of the telegraph and telephone engineerings, which position he has since held.

During his tenure of office there have been many opportunities for the exercise of his high executive

DR. S. OI, TOKYO, JAPAN.

ability, especially in connection with the introduction of the telephone in Japan. In recognition of his meritorious services he was decorated several times by the late Emperor. He is a recipient, too, of the Danish Order of Dannebrog, and of the Chinese Order of Double Dragon.

He is held in great esteem by his friends and colleagues, and his retirement, which is solely due to his own desire to open the way for the advancement of those under him, is widely regretted.

THE NEWSPAPER OF THE FUTURE.—Mr. Robert Donald, editor of the London *Daily Chronicle*, in his presidential address before the annual meeting of The Institute of Journalists, recently held at York, England, stated that the newspaper of the future will collect its news by wireless and a reporter will always have a portable telephone with him with which he will communicate with his paper without the trouble of going to a telephone. The wireless telephone messages will be delivered to the sub-editors in printed column form.

MR. M. H. CLAPP, superintendent of telegraph, Northern Pacific Railway Company, St. Paul, Minn., writes: "I would be very glad to have you include me in the class of subscribers from whom you have received instructions to renew their subscriptions as they expire, as I desire to keep my file of the AGE intact. I look over each issue very carefully and with a great deal of interest."

Course of Instruction in the Elements of Technical Telegraphy—XLVI.

(Copyrighted.)

(Continued from page 498, August 16)

[The Course of Instruction in the Elements of Technical Telegraphy, which has been running regularly in this journal since October 16, 1911, has met with wide-spread favor and is being studied diligently by thousands of telegraphers and others throughout the world. It is being translated into Spanish, and printed in South American electrical journals, and has attracted universal attention for its clearness of expression and its practicability. It has been endorsed by the officials of telegraph, telephone, cable and railroad companies, many of whom have acknowledged the improvement in the technical standing of their progressive employes, and they commend the course as being of the most practical kind of instruction.

This course was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, and is being published now for the benefit of those of our readers who desire to fit themselves for higher positions in the engineering branch of telegraphy, and it has been a valuable aid in this direction. It is elementary, and devoid of higher mathematics, yet it is fundamental in character and extremely easy to learn.

Each chapter is complete in itself, and the chapters are arranged in natural order so that the student acquires the knowledge step by step in logical sequence. Each chapter is followed by test questions on the subject of the chapter, thus enabling the student to review his progress from time to time.

Back numbers containing these valuable lessons can be obtained at 10 cents per copy.]

The Condenser.

It has been stated that the static capacity of a telegraph line depends upon the length and cross section of the conductor, and its proximity to ground. If, then, it is required to construct an apparatus capable of condensing or accumulating, a comparatively large static charge the conducting surfaces must be large, the distance between them small, and a dielectric used of high inductive capacity.

Fig. 57 shows the construction and action of such an apparatus, called a condenser. It consists of alternate layers of tin foil and specially prepared paper saturated with paraffin, arranged so as to expose a large surface to inductive action without taking up much room. The arrangement of plates is shown in the figure. Plates 2, 4, 6, 8 are joined together and to one terminal; plates 1, 3, 5, 7 are likewise connected to the other terminal, the dielectric, or paraffin paper, being represented by the blank spaces between the lines.

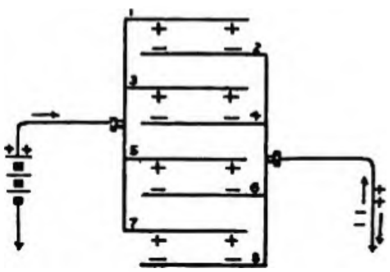


FIG. 57—PRINCIPLE OF CONSTRUCTION OF CONDENSER.

When such an arrangement is connected to a battery and ground, the series of plates in connection with the positive pole of the battery becomes positively charged, and the series in connection with the earth negatively, as already described.

The capacity of a condenser is its ability to accumulate a certain amount of electricity under a given electrical pressure and is governed by the proximity of its plates, their dimensions, and the specific inductive capacity of the dielectric.

The "charge" accumulated in a condenser of given capacity will, however, be increased by an increase of pressure. For example, if water were compressible, like gas, a vessel holding exactly one quart of water under normal pressure would represent a quart measure. But if the pressure were increased the water would be compressed into smaller bulk and the measure would hold more than a quart. The capacity of the measure still remains one quart, but the amount of compressible fluid it will hold will depend on the pressure applied. In the same way the actual capacity of a condenser is independent of variations of pressure, but the "charge" with any given capacity is proportional to the difference of potential between its two series of plates and may be found by multiplying the pressure by the capacity. Thus, E. M. F. $\times$ capacity $=$ charge. The theoretical unit of capacity is the farad. A condenser has a capacity of one farad if under pressure of one volt (the unit of pressure) it accumulates one coulomb of electricity (the unit of quantity). But a condenser of one farad capacity can hold two coulombs of electricity at two volts pressure and three coulombs at three volts, and so on, because electricity under pressure in a condenser is condensed in much the same way as though it were a compressible gas.

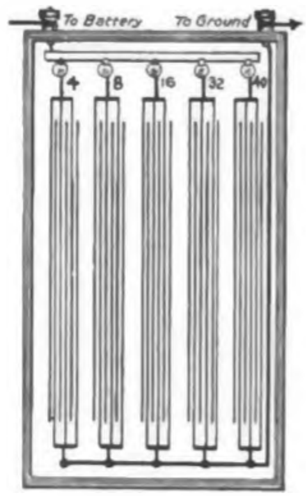


FIG. 58—ACTUAL CONSTRUCTION OF CONDENSER

As the farad is too large a unit for the convenient expression of condenser capacities, a smaller practical unit, the micro-farad, which is one million times less than the farad, is used. A condenser of 1 micro-farad capacity accumulates the one-millionth part of a coulomb (1 micro-coulomb) of electricity under 1 volt pressure.

The manner in which the leaves are arranged and connected in an adjustable condenser is shown in Fig. 58.

All the lower plates in the figure are joined together by a conducting strip leading to the ground terminal. The upper plates are divided, in this case, into five sections, each section being in connection with a disc, which, as a rule, indicates by figures the number of plates attached to it. A brass strip runs along these discs like the strap of a switchboard, and is joined to the other terminal of the condenser. The total number of sheets can be ascertained by adding the disc numbers, in this case, 100. If the capacity of this condenser, due to its 100 sheets, was 3 micro-farads, and this full capacity was desired for use, plugs would be inserted between the brass plate and all the discs, thus bringing every sheet into play.

In the figure, since there are plugs shown between the strap and discs 4 and 16, there are 20 sheets in use. This is $\frac{20}{100} = \frac{1}{5}$ of the full capacity, which is 3 micro-farads, and the capacity of the sections in use is therefore $\frac{1}{5}$ of $3 = .6$ micro-farad.

Condensers may be connected in parallel or series. When two or more condensers are joined in parallel, their joint capacity is the sum of their respective capacities in the same way as the total E. M. F. of a number of cells joined in series is the sum of their respective voltages.

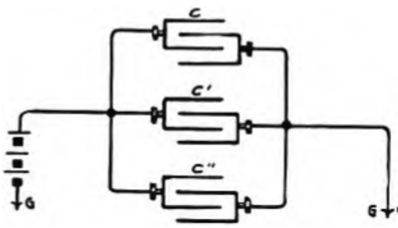


FIG. 59—THREE CONDENSERS IN PARALLEL.

Fig 59 shows three condensers, C, C' and C", connected in parallel. If each condenser has a capacity of 3 micro-farads, then their joint capacity is $3 + 3 + 3 = 9$ micro-farads, since the area of the opposing plates is now three times greater than in one condenser alone.

(To be Continued.)

Future Meetings of Associations, Societies, etc.

Association of Railway Telegraph Superintendents, at New Orleans, La., May 19, 1914. Secretary, P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill.

Telephone Pioneers of America, at Chicago, Ill., October 16 and 17. Secretary, Henry W. Pope, 15 Dey street, New York.

Telegraph Lines in Bolivia.—The latest available statistics for the state and private telegraph lines in the Republic of Bolivia show that the state operates 2,730 miles and private companies (railway and other companies), 1,080 miles, making a total of 3,810 miles.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What are the two main classes of repeaters?

What is a manual repeater?

What is an automatic repeater, and where are such repeaters usually employed?

Study the button repeater described and illustrated on page 163 of Pope's book on the Telegraph; also Wood's repeater.

In the management of button repeaters how does the attendant know when one side or the other wishes to break?

What is the essential feature of all automatic repeaters?

Why should a sending operator transmit more firmly when working a circuit containing repeaters?

Why should the sounder lever be limited in its play?

What is the best adjustment for the retractile spring?

What character of signals are best suited to pass through repeaters?

Can the sender be interrupted instantly through a repeater?

What is a dynamo-electric machine, the more modern term of which is "generator"?

In its elementary form what is the character of the current produced by a generator?

Does it give a steady current?

Are the electric waves or undulations delivered by an electric generator suitable for telegraph purposes?

What must be done in order to adapt such current for telegraphic uses?

What is the name of the device which rectifies undulating currents?

What is the character of alternating-current waves?

Why are the armature coils of a generator divided into a large number of sections?

How is the magnetic field of a generator produced?

Why is an electro-magnetic field preferable to one produced by a permanent magnet?

What is the difference between a permanent magnet and an electro-magnet?

How are the electro-magnets of an electric generator excited?

What is a self-exciting generator?

Psychology and Telegraphy—A New Psychological Explanation of "Operator's Paralysis."

BY REX D. MILES, TACOMA, WASH.

One of the most interesting phases of practical psychology is a study of its laws in connection with the art of telegraphy. Telegraphy, though possibly a science from the viewpoint of the electrician, is an art from the viewpoint of the operator, and from the viewpoint of the psychologist. Skilled telegraphy develops intricate connections and associations between the visual, auditory and motor regions of the brain which no other profession develops to such a great extent. An understanding of these connections and associations, and a study of the course of the nervous impulses called forth in telegraphing, both sending and receiving, is not only fascinating but invaluable, and operators taking up this study will find their work made easier for them by coming into a better understanding of the motor impulses and how best to direct them.

Probably the most important question in the relation of psychology to telegraphy is that of the cause of "operator's paralysis." Some time ago German psychologists announced that the cause of "writer's cramp" and "operator's paralysis" was due to a worn-out condition of the brain cells controlling the use of the muscles of the hand and wrist. Up to the time of this announcement it was believed that the trouble was purely a local cramped condition of the muscles, resulting from long-continued use. No one has ever, until now, advanced any hope to any one suffering from this condition, and the usual method pursued has been to give up hand sending and use an automatic dot sending machine.

The writer, himself an operator, has for the past year been engaged in a study of psychology, especially in relation to telegraphy, and has reached a new conclusion as to the cause of operator's paralysis. The conclusion being correct, relief from that condition can quickly and certainly be obtained by an observance of psychological laws.

The conclusion, briefly summed up, is this: The cramped and strained condition of the muscles is caused by confliction between conscious and sub-conscious motor impulses. Conscious impulses call for a slower rate of sending than sub-conscious, consequently if there is a conflict the muscles are unable to obey either impulse satisfactorily, and a strained condition results which, if persisted in, leads to cramps and pains in the arm and hand, which eventually become permanent. How the confliction arises will be shown later.

By conscious impulse is meant the directing of each separate move of the hand with the thinking, conscious mind, and by sub-conscious is meant the free and easy, steady impulse, having its seat in the visual and auditory regions of the brain, which directs the hand automatically, so to speak, while the conscious mind thinks only of the matter to be sent, and pays no attention to the hand. The path of the sub-conscious impulse is from the visual region to the auditory region through associatory cells, thence to the motor region, thence to the muscles of the hand and wrist. The path of the conscious impulse is from the visual region to the conscious mind, thence to the motor region, thence to the muscles, without the guidance of the auditory cells.

In skilled sub-conscious sending it is possible for the mind to be thinking of some extraneous matter, and at the same time pay close attention to the work in hand, as the eye and the ear guide the hand automatically, through permanent connections between brain cells which have been established in training. There must always be present, however, a conscious desire, or will, to transmit the matter being read, or thought of to be sent, which desire, or will, constitutes the motive force of the sub-conscious impulse, and which controls the speed at which the matter is transmitted.

In sub-conscious sending, therefore, we have a steady, unbroken impulse, while in conscious sending we have broken impulses, each move of the hand calling for a new impulse from the thinking mind. In learning to send, conscious impulses are used entirely, until such a time as training has developed a path for the sub-conscious impulse, when a marked degree of improvement is noted.

The psychological law explaining this is that in learning to send it is the auditory cells which are trained (by hearing on the sounder the result of the movement made by the hand), and not the motor cells, except that the motor cells are trained to obey the guidance of the auditory cells in directing the movements of the hand. Thus, if the letter "A" is thought of to be sent, the impulse goes to the auditory cells as the letter "A," and reaches the motor cells in terms of the movements necessary for the hand to make on the key to reproduce on the sounder the sound image of the letter "A." It matters little whether or not the hand is actually on the key. The movement made will be registered in the conscious mind as having the sound of the letter "A" whether or not the sound is actually heard.

But if the letter "A" is thought of in the conscious mind, and translated into one dot and one dash, two distinct impulses are sent from the conscious mind to the motor cells, the first requiring the movement necessary to form a dot, the second requiring the movement necessary to form a dash, and the movements made are registered as movements, and not as having the sound of "A."

It follows that if a word, or several words, are read to be sent, or thought of to be sent, one sub-conscious impulse is all that is required to transmit them, and the secret of easy sending is to keep one sub-conscious impulse going as long as possible, and keep it supplied with words to form into sound images.

To illustrate how the conflict between the conscious and the sub-conscious impulses arises after an operator has reached a high degree of efficiency, let us take a first-class sender and assign him to eight hours' sending per day on a poor circuit. Say a single wire, 500 miles in length, with a bad escape, through one set of repeaters, with a "cranky" receiver at the other end.

To begin with "the stuff drops out." The receiver complains and the repeater chief is called in. The repeaters are adjusted, but still the matter drops out and comes badly. The sender starts again to do the best he can under the circumstances. He begins to send heavier and more firmly, and every time the receiver breaks he puts forth more effort to make his sending carry through. After two or three hours of this sort of thing his arm becomes tired, and it requires more of an effort to send. The greater the effort to send, the greater the attention paid to the hand, and by the end of the day the sender has lapsed into conscious sending and is directing each move of the hand separately, and chances are he notices a slight pain in his wrist. The next day he starts in again sending sub-consciously, but if the performance of the first day is repeated, greater effort is called forth, and more and more attention is paid to the movements of the hand. It would be all right if the sender could entirely do away with the sub-conscious impulses for the time being, and send at a slower rate, using conscious impulses, but this is impossible. He may send one, or two, or three words consciously, then his mind will be momentarily taken from his hand and he will send several words sub-consciously. And even when he is directing the hand consciously, the sub-conscious impulse is present, conflicting with the conscious impulse.

It is self-evident that if he experiences the same sort of thing day after day for any length of time, the cramps and pains will become worse each day, and finally result in a permanent cramp which cannot be relieved by a night's rest.

It is possible for the same condition to result from merely sending eight or ten hours a day on a first-class circuit. After about six or seven hours sending, the hand itself, and the brain cells controlling it, become fatigued, and it requires greater effort to send against this handicap. This also results in paying too much attention to the hand, which eventually causes a lapse to conscious sending, and the attendant confliction between impulses.

An impression has been widely circulated that when the nerves and nerve cells become fatigued, and when sending becomes difficult, a few inhalations from a cigarette, pipe or cigar will stimulate the nerves and result in easier sending for a time. While it may, or may not, be true that tobacco stimulates the nerves, the writer is not inclined to the opinion that this explains the increased efficiency in sending after smoking a cigarette. What really happens is that the act of lighting and smoking the cigarette, pipe or cigar takes the mind completely off from the hand, in so far as sending is concerned, for the time being, and when sending is resumed the sub-conscious impulse has a clear path, which results in a surprising increase in efficiency until such a time as conscious attention is again directed to the movements being made by the hand.

Sending operators who are troubled with the cramp occasionally, as well as those suffering from a cramp of long standing, should observe the following rules when sending becomes difficult, and when the cramp makes itself felt.

Concentrate the mind on the sounder, forgetting all about the hand, and think of the letters and words to be sent in terms of sound images, the way they sound on the wire, and not in terms of the movements necessary to send them.

The ear, listening to the sounder, acts as a guide to the sub-conscious impulse in sending Morse, just as the eye, watching the point of the pen, acts as a guide to the sub-conscious impulse in writing.

If it is found impossible to forget all about the hand, the sender should endeavor to think deeply about some extraneous matter at the same time he pays strict attention to the copy. If this does not bring results the sender should resort to the law of suggestion and think strongly to himself: "I am a perfect sender. I listen to the sounder, and the sounder guides my hand. I am a perfect sender." Such auto-suggestion not only helps to concentrate the mind on the guidance of the sounder, but displaces any fear which may be present, and restores self-confidence, which is in itself an important factor in telegraphy.

The presence of fear and the lack of self-confidence reduces the strength of the motive force of the motor impulse, as is evidenced very often by pugilists whose blows lack strength because their opponent has them "scared."

It will be found that as soon as perfect sub-conscious sending has been recovered the cramps and pains will disappear, leaving the arm free and easy, and the only feeling in the arm after a hard day's work will be that of natural fatigue. The probable physiological explanation of this fact is that the confliction of nervous impulses tends to impede the circulation of the blood through the minute blood vessels of the muscles, while the free and easy sub-conscious impulse tends to accelerate it.

There used to be an operator in the Western Union office at Portland, Ore., Gus Prague, now deceased, who suffered from the cramp and who was a notoriously bad sender. His style was slow, cramped and tiresome. Yet if the receiving operator understood him, and broke him, cursed him, and annoyed him until he got mad, Gus would send about sixty words a minute of the prettiest Morse one ever heard. The explanation is obvious. His anger took his mind completely off from his hand and left a clear path for the sub-conscious impulse. Many similar cases have no doubt been noted by other operators.

In the case of the operator who has been out of service for a year or more and comes back, only to find that it seems impossibe to recover his old style of sending, the explanation is that the muscles, being stiffened from long disuse in telegraph sending, do not lend themselves readily to the speed of the sub-conscious impulse, which directs conscious attention to the hand, and a conflict results between the conscious and sub-conscious impulses.

The proper procedure for the operator returning to the service after a long absence is to send very slowly at first, increasing his speed gradually day by day until the muscles respond quickly to the sub-conscious motor impulse.

Another possible explanation of this case is that the connections formed between the auditory and motor regions become impaired from long disuse, but this does not seem probable, as we know that the connections formed in learning to receive Morse, once permanently formed, remain the same throughout the life of the individual, whether or not they are in everyday use. A first-class operator, ten years after hearing a sounder, could read and understand the fastest wire in the country.

The operator who feels that he has "lost his grip," and who buys a sending machine, simply gets back to sub-conscious sending in learning to use it, and because the operation of the machine is sixty per cent easier than that of the Morse key, the danger of lapsing into conscious sending because of fatigue of the hand and the motor cells is greatly reduced, and the danger of lapsing into conscious sending through a putting forth of too much effort is entirely eliminated.

This last point, which is greatly in favor of the sending machine, requires some explanation.

Effort in telegraph sending may be defined as the increasing of the force of the motor impulse, with the conscious mind, to above normal. Thus, when sending with a Morse key, if the signals drop out at the distant end, the operator begins to send heavier in an effort to make a better contact at the key points. This forms a more perfect path for the electric current, and results in the signals carrying through better. It also results, however, in directing conscious attention to the hand.

This is not the case when using a sending machine. Instead, readjustments are made of the weights, and at the contact points, and the result is more current with the same motor impulse force, or even less, as will be shown in connection with a discussion on the proper adjustment of keys in the following paragraphs.

A contributing cause to the condition known as "operator's paralysis" is sending for some length of time with the key improperly adjusted. If the spring is too strong the force of the motor impulse is raised to above normal; if the spring is too weak the motor impulse force is lowered to below normal. In either case it requires more effort to send (either to push the key down or to hold the hand up), and if the condition is persisted in for a long period, it results in directing conscious attention to the hand, which we have seen causes a lapse to conscious sending, and the attendant confliction between impulses.

Every operator knows how to adjust a key, and knows how he wants it adjusted, but the following psychological explanation of the proper adjustment of the key will perhaps be of interest to the telegraph profession, especially to those operators who are now struggling with the first symptoms of the cramp.

Two things regulate the force of the motor impulse in telegraph sending, first, the firmness with which the sounder closes, and second, the resistance offered to the muscles by the spring in the key.

The force of the impulse varies inversely with the force with which the sounder closes, and conversely with the resistance offered by the spring.

To illustrate this, go to a single wire, adjust the key spring to a medium resistance, and pull the relay way up, then send for a few moments. It will be found that the sounder closes imperfectly and a strong motor impulse is sent to the hand. Then turn the relay way down and send for a few moments. It will be found that the sounder closes strongly and firmly, and that a weak impulse is sent to the hand. The stronger the impulse to the hand the harder it is to do the work, and vice versa, which explains why a single wire "feels" heavy or light, according to the strength of current in the main line.

The spring in the key should be used merely as a compensation spring. If the sounder closes so strongly that the resulting motor impulse is too light for comfort, the compensation spring should be adjusted until its resistance to the muscles calls forth a stronger impulse. If the sounder closes imperfectly the resulting motor impulse will be strong, and the compensation spring should be adjusted lightly, otherwise the motor impulse will be stronger than necessary.

To secure the proper adjustment of the key, either on a single wire or on a duplex, the following rule should be observed:

Send for a few moments on the key as it is. If the hand feels heavy the spring is too light; if the hand feels light the spring is too strong. In either case the spring should be adjusted until the resistance offered by the spring is equal to what appears to be the weight of the hand when sending. The resulting motor impulse force may be considered as "normal," and this force should never be increased or decreased with the conscious mind for any length of time. If the signals drop out at the distant end adopt a slower rate of sending. If this does not avail, adjust the sounder until it closes imperfectly. This will result in a natural increase in the motor impulse force, insuring a firmer contact without the use of effort as defined.

It is now possible to explain psychologically why the operation of the sending machine becomes easier the heavier the signals are transmitted, if it is not already evident to the reader.

When the weights and contact points are readjusted to send heavier, the sounder closes stronger, and a lower motor impulse force is sent to the hand, making the work easier.

When sending heavier with the Morse key, however, the sounder closes strongly, which calls for a weak impulse, but in order to send heavier with the Morse key the motor impulse force must be increased with the conscious mind, and there we have another conflict in impulses between the strong conscious impulse and the weak sub-conscious impulse, which directs conscious attention to the hand, resulting in a lapse to conscious directing of the character of the movements, and the attendant conflict between the slow impulse from the conscious mind to the motor cells direct, and the fast sub-conscious impulse from the visual cells to the auditory cells, thence to the motor cells, which last conflict causes poor muscular work, and eventually causes "operator's paralysis."

It will be found that the same psychological laws govern writer's cramp, except that in considering writer's cramp we have to do with the visual region only. It is not within the scope of this article to discuss this question fully, but it may be stated that the conflict between impulses in writing results from excessive use of the pen or pencil against the handicap of fatigue, and from increasing the force of the motor impulse with the conscious mind, in order to write through several manifold copies, for some length of time.

The conscious impulse in writing is the directing of each move of the hand with the conscious mind, the sub-conscious impulse is the same as in telegraph sending, with the exception that the impulse reaches the motor cells in terms of the movements necessary for the hand to make in order to produce the visual image of the letter or word thought of to be written, read to be written, or heard to be written, as in dictation, and in telegraph receiving.

Sufferers from writer's cramp should strive to let the eyes guide the pen, and should think of the letters and words to be written in terms of visual images of the words as they learned to write them, not in terms of the movements necessary to form them. In other words, form a mental image of the word, the way it is to look, before they write it, or as they write it.

In learning to write, the visual cells are trained to guide the motor cells in making the movements, the motor cells are not trained to make the necessary movements to form a word thought of to be written.

In learning to send in telegraphy, the auditory cells are trained to guide the motor cells in making the movements, the motor cells are not trained to make the necessary movements to transmit a word thought of to be transmitted.

It may be well to observe here, for the benefit of the non-student of psychology, that there are two sets of motor cells, and that in learning to write or send, connections are made from the visual or auditory cells only to those motor cells controlling the use of the hand engaged in the process of learning. If it is desired to write or telegraph with the other hand, similar connections must be established by training, between the visual or auditory cells and the motor cells controlling that hand.

In conclusion, the writer earnestly submits to the telegraph profession as a whole, to all psychologists and students who may find the subject-matter of interest to them, and to the general public, that the cramped condition of the muscles is the effect, not the cause, of "operator's paralysis" and "writer's cramp," that the motor cells do not wear out, but only become fatigued, misused and misdirected, and that "operator's paralysis" and "writer's cramp" is not an incurable disease, but only a wrong condition, which can be certainly, surely and permanently righted by a proper application of the laws of practical psychology.

Improper Use of Sending Machine Wedges.

Mr. J. S. Knapp, of the Western Union Telegraph Company, Memphis, Tenn., calls attention to the improper insertion of sending machine wedges in keys, resulting in the latter being damaged and put out of service, thus causing avoidable expense in repairs and delay in traffic while another key is being substituted.

The proper way to insert the wedge is between the circuit closer lip and the base of the key. The wedge should never be inserted between the circuit closer and the lip, as it unduly strains the latter, causing it to finally break off, rendering the key useless until repaired. The circuit closer lever should be pushed to the extreme right and the wedge inserted between the circuit closer lip and the base of the key.

If the wedge is too wide, the owner of the machine should file it down to fit the key.

Marconi High Power Wireless Stations.

The three high-powered stations for the Marconi trans-ocean scheme, which are now under construction, are, says *The Marconigraph*, located on the Island of Oahu, Hawaii, and in California and New Jersey, respectively. Each of these developments consists of a generating station and receiving station; the generating and receiving stations being separated by a distance of twenty-five to fifty miles. All the stations are somewhat distant from a populated or built up district, so it is necessary to provide residences and living quarters for all the operators and employes, as well as the power buildings, aerials, and other equipment that will be required in the commercial operation of the wireless service.

At each generating station the group of buildings will include a power house, auxiliary operating building, hotel to accommodate about twelve men, and one or two residences for the chief engineer and assistant chief engineer.

At each of the receiving stations the group of buildings includes an operating building, a hotel for thirty-three operators, one or two residences for the chief operator and his assistant chief operator, and a lighting plant or light and heat plant, as may be required.

The buildings for the Honolulu and California developments are to be of concrete construction with solid concrete walls and reinforced concrete floors. The roofs are to be supported by structural steel on which will be placed red vitrified roofing tile. The building for the New Jersey development will have exterior walls of brick and red tile roofs.

The hotels for operators at the receiving stations, on the basis of thirty-five operators, will provide a room for each man. Billiard rooms, card rooms, reading and writing rooms are also provided.

The hotels for eleven men at the generating stations will provide similar accommodations.

The operating buildings will contain the business offices for the receiving stations, including the general office, private offices, receiving rooms, instrument rooms, etc.

On account of the isolated locations, complete water supply and sewer systems will be provided.

The construction work is under the direction of J. G. White Engineering Corporation, as engineers and contractors for the American Marconi Company.

Method of Locating Breaks with Alternating-Current Mil-Ammeter.

BY R. T. DAVENPORT, WIRE CHIEF, POSTAL TELEGRAPH-CABLE COMPANY, WILLIAMS, ARIZ.

A large part of the cost of clearing trouble on long telegraph and telephone lines is due to the fact that wire chiefs and test board men are not provided with means for accurately locating breaks or "opens." This is especially true of lines in the West where test offices are frequently from twenty to fifty miles apart, and transportation facilities for linemen are both few and expensive.

The methods usually employed for locating opens in cables cannot be successfully applied to open-wire lines, and, as a general rule, no attempt is made to determine the position of a break beyond locating it between two test offices.

The development of the alternating-current mil-ammeter has made possible a method by which this class of opens can be located with great accuracy. This method is based on the fact that when an open wire is connected to a grounded alternating-current generator, the amount of current that will flow into the wire, due to its capacity, bears a definite relation to the length of the line, although it is not directly proportional to it.

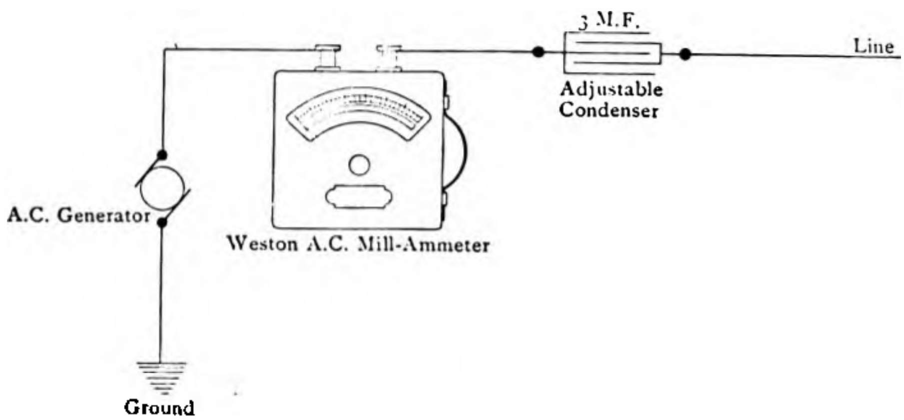


FIG. 1—ARRANGEMENT OF TESTING CIRCUITS.

This principle is applied to the location of opens by the use of the arrangement shown in Fig. 1. The function of the adjustable condenser is to eliminate the effect of induced currents set up by parallel telegraph circuits, and to afford a means of varying the strength of the alternating current, as will be explained later.

To determine the relation of the amount of current to the length of the line a good wire is opened at the most distant test office and the condenser or voltage adjusted to give the maximum readable deflection. Then, with the same voltage, frequency and condenser adjustment, readings are taken to opens at all available offices and test poles. From these readings a curve is plotted as shown in Fig. 2.

A separate curve must be made for each pole line, because both the amount and location of the capacity are different for different lines. If a line contains any considerable length of cable a reading should be taken to opens at each end of it, as the presence of cable or twisted pair greatly changes the shape of the curve. By keeping a record of all measurements and the actual location of the breaks found by linemen many new points can be located between offices and the curve changed to conform to them, thus making it more nearly correct.

Repeated experiment has shown that, in a dry country, these values remain practically constant; but, inasmuch as the capacity and insulation resistance of all lines are subject to variations, it is advisable before making a measurement to take a reading to an open, either on the faulty wire or on a good wire of the same size, at the test office nearest the break. If any discrepancy is noted the voltage or condenser is varied until the reading shown by the curve for that office is obtained. A reading is then taken on the faulty wire to the break and the location of the open read directly from the chart. If the end of the broken wire towards the testing office is grounded the distant portion of the wire can be looped back from the first office beyond the break, and the necessary calculation made to locate the open. When both ends of the broken wire show heavy leakage approximate locations may still be made, provided the wires are not dead grounded. A direct-current mil-ammeter and a source of direct current with the negative pole to the line should be used to determine the amount of escape at the break. The ordinary voltmeter is not suitable for this purpose.

Within a radius of 150 miles breaks can be located by this method with an average maximum error of not over two miles. Beyond this distance the accuracy decreases, but it is of great value up to 200 miles. For greater distances the curve becomes too flat to be of use. It should be noted, however, that the accuracy of the test depends, to a great extent, upon the insulation resistance of the line, and a high degree of precision cannot be expected when the wire under test shows heavy leakage along its entire length.

This method has been in use for nearly a year on a number of pole lines aggregating about 700 miles in length, and has given most satisfactory results. As one instance of the great saving in maintenance effected by its use, it may be stated that on one of these lines the first test office is located 138 miles from the testing station. It was formerly the practice when a break occurred in this section to start a lineman from each end. It generally took two days to clear the trouble and much expense was incurred by the linemen for transportation and meals. Since the adoption of this method, breaks are closed with little loss of time and with a minimum of expense.

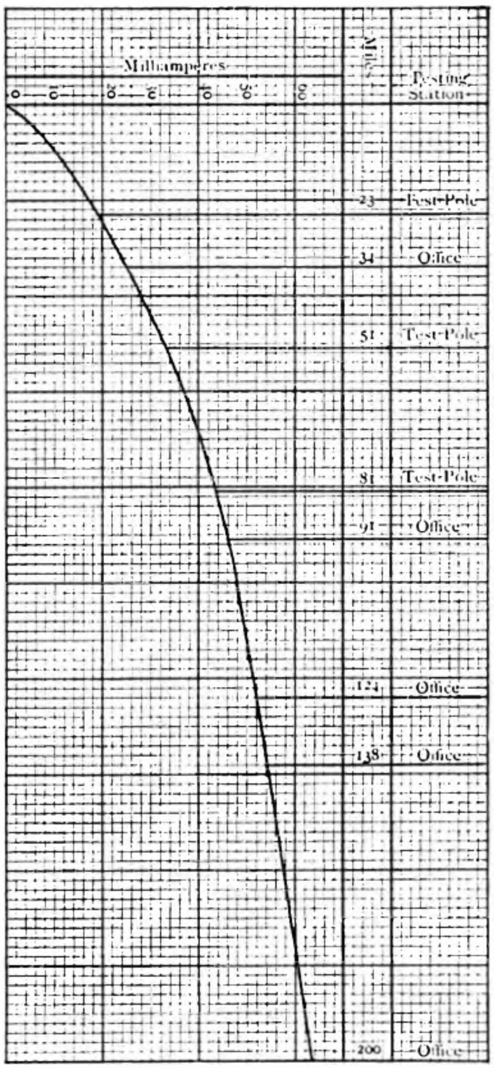


FIG. 2—CURVE FROM READINGS.

The mil-ammeter used in connection with these tests is the Weston alternating-current portable type, having a scale of 0 to 75. It is dead beat, and when used with the condenser is not affected by induction from parallel circuits. On lines other than telegraph the condenser could probably be dispensed with if some means is provided for varying the voltage of the generator without changing the frequency.

Besides being used for breaks on outside lines, many other uses of the alternating-current mil-ammeter will suggest themselves to the experienced wire chief. For instance, knowing the normal deflection to the end of a cable, it is an easy matter quickly to determine if a circuit is open in the cable; in the protectors at the distant end of the cable, or beyond them. It also affords a quick means of locating open fuses in a distant test office.

This instrument, when used intelligently, will quickly pay for itself in saving of time and maintenance expense, and is a most useful addition to a wire chief's testing equipment.

Earth Currents.

BY D. B. GRANDY, ST. LOUIS, MO.

In an article printed in the TELEGRAPH AGE some years ago, I suggested that an electric generator, with its negative pole to earth, and its positive pole sending a current to a distant point, would create an electrical vacuum, or area of low potential surrounding the grounded negative pole, and that a movement of electric currents would be set up from the territory outside of this area of low potential towards the vacuum, in all available conductors, in an effort to restore the equilibrium.

In the case of large cities this area is very extensive. But it is doubtful if there ever has been any real difference of potential between such points, except, of course, during the prevalence of "earth currents" of auroral origin. A wire between St. Louis and Chicago or Kansas City, having its terminals grounded, will show an inflowing current at each end, as shown in the illustration. These are

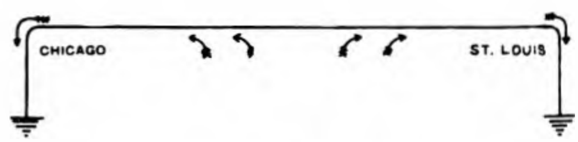


DIAGRAM SHOWING COURSE OF EARTH CURRENTS.

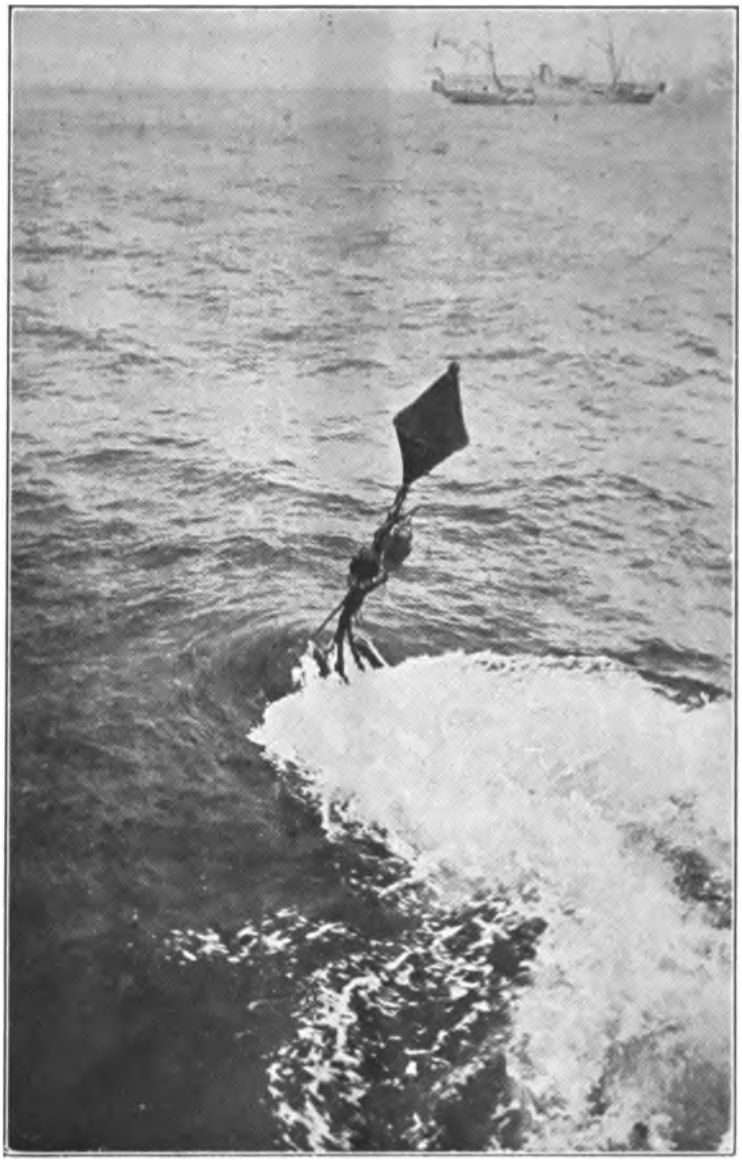
probably due to leakage in insulation and the poorer the insulation the greater should be the current flow. The improvement in bonding by electric railways has made the path of their "return current" easier, so that a larger portion of it is returned quickly to the area of low potential with the result that it does not fall so far below normal as formerly, and the tendency of current from outside the area to move toward it has been correspondingly lessened.

This peculiar behavior of earth currents was first noted, so far as I know, by Mr. C. C. Liggett, of this city, while he was wire chief for the Cumberland Telephone Company, at Louisville, Ky. At first glance it looks highly improbable, but experiment will show it to be a fact.

The whole subject will bear a good deal of investigation. Are these leakage currents from the earth or atmosphere? They have been noted on wires on which the insulation was very good.

Repairing a Cable off Cape Hatteras.

The accompanying illustration, reproduced from the *Postal Telegraph* shows the Commercial Cable Company's steamer "Mackay-Bennett" at work fifty miles off Cape Hatteras repairing a broken submarine cable. An interesting feature of the picture is the evident speed of the water rushing past the buoy in the foreground. The buoy is attached to one of the broken ends of the cable, the depth of the water at this point being 10,200 feet (only 280 feet less than two miles), and the enormous movement of the Gulf Stream, in which the buoy is temporarily placed, may he judged by the breaking of the water around the buoy. The Gulf Stream moves at a speed of four to four and a half miles an hour.



REPAIRING A BROKEN SUBMARINE CABLE OFF CAPE HATTERAS.

COMPANY DENIES RESPONSIBILITY.—Because one of the telegraph companies transmitted a message from a Milwaukee landlord to a tenant, demanding payment of back rent and threatening to swear out a criminal warrant for malicious destruction of property, if not paid, the tenant has brought an action against the company for $2,000 damages. The company admits transmitting the message, but denies responsibility.

MR. G. H. CORSE, well known in the telegraph service in America, now general passenger agent of the Pacific Mail Steamship Company, at Yokohama, Japan, in renewing his subscription for another year, writes: "The AGE comes regularly to hand, and serves to keep me informed of the general conditions regarding telegraph service in America, as well as personal items and the movements of a number of officials associated with the telegraph service with whom I am acquainted."

The Prevention of Induction Troubles.

Induction is one of the greatest enemies to the operation of telegraph and telephone circuits and is always present, in a greater or less degree, according to conditions. It is an effect and the theoretical way to remove an effect is to remove the cause, but since such a remedy cannot be applied in telegraphy or telephony, the only thing left to do is to minimize the effect as much as possible.

In his paper on induction, read at the convention of the Association of Railway Telegraph Superintendents, at St. Louis, Mo., in May, Mr. P. J. Howe, of New York, described several of the methods employed for the modification of induction. Following are abstracts taken from the paper:

Distance is the surest preventive of induction troubles. If all alternating-current lines were located a reasonable distance from telephone and telegraph lines there would be no such thing as inductive disturbances. But "reasonable distance" is an indefinite term. It varies with the opinions of different observers and it depends a great deal on the character of the disturbing circuits. It is, therefore impossible to fix any minimum distance or set of distances which a power line must be from a telephone line, or a telegraph line, in order not to cause disturbances. In any particular case, however, there should be no trouble in deciding upon a reasonable figure if the engineers of the two systems "get together" before the location of the second line is definitely chosen.

Whatever the type of a power circuit, its line insulation has a very considerable effect on the inductive disturbances caused by it. A broken insulator or a wire touching a limb of a tree, or any other object, will usually cause a leak to ground. If there are no other grounds on the circuit, this one point of low insulation will raise the potential to earth of the entire circuit and upset its static balance. As a result, the neutralizing effect of the two or three wires of the circuit will be destroyed and static disturbances in neighboring wires will be multiplied many times. Moreover, there may be a considerable current flowing to ground, if there happens to be another ground on the circuit, as, for example, at the generator or transformer, or at some other point of poor insulation. In such cases, the currents in the system will become unbalanced and electro-magnetic disturbances will result. The effect of an accidental ground on a lighting or power circuit may be very far reaching by reason of that circuit being tied into several other circuits at the power house bus-bars.

Single-phase distribution circuits are troublesome principally to telephone systems. The conditions which can be modified with corresponding effects on the telephone circuits, are the location of the disturbing wires with respect to each other, the location of transformers, taps, etc., the location of transpositions and the balance of the circuits, both static and magnetic.

It is desirable that the wires be as close together as practicable. That is, they should be on adjacent pin positions, and not on different cross-arms or on pins at the two extremities of an arm. Where a single-phase circuit includes a third or "neutral" wire, the transformers, taps, or other loads should be so located and connected that the currents will be as near in equilibrium as possible, and the system balanced.

Induction in paralleling wires can often be eliminated by transpositions in the power circuit, that is, by interchanging the pin positions of its wires. In order that transpositions may be effective, it is necessary that all exposures to the power circuit in one of its positions be equal to the exposures in its transposed position. For this reason, it is desirable that the circuit maintain its same position on a pole line throughout its entire exposure to foreign circuits. In locating transpositions, all transformers, attachments, abrupt changes in parallelism, etc., are regarded as points of discontinuity and the intermediate length of line divided by transposition into an even number of uniform sections. If the parallelism to the telephone line is uniform, the transpositions will be located equal distances apart. If the parallelism varies, the separation of transpositions will be increased as the separation of the line increases. The location of transformers, taps, etc., and of transpositions in the power wires, serve also as a basis for the location of transpositions, which are usually placed in the telephone circuits. When any of these conditions are altered, it is possible that the efficiency of the remaining transpositions in both lines will be greatly reduced. Therefore, it is desirable that all points of discontinuity on a circuit remain unchanged after they have once been established, and that the various conditions of the two systems be kept in mind whenever it is necessary to relocate taps and transformers or add new ones.

Alternating-current arc lighting circuits cause much greater induction on paralleling wires than the single-phase disturbing circuits. Like the latter, however, they are troublesome chiefly to telephone systems. Arc light induction is principally static and is generally the result of an unbalanced line.

In all cases of arc light induction, a ground on the circuit will greatly increase the disturbances in other lines. It is also probable that the effect on telephone circuits is increased by high frequency currents caused by the arc lamps themselves.

What has been said with reference to the insulation and balance of distribution and lighting circuits applies with equal force to three-phase systems. Induction from the fundamental voltages and currents of a three-phase line can be more or less eliminated by transpositions in the power wires, if the system is balanced. With an unbalanced system, transpositions will be only partially effective.

The same principles that apply to single-phase circuits apply also to the transposing of three-phase circuits.

About a year ago, the initial operation of a 140,000-volt, three-phase line induced potentials of over 2,300 volts in some neighboring telegraph wires. The parallelism was about thirty miles long and the disturbances were largely electro-static. Installing one complete transposition in the power wires reduced the induction to from 500 to 600 volts. After six transpositions had been installed, comprising seventeen 120-degree transpositions located one and two-thirds miles apart, the disturbances averaged from twenty to thirty volts.

The single-phase railway is operated with one terminal of the generator or transformer connected to the overhead trolley conductor and the other to the steel rails and earth. There is no conductor of opposite polarity carrying current in the opposite direction, as in the metallic single-phase distribution systems, and hence no neutralization of the inductive effects on other wires. For this reason, the large currents used in railway work induce very high potentials in paralleling telephone and telegraph wires, often amounting to hundreds of volts.

Most of the disturbances from single-phase railways are due to electro-magnetic induction. The magnitude of the induction depends to a large extent on the amount of current which leaves the track and returns through the earth. For this reason it is very important that the return rails be well bonded and maintained, so as to reduce the earth current to a minimum. Good bonding of rails will also tend to prevent direct leakage to other systems which work to ground in the exposed district.

Interference from single-phase induction could be largely reduced by providing an arrangement of circuits which would carry the return current in conductors located close to the trolley and feeder wires.

Electrical Transmission of Photographs.

During the last ten years the science of photo-telegraphy has developed with great rapidity, but out of the many systems invented only one or two have any possibility of being adopted for commercial purposes, says Mr. Marcus J. Martin in *Electricity*, of London. There are two questions which will have a direct bearing upon the commercial success of any system, these are how far and how quickly can photographs be transmitted. Owing to the small currents received, and to prevent interference from the leakage to earth of large currents, it is necessary to use a metallic circuit. If an overhead line could be employed no difficulty would be experienced in working a distance of over 1,000 miles. A certain amount of submarine cable is essential.

It has been found that the electrostatic capacity of one mile of submarine cable is equal to the capacity of twenty miles of overhead line, and as the effect of capacity is to retard the current and reduce the speed of working, it is evident that where there is any great length of cable in the circuit, the distance of possible transmission is enormously reduced. If we take for an example the London-Paris telephone line, with a length of 311 miles and a capacity of 10.62 microfarads, we find that about half this capacity, or 5.9 microfarads, is contributed by the twenty-three miles of cable connecting England with France.

In practice the reduction of speed due to capacity has, to a great extent, been overcome by apparatus known as a line balancer, which hastens the slow discharge of the line and allows each current sent out from the transmitter to be recorded separately on the receiver.

In extending the working to other countries where there is need for a great length of cable, as between England and Ireland, or America, the retardation due to capacity is very great. On a cable joining this country with America, the current is retarded four-tenths of a second.

In submarine telegraphy use is made of only one cable with an earth return, but special means have had to be adopted to overcome interference from earth currents, as the enormous cost prohibits the laying of a second cable to provide a complete metallic circuit. The current available at the cable ends for receiving is very small, being only 1-200,000th part of an ampere, and this necessitates the use of apparatus of a very sensitive character.

One system of photo-telegraphy in use at the present time employs what is known as an electrolytic receiver, which can record signals over a short line, such as the London-Paris line, with the marvellous speed of 12,000 a minute, but this speed rapidly decreases with an increase of distance between the two stations. If the same apparatus could be rendered sensitive enough to work on the Atlantic cables, we should find that only about 500 signals could be recorded. This would mean that a photograph which could be transmitted over ordinary land lines in about ten minutes, would take about two hours over the cable. This would be both costly and impracticable, and time alone will show whether for long-distance work transmission by wireless will prove to be both cheaper and more rapid than any other method. No system of wireless photography will be likely to come into general use (at least not for a good many years), but where there is any great distance to be bridged, especially over water, wireless transmission is really the only practical solution.

The ideal system of wireless photography will require to be both simple and reliable, besides being able to work in conjunction with the apparatus already installed for the purposes of ordinary wireless telegraphy.

Operators' Wireless Handbook.

Operators' Wireless Telegraph and Telephone Handbook, by Victor H. Laughter, is an excellent work for those who wish to obtain a general knowledge of what wireless telegraphy and wireless telephony are, and how the systems work. It describes the various pieces of apparatus employed in wireless communication, and their uses, also the various wireless telegraph systems.

A short history of early wireless methods prepares the reader to better understand the later improved systems. The book contains many illustrations, the diagrams being especially clear, which makes them easily understood. The various systems and connections are thus portrayed.

The volume is devoid of mathematics to confuse the beginner. The price is $1.00 per copy. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

"Old Farmer" Lawton and His Indian Friends.

During the late Knight Templars Conclave at Denver, Col., the remnants of the Arapahoe Indian tribe were brought to that city as one of the attractions. Among them was chief "Yellow Calf" and his favorite squaw, who had not been in the city for thirty-five years. Meeting their old acquaintance, "Old Farmer" Lawton, they showed the Indian trait of never forgetting a face by grasping the farmer's hand like an iron vise and wanted to know "how big telegraph man getting along." As the "Farmer" prides himself on the growth of the Denver office, and remembering having explained

"OLD FARMER" LAWTON AND HIS INDIAN FRIENDS.

the secrets of the dots and dashes to Yellow Calf when only four operators composed the working force, he invited the chief and his squaw to visit the present big office.

After conducting them through the operating room, where over one hundred operators are now employed, and other departments, the party reached the telephone room, where thirty-five young ladies were busy attending to the public wants. Here the wiry old chieftain turned to "Farmer" Lawton and remarked in a good strong voice, "Like city telegraf him grow too, Farmer now have many more squaws than Yellow Calf and heap lot pretty papooses." At this juncture the "Old Farmer" sank into a near-by chair and while his dusky friends were endeavoring to revive him one of the telephone girls took a snap shot at the trio.

New Resistance Material.

A new resistance material applicable to rheostats and electric heating elements is described by Mr. K. Perlewiz in *Elektrotechnische Zeitschrift*, of Berlin. It has been placed on the market under the name of "silite" and is composed of silicon and silicon carbide. In the process patented by Dr. Egly, silicon carbide is mixed with free silicon pressed to the desired form and then heated in an electric furnace. A thoroughly homogeneous and non-porous compound is obtained which has been named "silite." According to the exact mixture employed, three grades of silite are obtainable: (1) Suitable for resistances and capable of intermittent operation at red heat. (2) Suitable for heating elements and unaffected by continuous incandescence. (3) A refractory material capable of any temperature variations, however wide and rapid.

The temperature coefficient of resistance of silite is negative, and is greater the higher the resistance of the material at normal temperature. Beside the physical and chemical advantages of the new material, the space occupied by a resistor of given ohmic value is roughly one-fourth that occupied by a wire resistance.

Cost of Constructing Concrete Poles.

In our issue dated February 16, was published an article on concrete poles, written by Mr. J. W. Lee, jr., of the Pennsylvania Railroad Company, Philadelphia, Pa. The poles referred to specifically in this article were those erected on the meadows section of the Pennsylvania Railroad entrance to the New York terminal station.

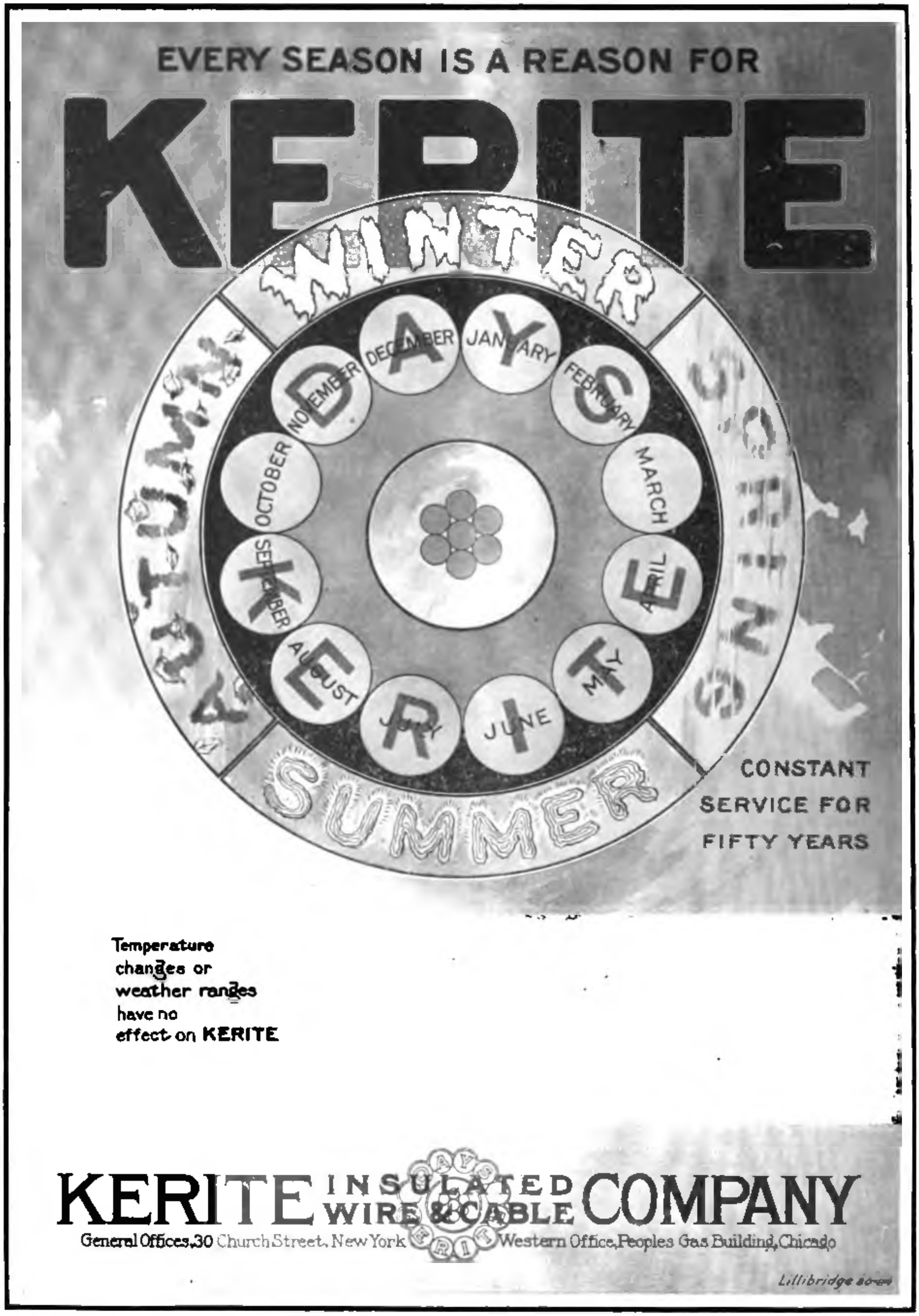
Mr. Lee gave much valuable construction data, but did not give the cost of manufacture. The following figures of costs will be of special interest to line builders.

The actual cost of labor and material for manufacture of these poles, reduced to a unit cost for an average length pole of forty feet, weighing 7,600 pounds, was as follows:

Forms—labor and material	$19.00
Concrete—labor and material	26.50
Reinforcement—labor and material	32.00
Total per pole	$77.50

These figures do not include cost of preparing site, engineering, etc., and is for the bare poles without fitting or foundation timbers. To obtain the cost of the poles erected, there must be added the cost of loading, distribution, foundations and setting, cross-arms, and fittings, but these items were special to the particular location and would be of little use as a matter of general information. It might be stated, however, that the cost of handling and erecting these heavy poles was considerably more than would be the case for wooden poles; furthermore, care must be taken in loading and unloading them, and special appliances are required for their erection.

In the special case in question it was figured that the cost of the line erected complete was not greatly in excess of an equally stable wooden pole line, as, in order to meet such a condition, it would have been necessary to employ "H" frame poles and set them in equally expensive foundation pits. In the case of this line it is interesting to note that the foundations and setting cost considerably more than the poles themselves.


EVERY SEASON IS A REASON FOR
KERITE
WINTER
SPRING
SUMMER
AUTUMN
DAYS KERITE
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
CONSTANT
SERVICE FOR
FIFTY YEARS
Temperature
changes or
weather ranges
have no
effect on KERITE
KERITE INSULATED WIRE & CABLE COMPANY
General Offices, 30 Church Street, New York
Western Office, Peoples Gas Building, Chicago
Lillibridge

THE RAILROAD.

MR. ALEXANDER CRAW, division claim agent of the Baltimore and Ohio Railroad Company, Chicago, Ill., who is well known to the telegraph fraternity in New York, was a recent New York visitor. He was accompanied by his wife. He attended the Old-Timers' reunion on his return trip to Chicago.

WOMEN OPERATORS ON THE PENNSYLVANIA RAILROAD.—The women telegraphers on the Pittsburgh Division of the Pennsylvania Railroad have petitioned the Pennsylvania Public Service Commission to set aside the requirement for a lunch-hour period, which is provided for in the new state law. They claim that the law works a hardship on them. This matter was referred to in our issue of August 16.

MR. COOPER, manager, and L. C. McIntosh, assistant manager of the Southern Pacific Company, Los Angeles, Cal., have recently completed the installation of five Gill selectors on five of the company's heaviest circuits and will soon install five more. The selectors are mounted in a neat cabinet and wired to display a signal in white figures with black background by means of a thirty-five-volt Mazda lamp and a bell common to all. The object is to save the time spent in calling by outside offices and thus avoid tieing up circuits and delay on circuits where calls are infrequent.

TELEPHONE DISPATCHING ON SEABOARD AIR LINE.—The Seaboard Air Line now has telephone train dispatching circuits from Richmond, Va., and Portsmouth, Va., over its main line to Venice, Fla., including its Orlando, Fernandina and Bartow branches; also its main line to Atlanta, Ga., aggregating 1,669 miles. The line from Atlanta, Ga., to Birmingham, Ala., Savannah, Ga., to Montgomery, Ala., and Jacksonville, Fla., to Chattahoochee River, and several branches, are yet to be covered, which will be done in due time. Three hundred and seventy-one miles of the road in Florida are equipped with the telephone. Mr. W. F. Williams, Portsmouth, Va., is superintendent of telegraph of this road.

MOTOR-GENERATOR EQUIPMENT ON MICHIGAN CENTRAL.—The Great North Western Telegraph Company has completed the installation of a motor-generator plant at the Michigan Central Railway station, St. Thomas, Ont., replacing the gravity battery. The new equipment consists of five motor-generator sets manufactured by the Canadian General Electric Company. The motors are all of 110 volts, three-phase, 25 cycles. Three of the generators are 240 volts, direct-current, compound-wound machines, and the other two are 25 volts, direct current, compound wound. The telegraph office was also equipped with two sets of Athearn standard quadruplexes, two bridge duplexes and single line repeaters. The plant was installed under the supervision of Mr. C. E. Davies, supervisor of equipment of the Great North Western Telegraph Company, while the Michigan Central interests were looked after by Mr. J. J. Ross, superintendent of telegraphs, and Mr. C. O. Van De Voort, telephone engineer, Detroit, Mich.

TELEPHONE DISPATCHING.—At a recent meeting, in Chicago, of the salesmen of the Western Electric Company, Mr. George K. Heyer, general sales agent, New York, gave some interesting statistics regarding the use of telephones in train dispatching. Prior to 1908 train movements were governed by telegraph, the first telephone dispatching being tried in October, 1907. At the present time about 70,000 miles of railroad are operated by telephone. Many large roads, he said, are now nearly fully equipped, among them being the Lackawanna, New York Central Lines, Lehigh Valley, and Atchison, Topeka and Santa Fe. Forty per cent more work can be done by train dispatchng with the telephone, he stated. Some roads report a saving on an average of an hour and a half in running time on all freight trains. This amounts to about $14,000 a year for each 150-mile section.

Resistances of Bridge Duplex and Quadruplex Sets.

Editor TELEGRAPH AND TELEPHONE AGE:

SIR:—In the article on Resistances of Bridge Duplex and Quadruplex Sets, which appeared in the July 16 issue of TELEGRAPH AND TELEPHONE AGE, formulas 1 and 35 were incorrect, one factor having been omitted from the last term of the numerator of the fraction in each case. These errors were made by the writer in transcribing from his notes, and do not affect the accuracy of the remaining formulas, which were derived from the original correct expressions.

The corrected formulas are as follows:

$$R = \frac{b(a + c)(r + s) + ar(c + s) + cs(a + r)}{b(a + c + r + s) + (a + r)(c + s)} \qquad (1)$$

$$R = 350 + \frac{b(a + c)(r + 350 + s) + ar(c + 350 + s) + c(350 + s)(a + r)}{b(a + c + r + 350 + s) + (a + r)(c + 350 + s)} \qquad (35)$$

NEW YORK. H. W. DRAKE.

LONG TELEGRAPH CIRCUIT IN ARGENTINA.—In order to commemorate the National Anniversary, the National Telegraph Department of Argentina, on July 9, effected direct duplex communication between Jujuy and Puerto Rio Gallegos (Santa Cruz). The circuit passed through fourteen provinces and four territories, the distance being 5.500 miles. There were eighteen repeater stations on the line.

MR. B. S. JENKINS, general superintendent of the Canadian Pacific Telegraphs at Winnipeg, Man., has retired on pension. Mr. R. N. Young has been transferred from Moose Jaw, Sask., to Calgary, Alta., and Mr. D. Coons has been transferred from Calgary, Alta., to Moose Jaw, Sask. Mr. D. Bowen has been appointed acting superintendent on the Lake Superior Division while the superintendent is on his vacation.

BACK NUMBERS.—We desire to call attention to the fact that 25 cents per copy will be charged for back numbers of this journal more than one month old.

Loading Telephone Lines.

In the paper of Messrs. Elam Miller and C. A. Robinson, read at the recent convention of the Association of Railway Telegraph Superintendents, in St. Louis, the authors gave some interesting facts concerning the loading of telephone lines, dwelling upon the railroad phase of the subject.

One of the potent factors in the development of the Bell telephone system, especially in the extension of the range of long-distance telephony, they stated, has been the application of the principle of loading. The question has been raised on a number of occasions as to why loading cannot, in general, be applied equally as well to the long open-wire telephone circuits of various railroad companies to increase the range of transmission over them, or to permit the stringing of lighter circuits and loading them to obtain the desired transmission equivalent.

While very material benefits in the way of increased transmission efficiency and in cheapened line construction are possible by the proper application of loading under certain service conditions, it must be explained that loaded circuits possess characteristics which exclude their use in many parts of the Bell telephone plant to-day. It is necessary that the degree of balance on loaded circuits be very much greater than that on non-loaded in order that cross talk may not be excessive. The effect of leakage or low line insulation on loaded circuits is much more deleterious than on non-loaded circuits. Further, the design, of the loading coil itself is such that currents beyond certain relatively low values, cause magnetization of the core, largely reducing the inductance and introducing irregularities, and the effect of lightning may cause similar difficulties.

The introduction of bridges on loaded circuits causes greater transmission losses than on non-loaded circuits, and special care is required in connecting loaded circuits to each other and to non-loaded circuits to prevent transmission losses at the junction points. Because of these inherent characteristics loaded circuits are far less flexible than non-loaded circuits and their successful use is limited to conditions that permit of the observing of many necessary precautions.

In general, it would seem that conditions in railroad work are not such that all of the conditions necessary to insure successful operation with loaded circuits can be observed. Where but a limited number of circuits are on the same lead, it is frequently necessary that the circuits be used for both through and way business. If these circuits were loaded, the introduction of bridges would introduce in many instances losses so serious that the circuits might well be less efficient than if non-loaded. Even if in certain cases a circuit can be set aside for long haul through business exclusively, there are still important reasons from a physical standpoint why loading cannot, in general, be proved in on railroad telephone lines. In loading open wire circuits, it is the practice to space the loading coils as uniformly as practicable at eight-mile intervals on continuous stretches of open wire line. If, however, the lines are broken up by short stretches of cable, the spacing of the loading coils has to be correspondingly shortened to allow for the higher electro-static capacity of the cable conductors. While proper allowance can be made when the loading is originally laid out for any stretches of cable which then form part of the circuits, any later changes by which relatively short stretches of open wire are replaced by cable construction, will introduce irregularities in the uniformity of the loading, which may be very disastrous from a transmission standpoint.

On railroad rights-of-way, more or less reconstruction work of one kind or another is constantly in progress. This often necessitates removing the open wire pole line temporarily in the stretches where the reconstruction work is being done and replacing it with emergency cable. The emergency cable which is used has, of course, a much higher electro-static capacity than the open wires which it replaces. As already mentioned, it would require only a few such conditions on a loaded circuit to render the transmission worse than if no loading had been done. The temporary construction work, moreover, is usually not up to the standard which is required for permanent construction, which means that while the temporary construction is in, the insulation and general maintenance conditions of the circuits will not be up to the high grade which is essential for loaded lines. All things considered, therefore, it is our feeling that except in rare instances the requirements and conditions of railroad telephone and telegraph service would exclude the use of loading.

All that has been attempted in this paper has been to give some facts, a knowledge of which, it is felt, may prove helpful in laying out a railroad telephone system from the telephone transmission viewpoint. One thought which it is particularly desired to have stand out above all others, is that no matter how well the initial design of the telephone system may be, satisfactory transmission conditions will not last unless the system is carefully supervised and maintained. In our telephone system we have found that supervision and maintenance are as essential to good service as the proper initial designing and constructing of the system itself.

RAPID PERFORATOR WORK.—Some extraordinary perforator work was done in the Cincinnati Western Union office by Miss Hazel Brown on August 5, when she punched 1,220 messages, equated, in eight hours. Her equated average per hour for the day was 152.5 messages, the flat hourly average being 138.37. The maximum was reached between 10 and 11:11 a. m., during which time 167 messages were punched. The work was mostly confined to the Cincinnati-Chicago circuit, as the file fell, but as there was not at all times sufficient business to keep her busy on that wire, the slump was filled in from other sources. Out of this number punched only twenty-eight were repunches.

PHILLIPS CODE.

The popularity of Phillips' Code, by Walter P. Phillips, was never more apparent than at the present time. Its acceptance by the telegraphic fraternity, as a standard work of the kind, dates from its first publication, and the constantly increasing demand for this unique and thoroughly tested method of shorthand arranged for telegraphic purposes has necessitated from time to time the issuance of several editions. The present edition was carefully gone over, a few revisions made, and a number of contractions added, until now this "staunch friend of the telegrapher" is strictly up-to-date in every particular. It has been declared that an essential qualification of a "first-class operator" is a thorough understanding of Phillips' Code.

The use of this system promotes rapid transmission, and for press reports especially was long since declared to be the best ever devised. By common consent it is recognized as standard, and everywhere is regarded in the profession as indispensable in contributing to the operator's fund of practical knowledge. In fact, not to understand Phillips' Code acts as a distinct embarrassment to the operator.

The price of the book is $1 per copy. Address J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Convention of Municipal Electricians.

The eighteenth annual convention of the International Association of Municipal Electricians was held at Watertown, N. Y., August 19-22, and was well attended. Among the papers presented were: "Improvements in Police Signaling Boxes," by P. I. Patton, of Philadelphia, Pa.; "Operating Fire-Alarm Systems in Smaller Cities," by A. C. Farrand, Atlantic City, N. J.; "Central Energy for Fire-Alarm Circuits," by G. McD. Johns, St. Louis, Mo.; "Moving-Picture Risks," by R. A. Smith, Norfolk, Va.; "The Electrical Wiring Standard and the Efforts to Maintain It," by W. S. Boyd, Chicago, Ill.; "Allowable Voltages in Overhead Construction in Cities," by C. P. Pike, Philadelphia, Pa.; "Grounds," by H. P. Liversidge, Philadelphia, Pa.; "Grounding Boxes," by T. C. O'Hearn, Cambridge, Mass.; "Electricity in Municipalities," by H. Joslyn, Seattle, Wash.; "Street Lighting," by L. Taylor, Dallas, Tex.

Messrs. J. W. Kelly, Jr., and Clarence R. George were re-elected president and secretary, respectively.

We expect to print a full report of the convention in a later issue.

Mr. G. McD. Johns, superintendent of police and fire-alarm telegraph, St. Louis, Mo., proposes to set the municipal clocks in that city at accurate time by wireless signals from the Government station at Arlington, Va. A wireless receiving station is now being constructed on the city hall for this purpose.

Telephonic Fire-Alarm System.

A novel fire-alarm system has recently been installed in Ephrata, Pa. The township authorities decided to adopt a telephone system, because a person sending in an alarm could, by word of mouth, give the fire department headquarters the exact location of a fire, and, in this way, the fire-fighting apparatus could be sent direct to the scene.

The equipment consists of eighteen fire-alarm telephone stations, and a switchboard at headquarters. The telephones are of the box type, with double-door construction, especially adapted to out-of-door service.

When an alarm is sent in, and the telephone receiver at the first-alarm station taken off the hook, a lamp, which is numbered to correspond with the station, lights in the face of the switchboard, and indicates the box which is calling. Associated with all the line signals is a 12-inch gong, which starts ringing whenever one of the signal lamps lights.

This system is claimed to be especially applicable to small communities.

OBITUARY.

John D. Cheever, a director of the Okonite Company, New York, and well known in electrical circles, died August 16 at Coburg, Ont.

James R. Wiley, aged sixty-six years, western manager of the Standard Underground Cable Company, Chicago, Ill., died of pneumonia in that city, August 17. Mr. Wiley was one of the most popular and best known of the Chicago electrical men. He entered the service of the Metropolitan Telegraph and Telephone Company of New York in 1878, and remained with it and its successors until 1895, when he became affiliated with the Standard Underground Cable Company, removing to Chicago as its western manager. He was a member of the Telephone Pioneers of America. Mr. Wiley was born in Newark, Mo., May 1, 1847, and spent his early manhood in St. Louis, where he was graduated from the St. Louis City University. Deceased was unmarried and is survived by three brothers and two sisters, one of the brothers being Mr. George L. Wiley, manager of the Standard Underground Cable Company, at New York.

Permanent Accumulators.—The Hagen "permanent" accumulator, designed to retain its charge over long periods efficiently and without cell deterioration, and thus to form a substitute for primary batteries in microphone, bell and alarm circuits, etc., comprises two cylindrical electrodes in a circular container of red-brown glass, this color being chosen to prevent deterioration of the plates by exposure to light. The thick rod or block forming the negative plate is separated from the positive plate (bent to cylindrical form) by insulating material. The cell is hermetically sealed except that a valve is provided for filling purposes and to permit escape of gases. Ebonite sheathing is employed to protect the terminals. An electro-motive force of two volts per cell is obtainable, and when charged the cell may stand idle for twelve months without undergoing deterioration. On continuous discharge 0.5 ampere is obtainable for sixty hours from a cell 3.5 inches in diameter.—*Electricity.*

New Book of Sketches by Mr. J. W. Hayes.

"Portland, Oregon, A. D. 1999, and Other Sketches" is the title of an interesting book just issued by Mr. Jeff. W. Hayes, of Portland, Ore., the well-known old-time telegrapher and author of "Tales of the Sierras," "Looking Backward at Portland," etc.

The story of how Portland will appear and of its activities in 1999, as seen through prophetic eyes, will be particularly interesting to the citizens of that place, as many names of business men and business houses are mentioned. Women seem to be largely in control of governmental affairs; the "tube" skirt has been abolished, and men and boys wear knickerbockers. Everything is done on a centralized basis; breweries and distilleries are out of business, a substitute for alcoholic beverages having been found, and the ministers of the gospel are under the control of a city commission.

The "sketches" referred to in the title of the book comprise a series of short stories dealing with life in the West and experiences of operators, and, altogether, the book is very readable and worth having. Mr. Hayes has a sprightly style of writing and the reading of his stories always leaves one with a satisfied feeling and in a pleasant frame of mind.

Miscellaneous.

Mr. William G. Bee, who has been associated with Mr. Thomas A. Edison for the past eleven years, has been elected vice-president and general sales manager of the Edison Storage Battery Company of Orange, N. J.

Mr. Charles Reutlinger, former plant engineer of the Harrisburg Division of the Bell Telephone Company of Pennsylvania, has been made engineer of outside plant for that company and associate companies. Mr. A. S. Schultz, former equipment engineer of the Harrisburg Division, has been appointed plant engineer to succeed Mr. Reutlinger.

Telephone Dispatching on the Erie.—The mileage of telephone dispatching circuits on the Erie Railroad totals over 700 and the number of stations approximately 300. Waystation equipments consist of Western Electric selector sets and desk stand telephones. Wherever train and message wires enter the same station the selectors are so numbered and adjusted that they can be switched through test panels from one wire to another in case of emergency. Portable telephone sets have also been furnished the various train crews on the divisions equipped for telephone dispatching.

T. and T. L. I. A. Assessment.—The Telegraph and Telephone Life Insurance Association has levied assessment 557 to meet the claims arising from the deaths of W. J. Huggins, at Nestor, Cal.; J. A. Irwin and G. Hauser, at New York.

LETTERS FROM OUR AGENTS.

PHILADELPHIA A. T. & T.

Mr. John F. Daymude, lately of the Charlotte, N. C., office of this company, has been added to the force in this office.

ATLANTA, GA., WESTERN UNION.

General manager H. C. Worthen is on a trip to California and intermediate points.

Mr. H. S. Woodruff, chief in charge of the printer department, is visiting Eastern cities.

Mr. Tom J. Goodrum has been appointed assistant chief operator, to assist Mr. B. F. Ragsdale.

Mr. Douglas Terry, repeater attendant, is in Key West, Fla., relieving the repeater men in order to give them a vacation.

Mr. J. Levin, former special agent, now retired, who has been suffering from poor eyesight for several months, is much improved.

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, Telegraph and Telephone Age, 253 Broadway, New York.

Telegraph and Telephone Age

No. 18 NEW YORK, SEPTEMBER 16, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

The Earth's Magnetic Field.

We all know that the earth is the master magnet, for every text-book makes that assertion, yet how comparatively few students give the matter any considerable thought or consider the opposing influences it may possibly be exerting against the operation of the artificial magnets used in the telegraph and telephone service.

Scientists and engineers have, no doubt, given the subject due consideration, and obtained a great deal of valuable information on the subject, but so long as mysterious external influences continue to manifest themselves every source of electrical disturbance, no matter how insignificant, should be an object of suspicion until it is proved guiltless.

For instance, the assertion has often been made that wires running north and south can be "quadded" more satisfactorily, as a rule, than wires running east and west, notwithstanding the conductors, distance and conditions may be approximately identical in the circuits compared. If such is the case, is it because the earth's magnetic lines of force run north and south, and, consequently, cross wires extending in one direction, while paralleling them in another direction?

Again, it is known that the ether waves transmitted by wireless telegraph apparatus are always perceptibly affected and sometimes greatly distorted when passing over regions known to contain considerable iron ore, such as in certain parts of Pennsylvania and other mining localities. Is not this due to a greater degree of magnetic density existing at such places than normally obtains elsewhere? Possibly no practical means of completely subduing such counter influences will ever be found, but an accurate knowledge of the general distribution of the earth's magnetic lines of force enables one to avoid them in some cases and to take advantage of them in others. At any rate, they are of such great importance to mariners that ship navigation at sea would be dangerous without an accurate knowledge of the earth's magnetic field.

In order to study the nature of this vast magnetic field, let us divide it into three principal elements; viz., magnetic intensity, magnetic declination, and magnetic inclination, as they indicate the actual magnetic conditions existing at any given point on the earth's surface.

Magnetic intensity refers to the strength of the magnetism at any place; magnetic declination refers to the direction or north and south position a free-to-move needle takes when at rest, while magnetic inclination, or "dip," as it is sometimes called, refers to the inclined position the needle would also assume if free to move vertically as well as horizontally, in addition to pointing north and south.

Now, if the values of these elements remained constant at any locality, mariners would have little trouble in locating the position of their ships, but, unfortunately, the magnetic values vary not only from year to year, month to month, but daily, and sometimes within a few hours.

The exact value of the magnetic declination at the point taken is of particular importance to the mariner. In other words, it is necessary for him to know just how far east or west of the true north his compass needle is pointing, in order to make allowance therefor in reckoning the ship's position.

We have all heard the phrase, "True as the needle to the pole," so often that most of us believe that a magnetized needle really does point to the geographical north pole. The truth, however, is that there are comparatively few places in the world where such is the case. Moreover, even where it does point true to-day, it may not point true to-morrow or at the end of any other interval of time. The compass needle nearly always shows an "east" or "west" declination, according to what part of the world the ship is in.

For this reason, charts, consisting of maps of the earth, with lines connecting together all points on the surface which have the same magnetic value, are made up from time to time for the mariners' benefit. Lines which connect all localities having the same declination are called isogonal lines. Lines which connect points where the needle points true north; that is, where there is no declination, are called agonal lines.

It would well repay one interested in this subject to procure a number of old charts and note the many changes that have occurred during even the present century.

The actual source of the earth's magnetism has always been somewhat of a mystery, although, at the present time, the belief is quite general that it is caused by electric energy from the sun acting on the magnetic substances in and surrounding the earth. This conclusion was arrived at after Humboldt, in 1836, demonstrated by his celebrated experiment that "whatever be the cause of the earth's magnetism, this cause *acts on the earth as a whole.*"

Obviously, the sun exerts a greater influence on the earth than does any other external body, and when, in addition to this fact, we find that whenever anything intercepts such influences, such as seems to be the case when spots cover part of the surface of the sun, great changes occur in the earth's magnetic field, which often bring on what are called electric storms. For this and other plausable reasons accusing fingers point almost unanimously in the direction of "Old Sol" as the actual source or cause of the earth's magnetic field.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, September 10:

American Telephone and Telegraph Co.	131¼
Mackay Companies	83
Mackay Companies, preferred	68
Western Union Telegraph Co.	67½

Telegraph and Telephone Patents.

ISSUED AUGUST 19.

1,070,407. Telegraph Typewriter. To A. D. Cardwell, New York, N. Y.

1,070,726. Harmonic Selective Telephone System. To A. F. Poole, Wheeling, W. Va.

ISSUED AUGUST 26.

1,071,207. Telephone System. To E. R. Corwin and C. A. Bals, Chicago, Ill.

1,071,208. Telephone System. To E. R. Corwin, Chicago, Ill.

1,071,209. Telephone Exchange System. To E. R. Corwin, Chicago, Ill.

1,071,210, 1,071,211 and 1,071,212. Telephony. To E. R. Corwin, Chicago, Ill.

1,071,267. Telegraphic Transmitter. To W. E. Shaw, Sheridan, Wyo.

1,071,292. Lockout Telephone for Party Lines. To E. Bowman, Elmwood, Ont., Canada.

MR. JOHN A. TOWNSEND, a forty-niner of the telegraph, and who for about a half a century was manager of the Western Union Telegraph office at Dunkirk, N. Y., writes: "Inclosed I send $2.00 to renew my subscription to the ever welcome AGE. Long may you and the AGE live for the benefit of all old-timers, both in and out of harness, and of the rising generation of those whom you guide and teach."

PERSONAL.

MR. J. H. FINLEY, supply sales engineer of the Automatic Electric Company, Chicago, Ill., was a recent New York business visitor.

MR. RICHARD L. BAMFORD, superintendent of telegraph of the New York Stock Exchange, and Miss Julia A. Rayens, sister of Michael W. Rayens, general manager of the United District Telegraph Company, were married in New York on September 3.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. EDWARD REYNOLDS, vice-president and general manager, has returned from his recent trip throughout the Middle West.

MR. CHARLES C. ADAMS, vice-president of the company, has returned to his office after spending his vacation with his family at Coburg, Ont., and Raquette Lake, in the Adirondacks.

MR. C. P. BRUCH, third vice-president, is absent on a vacation.

MR. W. C. DAVIET, district superintendent, is now settled in his new headquarters at Louisville, Ky., to which city they were moved from Atlanta, Ga.

MR. W. A. RELF has been appointed manager of the Greenville, Tex., office of this company.

MR. I. KIVEL has assumed the duties of manager at the Westminster Hotel office, Los Angeles, Cal.

NEW BRANCH OFFICE.—A handsome new branch office has been opened by this company at No. 8 East Forty-second street and 501 Fifth avenue, New York.

NEW OFFICES have been opened at Joplin, Mo., and Pittsburg, Kan., on the new line between Kansas City, Mo., and McAlester, Okla. An office will be opened on the same line at Muskogee, Okla., in a few days.

THE NORTH AMERICAN TELEGRAPH COMPANY has opened offices at Fargo and Grand Forks, N. D.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

MESSRS. NEWCOMB CARLTON, vice-president, W. H. Baker, secretary, and J. C. Willever, United States manager cable system, are again at their desks having returned from their vacations.

Mr. A. G. SAYLOR, general manager of the Eastern District, has moved his office to the old location on the fifth floor.

MESSRS. C. W. MCKEE, district commercial superintendent, and D. C. Dawson, district traffic superintendent, St. John, N. B., were in New York last week on company business.

THE OFFICES of Mr. W. A. Sawyer, district commercial superintendent, have been removed from 189 Broadway to quarters on the first floor of 195 Broadway.

MR. T. A. MCCAMMON, of the office of the division traffic superintendent, has been given the title of city traffic superintendent.

MR. J. A. BELL, chief operator of the Columbia, S. C., office, was a recent New York visitor.

THE TREASURER'S DEPARTMENT has been moved to the quarters on the first floor, formerly occupied by the Mercantile National Bank, and the traffic department, now occupies the offices on the second floor, formerly used by the treasurer's department.

GEORGE E. BAKER, aged 65 years, formerly a wire chief at 195 Broadway, New York, died at his home in Jersey City, N. J., September 7. He joined the Union army and became field operator for General Grant. When General Grant was elected to the presidency, he appointed Mr. Baker telegraph operator at the White House. After President Grant's administration, Mr. Baker entered the service of the Western Union Telegraph Company. He retired two years ago.

DIVIDEND.—The usual quarterly dividend of three-quarters of one per cent, payable October 15, was declared by the directors at their meeting September 10. The stock books close September 20.

MR. WILLIAM H. VAN ZANDT, manager Western Union Telegraph Company, at Albany, N. Y., is the subject of an interesting sketch in the Albany *Knickerbocker Press* of August 30.

THE CABLE.

NEW CABLE BETWEEN ENGLAND AND GERMANY.—The English postoffice department has decided to lay a new telegraph cable to Germany. The cable will have four conductors, and will start from a point in Norfolk, England, says the London *Electrical Review*. There are already four similar cables in use.

CABLE DAMAGES SETTLED.—The steamboat "Crown Point," last spring anchored over the cable of the Postal Telegraph-Cable Company, near Fortress Monroe, Va. The cable was hauled up with the anchor and the boat steamed away, making no effort to disentangle the cable, which was consequently broken. The "Crown Point" has settled the case by paying the entire cost of repairing the cable and also one-half in addition thereto for injury to the cable and interruption of business.

AMERICAN OPERATORS IN MEXICO.—Much is being printed these days about the danger to American citizens in Mexico, but, according to a statement made by Mr. James A. Scrymser, president of the Mexican Telegraph Company, the fifty operators of that company consider themselves as safe in Mexico as at home. The company has been operating its lines in Mexico for three years. Two years of this time the country has been more or less disturbed, but the lines and service of the Mexican company have not been interrupted for two consecutive hours during the entire period.

HOW NEWS IS DISTRIBUTED ON GRAND TURK.—The Direct West India Cable Company exercises the functions for a newspaper at Grand Turk, West Indies, where it has an office connecting with Jamaica and Halifax, via Bermuda. There being no daily newspaper there, the cable company supplies a bulletin of the world's news daily, except Sunday, which is posted at the Government office, where the public may read it. There is no wireless or other telegraph service in the colony, and the only telephone line is a short private one between the residence and the store of a prominent merchant.

THE TELEPHONE.

MR. H. J. PETTENGILL, president the Southwestern Telegraph and Telephone Company, St. Louis, Mo., was a recent New York visitor.

TELEPHONE WIRES CUT BY SUFFRAGETTES.—A number of telephone wires connecting public call offices in London were cut recently by suffragettes.

NO MORE FIRE INFORMATION BY TELEPHONE.—The Missouri and Kansas Telephone Company has issued a rule prohibiting its operators from giving information over the telephone as to the whereabouts of fires.

MEETING OF COMMISSIONERS BY TELEPHONE.—The commissioners of Madison County, Ind., who reside long distances apart, recently held a meeting by telephone, and passed an appropriation to pay the salary of a county official.

REDEMPTION OF BONDS.—The Sunset Telephone and Telegraph Company, one of the subsidiaries of the Pacific Telephone and Telegraph Company, has called for payment, October 1, its $2,250,000 consolidated mortgage five per cent bonds. The redemption is 105, so that the amount involved will be $2,362,500.

The Telephone in Japan.

Mr. Takeo Hida, electrical engineer of the Imperial Department of Communications, Tokyo, Japan, has been spending several months in New York, studying the telephone service. He is looking into telephone matters in the large cities throughout the world.

In Japan, the telephone system is owned by the government, Mr. Hida states. The government, due to recent wars, is not in a position, financially, to provide facilities adequate to meet the needs of all those who desire the telephone service.

There are 35,000 telephones in Tokyo, and as many applications for telephone service which cannot be filled because of lack of facilities. It is a common practice in Tokyo to speculate in telephone contracts, and sometimes an applicant pays a subscriber as high as $100 for the privilege of getting his contract. The longest toll line in Japan is about 350 miles. In Tokyo about eighty per cent of outside wire is in aerial or underground cable.

As the Japanese telephone girls are small in stature, it is necessary to place a platform six inches high before the switchboard to enable the operator to make all the connections easily, There are eight central offices in Tokyo, three of the common-battery type and five magneto.

J. J. BARNETT, of the Postal Telegraph-Cable Company, Knoxville, Tenn., writes: "It affords me much pleasure to enclose my check in renewal of my subscription for another year. I admire your 'yellow backs' for the reason that they are easy to locate and hard to snow under, and your columns have always been 'white' and full of interest. You have my best wishes for continued success."

CANADIAN NOTES.

Mr. J. Tait has been transferred to an inspectorship of the Canadian Pacific Railway Company's Telegraph, at Nelson, B. C., and Mr. F. E. Camp has been transferred to a like position at Brandon, succeeding Mr. E. M. Payne, promoted.

Operators Sentenced for Intoxication.—Two operators of Canadian Railways, at Montreal, Que., were recently sentenced to jail for intoxication while on duty, one of them for six months and the other for nine months.

Canadian Poles.

A bulletin has been issued by the Canadian Interior Department's Forestry Branch giving statistics as to the pole industry in Canada in 1912. From this it appears that 608,556 wooden poles were purchased, an increase of 22,853 over the year 1911. Altogether nine kinds of wood were reported for poles in 1912, with eastern cedar heading the list.

Durability in contact with the soil, lightness and a slender tapering form are most essential and cedar seems to fit those requirements better than any other native wood used in an untreated state. Balsam fir was reported for the first time in 1912. As far as form and lightness are concerned, the report states, this should make an excellent pole material if its lack of durability were made up for by some preservative treatment. The average value of poles in 1912 was $1.83, an increase of three cents over 1911. Steam railways, telephone and telegraph companies reported the purchase of 549,560 poles in 1912, an increase of 5.4 per cent over the total for 1911.

Many of the pole-line companies use preservative treatments of different kinds to prevent decay and insect injury. By thorough treatment with preservatives many non-durable woods, such as balsam fir, are being used satisfactorily where their use in an untreated state would not have been possible.

RADIO-TELEGRAPHY.

Mr. John Young, auditor of the Marconi Wireless Telegraph Company of America, accompanied by his wife, sailed for Scotland recently, where he will spent his vacation.

Mr. N. E. Albee, manager of the Marconi station at Tampa, Fla., has been placed in charge of the Cape Hatteras station. Mr. Albee is succeeded at Tampa by Mr. I. Young, formerly assistant to the manager.

Wireless in Japan.—A system of wireless telegraphy has been invented by a Mr. Torikata. It has been adopted by the government and on the mail steamers of a Japanese steamship company.

Wireless in Brazil.—The Marconi Wireless Telegraph Company has obtained a concession from the Brazilian government for the establishment of international stations at Rio de Janeiro, Belem, Trinidade, Santa Martha and Fernando de Noronha.

Wireless Station in the Bahamas.—The radio-telegraph station at Fort Charlotte, Bahamas, was opened with considerable ceremony on August 28, by Governor Haddock-Smith. Mr. P. B. Burns, superintendent of the telegraph department, Nassau, Bahamas, took a prominent part in the ceremonies. The system used is that of the Anglo-French Wireless Company. The towers are supported on concrete bases, and are constructed of galvanized iron, latticed. They are eighteen feet square, 300 feet apart and 164 feet high, each being surmounted by a wooden mast thirty-six feet high.

Wireless Direction Finder.—The Marconi Wireless Telegraph Company is placing on the market a wireless direction finder, constructed on the Marconi-Bellini-Tosi system. The object of this instrument is to enable the navigating officer of a ship to take bearings of wireless telegraph stations with a view to finding the position of his ship, especially in foggy weather, or avoiding collisions with other ships. The instrument has a range of fifty miles, or more, depending upon the power of the station from which signals are being received. It is operated in conjunction with the regular wireless system, a special aerial being used for the finding apparatus, however.

The Institute of Radio Engineers held its first meeting for the present season at Columbia University, New York, September 3. Vice-president R. H. Marriott commented on the practical achievements of radio workers during the summer, and announced the incorporation of the institute under the laws of New York State. The list of active members now numbers over 200, and includes many prominent radio engineers in England and the European continent, as well as in Australia, Africa and South America. An interesting and well-illustrated paper by Dr. Hans Rein, of the Lorenz Company, in Germany, describing the theory and apparatus of the "Multitone System," was read by Dr. Goldsmith, and was followed by a long discussion. The next meeting will be held on October 1, when a paper on the new outfits of the American Marconi Company will be presented.

An Important Book on Testing.

Every student-telegrapher should have in his library of electrical literature a copy of "Electrical Instruments and Testing," by Norman H. Schneider. The importance of electrical testing cannot be over-estimated, and a practical knowledge of this branch of technical telegraphy is indispensable to those who would progress. This book is the latest on the subject of testing and is clearly written and well illustrated. It is as useful to the telephone man as to the telegrapher, as it contains a good deal of information on testing in telephone exchanges. The work is designed for the practical man and contains only the simpler mathematics. The chapters on the testing of telegraph wires and cables. and the location of faults were written by Mr. Jesse Hargrave, a well known telegraph engineer.

The price of this book is $1.15, postpaid, to any part of the world and orders will be filled by Telegraph and Telephone Age, 253 Broadway, New York, on receipt of price.

DETROIT REUNION OF THE OLD-TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION AND SOCIETY OF THE UNITED STATES MILITARY TELEGRAPH CORPS.

The annual reunion of the Old-Time Telegraphers' and Historical Association and Society of the United States Military Telegraph Corps, convened at Detroit, Mich., August 26, 27 and 28. It was well attended and proved to be one of the most interesting and enjoyable in the history of both societies. The entertainment furnished by the local committee was exceedingly good and was thoroughly enjoyed by all present. To adequately express appreciation and to thank every member of the local committee would be a very difficult task. We cannot, however, omit mentioning a few of those who were especially active in caring for the comforts of the visitors. The president, Mr. H. J. Kinnucan, practically closed his office for the three days of the meeting and devoted his entire attention to seeing that each detail of the programme was promptly and efficiently carried out. Messrs. William A. Jackson, C. H. Cadwallader, J. Moxam, F. J. Dayman, W. M. Hayes, E. W. Malloy, F. V. Moffitt and A. L. Lafferty were especially active, and contributed very largely to the success of the reunion. The thanks of both societies and of the visitors are due to the Board of Trade at Mt. Clemens, Mich., for the entertainment furnished by that body in enabling the Old Timers to visit the various points of interest in Mt. Clemens, especially the old Grand Trunk Railway station, immortalized as the starting point of the career of Mr. Thos. A. Edison, and also for the excellent luncheon served at the Hotel Medea.

The ladies of Detroit were indefatigable in their efforts in caring for the lady visitors, and many warm friendships sprang up between the visitors and their fair hostesses. It is to be expected that many of the Detroit ladies will attend the reunion at Kansas City, next year.

Mr. J. J. Ghegan, president of the J. H. Bunnell and Company, New York, made an exhibit which attracted considerable attention. It consisted of a miniature set of telegraph instruments made by Charles Dubois and Frederick Pearce for Professor Morse in the early days of the telegraph. Mr. Ghegan also distributed snapper sounders, which created considerable merriment throughout the reunion at every informal gathering of the members.

The business meeting of the Old-Time Telegraphers and Historical Association was called to order at 10 a. m., Tuesday, August 26, in the parlors of the Hotel Cadillac, when one of the city fathers of Detroit was introduced, and, in the name of the mayor and citizens of Detroit, welcomed the delegates and friends to the city, in a pleasing address, which was responded to by Mr. E. P. Griffith, superintendent of telegraph of the Erie Railroad, Jersey City, N. J., in one of his characteristic humorous addresses.

Mr. F. J. Scherrer, secretary and treasurer, read his reports, which were followed by the auditing committee's report. The reports showed a membership of 1,215 on the rolls and a substantial balance in the treasury.

The committee on time and place reported in favor of Kansas City, Mo., for the 1914 reunion, and nominated the following officers of the association for the ensuing year: Mr. George M. Myers, Kansas City, Mo., president; Messrs. Edward Dickinson, George W. Brownson and A. B. Richards, Kansas City, vice-presidents, and F. J. Scherrer, of New York, secretary and treasurer. The report of the committee was received and its recommendations were unanimously adopted.

Mr. M. J. O'Leary, of New York, then brought the Reid Memorial Fund to the attention of the meeting, reading copious extracts from correspondence by Mr. Charles P. Bruch, chairman of the fund,

GEORGE M. MYERS, KANSAS CITY, MO., PRESIDENT OLD-TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION

and Mr. D. H. Bates, secretary of the United States Military Telegraph Corps, pressing the claims of the fund on all who are now and have been connected with the telegraph service, and announcing that a well-known old-timer has generously offered to contribute an amount equal to the total of all contributions. His eloquent appeal aroused considerable enthusiasm and resulted in a motion being made that the Association contribute an additional $100 to the fund. Individual subscriptions were also collected by Mr. R. J. Murphy, of New York.

The chair again recognized Mr. O'Leary, who, after referring to the distinguished services rendered by the members of the United States Military Telegraph Corps to the nation, offered a resolution that the secretary be instructed to prepare a suitable memorial to Congress calling for full recognition of the claims of the survivors of the corps for their invaluable services during the Civil War.

The meeting then adjourned.

The Society of the United States Military Telegraph Corps was called to order at 11 a. m., Tuesday, with Colonel W. B. Wilson, of Holmesburg, Pa., the president of the society, in the chair. Mr. M. H. Kerner, of New York, acted as secretary *pro tem.* in the absence of Mr. D. H. Bates, who was unable to be present. The reports of the president and secretary were then read and ordered printed, as well as the other reports and resolutions, letters of regret, etc.

In his address, Colonel Wilson referred to the disappointment in the failure of Congress to pass the bill for the relief of the military telegraphers of the Civil War, but urged renewed and more vigorous efforts to secure final success.

"Your committee on congressional action, under the lead of its very efficient chairman, has," he said, "rendered invaluable service during the year, and has kept in constant touch with Congress. In the present session, they have introduced Bill No. 5292 in the House, and Bill No. 1190 in the Senate. As no bills of their character will be acted upon during the present extra session, consideration of them by the respective committees will not be given until the regular session, which begins in the coming month of December. However, the full statement of your services to the government have been filed with the committees, and your president and Mr. Zion hold themselves in readiness to appear in Washington whenever necessary to urge action."

He referred to the personal interest taken by Miss Effie J. O'Neal, daughter of comrade W. C. O'Neal, to secure the passage of the bills, and, as a mark of appreciation of her work, he recommended that she be elected an auxiliary member of the Society, free of dues, with the privilege of attending the reunions and of wearing its button.

He complimented Mr. David Homer Bates, the secretary-treasurer, for his faithful work in behalf of the Society, and continued:

"To those members who have not secured the government certificate of 'Honorable Service,' I cannot give too great emphasis to his recommendation that they take measures at once to obtain it. It is a distinct honor to possess one, and it is inconceivable why anyone eligible to receive it should delay in applying for it. It is well to mention in this connection that since the Approval of the Act of Congress, on January 26, 1897, providing for these Certificates of Honor, 331 have been issued to members of the Corps. Of the comrades, in whose names they were issued, 183 are living and 148 have passed away. I would also second the Secretary in urging the sons and grandsons of members of the Corps to apply for membership in the Society, so that they may give their aid in perpetuating the history of the deeds of their sires or grandsires, who so faithfully served their country in its hour of peril."

The annual report of Mr. David Homer Bates, secretary of the Society, was a very interesting paper. He reviewed the important events of 1863, which was the crucial year of the Civil War.

"In all these critical occurrences," he said, "the military telegraphers took a specially prominent part, as many of our surviving comrades can testify. * * * To-day, half a century after those eventful years, our fraternal reunion causes a flush of memories of those stirring times in which we bore such an honorable, and, albeit, unconsciously, so important a part."

Referring to certificates of honorable service, Mr. Bates said that all that is required to obtain these certificates is to apply direct to the Secretary of War, at Washington, for the necessary form, which when received, should be filled out according to their terms.

He gave the names of the sixteen members who died during the past year.

Since the Jacksonville reunion, in 1912, ten original members, whose whereabouts had not been known before, had obtained certificates of honorable service, under the Act of January 26, 1897.

"We now have on our record," Mr. Bates continued, "the names of 249 surviving members of our corps, and also of 201 sons and grandsons, making a total of 450."

Mr. Bates stated that he had the good fortune, during the past year, to reunite, by mail, a number of comrades who had not known of each others' whereabouts since the war ended.

Since December, 1907, when Mr. Andrew Carnegie established the military pension fund, 156 pensions in all have been approved by the executive committee, forty-two of the pensioners have died, four have been dropped at their request, and one was dropped for cause; leaving on the list, at this time, seventy-four men and thirty-five women, a total of 109. This is an increase of eleven since last year's report. He also referred to the James D. Reid Memorial, and urged those, who had not already subscribed to the fund, to do so.

Mr. Bates's report, as treasurer, was read and approved. It showed a balance on hand on August 14 of $106.89.

The election of officers for the ensuing year resulted as follows: President, Colonel William Bender Wilson, Holmesburg, Pa. Vice-presidents: W. L. Ives, New York; Charles Almerin Tinker, Brooklyn, N. Y.; Marion H. Kerner, New York. Secretary and treasurer, David Homer Bates, 658 Broadway, New York—all re-elected.

President Wilson reappointed the present members of the executive committee, committee on congressional action and auditing committee.

Following is a copy of the entertainment provided by the local committee.

TUESDAY, AUGUST 26

10:00 a. m.—Business meeting of the Old-Time Telegraphers' and Historical Association called to order by the retiring president. Address of welcome and response. Installation of the new president. Transaction of business, etc.

11:00 a. m.—Business meeting of the United States Military Telegraph Corps.

Automobile ride—Cars will leave Cadillac Hotel promptly at 3:30 p. m.

WEDNESDAY, AUGUST 27

Steamer "Pleasure" leaves foot of Bates Street promptly at 10:30 a. m., up through Belle Isle

Bridge into Lake St. Clair, return by Canadian side down River, passing Detroit, Grosse Isle, through Livingston Channel into Lake Erie, returning by Amherstburg Channel, with stop at Bois Blanc, land at Detroit about 5 p. m.

THURSDAY, AUGUST 28

Trolley ride to Mount Clemens, and reception by Chamber of Commerce. Entrain at Congress and Shelby Streets, cars leave promptly at 9:30 a. m. Banquet at the Hotel Cadillac, 6:30 p. m.

Over 200 persons gathered in the banquet hall of the Hotel Cadillac on the evening of August 28. The room was beautifully decorated and this assemblage proved to be the crowning event of the reunion. After coffee was served, Mr. H. J. Kinnucan, president of the association, gave expression to his pleasure, as well as that of the citizens of Detroit, in having been able to entertain such a large gathering of old-timers and military telegraphers, and introduced Mr. William A. Jackson, the president of the Michigan Telephone Company, who, in short addresses, introduced the various speakers. Among those called upon were Governor W. N. Ferris, of Michigan, who delivered a most stirring and eloquent address on the subject of Higher Education, as exemplified, in general, in the character of many telegraphers, both past and present. He was followed by Colonel William Bender Wilson, who spoke on behalf of the military telegraphers during the war.

Mr. William R. Plum, of Lombard, Ill., spoke on the "Relation of the Telegraph to Military Service"; Mr. Jas. Schermerhorn, of the Detroit *Free Press*, delivered an interesting address on the "Press"; and Mr. E. P. Griffith, on the "Relations of the Telegraph and the Telephone." Mr. T. E. Fleming responded to the toast "The Ladies," and Mr. M. J. O'Leary, on "Fraternity."

The various addresses were of such an interesting character that the full attendance of the meeting was held to the hour of adjournment, which was after midnight.

A resolution was carried by acclamation, embodying the high appreciation of the visitors for the splendid hospitality and generous entertainment furnished by Mr. H. J. Kinnucan and his able assistants on the various committees.

Those present were:

Adrian, Mich.—Cass W. White.
Arlington, N. J.—J. H. Dresser.
Ashtabula, Ohio.—C. W. Jaques and wife and Mrs. C. W. Naumann.
Bay City, Mich.—Thos. J. Cooper and Florence E. Cooper, A. A. Patterson and wife.
Boston, Mass.—J. B. Colson and wife, C. A. Richardson and wife.
Bradford, Pa.—E. E. Buel.
Buffalo, N. Y.—N. Hucker and two daughters, J. E. Jenkins, L. M. More and wife, John A. Pferd, H. D. Reynolds.
Brooklyn, N. Y.—Cora A. H. Mauer.
Cheboygan, Mich.—Mayme E. Farr.
Chicago, Ill.—A. H. Bliss, Herbert Brown and wife, M. T. Cook and wife, T. P. Cook, John Crawford and wife, W. W. Drew, John S. Henderson, E. C. Keenan and wife, C. S. Loewenthal and wife, J. R. Magill, wife and sister, A. W. Nohe, Mrs. A. W. Sharp, E. G. Scheckler and wife, Enoch B. Stevens.
Cincinnati, Ohio.—R. C. Bliss and wife, I. N. Miller and wife.
Cleveland, Ohio.—F. J. Dayman, wife and daughter, E. C. Newton, A. G. Paine and wife, B. J. Ross, O. F. Stow and wife.
Columbus, Ohio.—Otis H. Newell, G. F. Ramsey and wife, H. E. Rawson.
Crystal River, Fla.—M. H. Baum and wife.
Davenport, Ia.—L. A. Rose.
Detroit, Mich.—J. Baxter, W. H. Bouma and wife, C. H. Cadwallader, Jno. L. Currier, wife and son, Charles T. Duffie, R. H. Dunphy, G. M. Eitemiller, W. M. Hayes and wife, F. M. Hughes, W. A. Jackson, O. L. Ray Jones, Stewart W. Knapp, H. J. Kinnucan and wife, A. L. Lafferty, Alfred Lowther, John S. Lucock, Tom A. Mears, J. Moxam and wife, J. McArdle, E. C. McConnell and wife, L. C. McCormick, Mrs. T. D. McGarry, J. W. McNamara, Miss M. Payne, W. A. Powers, Thos. Powers, J. M. Richardson, Mrs. R. M. Robinson, A. H. Rockwell, Wm. Rosenberg, J. J. Ross and wife, J. H. Shields, B. C. VanValkenburg, T. E. Wellington, C. E. White.
Elmira, N. Y.—J. H. Shearer.
Grand Rapids, Mich.—W. Fry, F. S. Gould, A. M. Nichols.
Holmesburg, Pa.—Wm. Bender Wilson.
Indianapolis, Ind.—P. L. Mounce, C. S. Rhoads and wife, J. F. Wallick, A. A. Zion.
Jacksonville, Fla.—Mrs. Florence W. Heston.
Johnstown, Pa.—Peter Weitz, wife and two daughters.
Jersey City, N. J.—J. B. Bertholf, J. Fliegauf and wife, Jos. Mills, C. B. Molineaux and daughter.
Jersey Shore, Pa.—H. W. Wedge.
Kansas City, Mo.—G. W. Brownson and wife.
Lombard, Ill.—William R. Plum.
Lansing, Mich.—E. W. Malloy and daughter Mildred.
Marion, Ohio.—J. W. Freeland and wife.
Manistee, Mich.—J. J. Richards.
Massillon, Ohio.—F. R. Drake and wife.
Montreal, Que.—W. J. Camp, wife and son, Eric W.
Mt. Clemens, Mich.—J. Schanher.
Montgomery, Ala.—Edgar Winter.
New Haven, Conn.—Chas. E. Graham.
Norwalk, Ohio.—L. B. Dennis.
New Orleans, La.—H. F. Farmer
New York City.—Thos. E. Fleming, wife and daughter Rita, J. J. Ghegan, M. H. Kerner and wife, R. J. Murphy, M. J. O'Leary and wife, Frederick Pearce, Chas. W. Pearson, F. J. Scherrer, wife and daughter Edith, J. B. Van Every and wife, A. P. Velie and wife, H. C. Wildner and wife, Mrs. M. C. Gates.
Omaha, Neb.—C. B. Horton and wife.
Owosso, Mich.—J. M. Beckwith and wife.
Passaic, N. J.—E. P. Griffith.
Petoskey, Mich.—S. L. Robinson.
Port Huron, Mich.—Elenor F. Dean.
Punta Rassa, Fla.—G. R. Shultz.
Philadelphia, Pa.—J. W. Crouse and wife, J. W. Collins and wife, Dan S. Robeson.
Pittsburgh, Pa.—John F. Amend and son, S. J. Armstrong, L. Behner and wife, E. C. Bishop, Miss Jane L. Collins and sister, Miss L. J. Duncan, T. S. Fleming and wife, Thos. Gosden and wife, Miss S. R. Haney, Miss Bell, E. M. Love, W. K. Mellor and wife, W. I. McQuown, wife and two sons, C. H. Rugg and wife, W. R. Smith and wife, Charles R. Stough, Jno. W. Stump and wife, J. A. Watson, Jno. Wentz, James Allen Wilson and friend, J. W. Yealy, wife and daughter, George Evangel Young.
Rochester, N. Y.—John A. Townsend.
Saginaw, Mich.—C. E. Gage, E. A. Patterson.
Springdale, Pa.—Mrs. Lizzie C. Adams and niece.
St. Louis, Mo.—R. H. Bohle and wife, W. R. Chapman and wife, J. H. Gallagher and wife, H. J. Pettengill.
Toledo, Ohio.—W. G. Brownson and wife, Geo. E. Crapsey, F. C. Hackett, F. V. Moffitt and wife, Charles Olsen, Misses Grace, Alice and Norma Schultz.
Toronto, Ont.—Geo. D. Perry and wife.
Trenton, N. J.—F. J. Weis.

Washington, D. C.—Harry McKeldin and wife, R. M. Ross and two daughters.
Wellsville, Ohio.—P. Bruner and daughter.
Wilkinsburg, Pa.—S. W. Geary, wife and daughter, C. M. Hicks and wife, C. A. Mitinger.

NOTES.

Mr. George M. Myers, the new president of the Old-Time Telegraphers' and Historical Association, is a well-known old-timer. He is a native of New York City, but practically all of his telegraphic experience has been in the West. He is one of the most prominent and successful business men in Kansas City.

Mr. M. J. O'Leary, secretary of the Telegraph and Telephone Life Insurance Association, was indefatigable in his efforts to push the welfare of his association, and the interest which he created among the local telegraphic and telephonic fraternity will, doubtless, result in many new members being enrolled.

An automobile trip around the city and through the park system was one of the most interesting features, and the visitors were loud in their appreciation of the extent of the manufacturing interests of the City of Detroit, and the beauties of Belle Isle Park and Waterworks Park. A unique attraction in the latter was a clock made of flowers and keeping perfect time. The trip down the river, on Wednesday, which occupied the entire day, to "Bob-lo" (Bois blanc) proved to be one of the most pleasant and interesting events of the reunion. After luncheon was served on board the boat, both young and old gathered on the dancing floor and thoroughly enjoyed themselves. It was, indeed, a pleasure to everybody on board to see many of the old veterans, who were conspicuous by their activity, vying with the younger visitors in furnishing amusement to all on board. The steamer then proceeded up the river to Walkerville, Ont., where the entire party disembarked and was shown through the large distillery of Hiram Walker's Sons Company, Ltd. After going through the various buildings, an enjoyable luncheon was served by the firm, on the grounds. During the assembling of the party for the purpose of having a photograph taken, an opportunity was presented to give a hearty expression of thanks of all present to the firm for the privilege of the visit and for its generous hospitality. After re-embarking, the steamer returned to Detroit, which was reached about 6:30, after a most enjoyable day.

Four of the large cars of the Detroit Street Railway conveyed the party to Mount Clemens, as the guests of the Mount Clemens Board of Trade. Mr. J. Schanher acted as chairman of the local committee, and received the visitors at the Hotel Medea, where an opportunity was afforded to all to visit the wonderful bathing arrangements of that famous resort, as well as to enjoy an automobile ride around the city, having for its objective point the old historic station of the Grand Trunk Railway. On reassembling, the party was entertained at luncheon and was welcomed to the city by the president of the Chamber of Commerce. Short responses were made by Mr. M. J. O'Leary and Mr. E. P. Griffith, after which the party returned to Detroit to prepare for the banquet.

Miss Effie J. O'Neal, daughter of William C. O'Neal, a veteran war telegrapher of Washington, D. C., had a unique honor conferred upon her at the Detroit reunion by the Society of the United States Military Telegraph Corps. At its meeting in the Hotel Cadillac, on August 26, Miss O'Neal was unanimously elected an auxiliary member of the society, free from the payment of dues, with the privilege of attending its meetings and wearing its button. Subsequently, the society ordered that a gold button should be made, and presented to her. Miss O'Neal has been a strenuous and enthusiastic advocate of the bills before Congress to pension the military telegraphers who served in the Civil War.

Bound Volumes of Telegraph and Telephone Age.

For those of our readers who desire to have the past year's issue of TELEGRAPH AND TELEPHONE AGE in a form in which they can readily preserve all of the copies for future reference we would recommend a bound volume. We are now able to supply these containing the twenty-four issues of 1912 for the nominal price of $3.50. There are several features in one of these volumes, which comprises nearly 900 pages of reading matter, which are alone worth much more than the amount asked. The most important series of articles during the year was the "Course of Instruction in the Elements of Technical Telegraphy," which is widely studied and highly commended. These articles, together with the series by Mr. Willis H. Jones entitled, "Some Points on Electricity," are worth many times the price of the book. We have also published articles by the best-informed authors upon the developments in wireless telegraphy, and, in fact, there will be found recorded in this book all of the important improvements in the wireless art during the past year. The use of the telephone for train dispatching has largely increased since January, 1912, and we have kept pace with its development by presenting to our readers many articles upon this subject, written by some of the best-posted men in the railway and telephone world. Those interested in any branch of the telegraphic industry will find much valuable information in one of these bound volumes. A copy of this work will be sent to any address, upon receipt of price, $3.50, by J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

MR. F. C. HACKETT, an old-time telegrapher, now general manager of the Toledo Warehouse Company, Toledo, Ohio, writes: "I enjoy the contents of TELEGRAPH AND TELEPHONE AGE as much as ever, although my efforts are in other than telegraphic lines. I appreciate its personal mention column probably more than any of the technical problems worked out. I want to reiterate what I have said many times before that you have a journal worthy of the attention of every telegrapher."

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Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

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253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, SEPTEMBER 16, 1913.

Ground Connections.

The importance of a reliable connection between the ground and electric systems has, in late years, been emphasized as a result of the use of high-voltages for electric light, electric railway and power transmission, and much investigation and study have been devoted to this subject by electrical engineers. Formerly a few turns of wire around the gas or water pipe sufficed for the purpose of a telegraph ground connection, but, with the increasing use of larger currents, this makeshift was soon found to be unreliable and inadequate.

The American Telephone and Telegraph Company has given probably more attention to the subject of grounds than any other electrical interest, and has standardized a form that is being generally adopted.

In this issue we print two articles bearing upon this important subject. Mr. Liversidge, in his paper, read at the recent convention, in Watertown, N. Y., of the International Association of Municipal Electricians, calls attention to the importance of reliable ground connections and describes the modern improved method of attaining this end.

The description of the method adopted by the Marconi Wireless Telegraph Company to secure a good ground for its high-power stations now being erected along the eastern coast of this country will be read with much interest. It is an elaborate system, but the end evidently justifies the means.

At the recent St. Louis convention of the Association of Railway Telegraph Superintendents, Mr. R. E. Chetwood, of the Western Union Telegraph Company, also referred to the subject of grounds and described the standard system of that company.

From the fact that grounds have formed the topic of discussion at three important conventions of technical associations this year it may be readily inferred that the subject is one of deep concern to the interests involved.

The Old Timers' Reunion.

The annual reunion of the Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps, which was held at Detroit, Mich., August 26-28, a report of which appears on other pages in this issue, was a highly successful and largely attended event. One of the enactments of the meeting was the donation of $100 toward the James D. Reid Memorial, and this amount was considerably augmented by many individual subscriptions.

The excellent entertainment programme was fully carried out, and everyone in attendance had an enjoyable time. Even the weather was on its good behavior, only once was there rain and that was while the party was in Mount Clemens on the trolley trip. But rain in that town is not taken seriously, as it is a place where baths are the rule.

It is not often that a gathering of this character is honored by the presence of the governor of the state in which it is held, but these old timers are in a class by themselves, and no honors too great can be bestowed upon them. The Governor of Michigan graced the banquet by his presence, and made an interesting and laudatory address, which well fitted the occasion.

Much regret was expressed at the absence of Mr. Thomas A. Edison, who expected to attend the banquet.

From beginning to end the old timers received the utmost attention, and were greeted with open arms, and entertained without stint wherever they went. The remembrance of the Detroit meeting will, therefore, linger long in the minds of those who were present.

Chinese Telegraph Code.

American telegraphers have reason to be thankful that there are only twenty-six letters in the English alphabet, with their corresponding telegraphic characters to memorize. In the Chinese language there are about 40,000 characters, but, fortunately for Chinese operators, they are not required to memorize so many. It is only the highly educated persons that utilize them, the fairly literate classes not using over 7,000. Even this number is prohibitory in a telegraphic sense, and the problem has been to fit the Chinese language to a telegraphic code.

One of the difficulties met with is the fact that many of the monosyllables of the Chinese language have entirely different meanings, according to the way they are uttered. Thus, for instance, the word for "girl" may mean "chair" when spoken in a shriller tone of voice.

The Morse code, of course, cannot meet such conditions, but Professor Schellerup, a Dane, has found a solution to the problem. The 7,000 characters most commonly used are given their equivalents in a code of numerals and these numerals are telegraphed. Thus, "cash" in the code is 6,030. If any one wanted to telegraph the number 6,030 itself, he would send the code equivalents of the words "six," "thousand" and "thirty."

Mental Growth.

As we ascend a mountain, each step reveals a wider horizon, and we get a broader view of the world, the like of which could not be obtained on the lower levels. So it is with the acquirement of knowledge. We start from the common level, and, as we advance, our mental horizon expands and we are brought to a realization of the existence of facts that we knew nothing of.

Telephone Pioneers of America.

C. J. GLIDDEN.

Mr. Charles Jasper Glidden, a well-known former telegrapher and prominent telephone official, was born at Lowell, Mass., August 29, 1857. He began his business career in 1872 as a messenger for the Northern Telegraph Company in Lowell, and filled the position of manager of the Atlantic and Pacific, and Franklin Telegraph Companies, at Manchester, N. H., between 1873 and 1877. In the year 1876 Mr. Glidden became interested in the telephone, conducting the Manchester end of experiments with Professor Alexander Graham Bell in Boston. He built private lines in Massachusetts and New

CHARLES J. GLIDDEN, BOSTON, MASS. (1876)

Hampshire, and suggested to the Bell Company the building of an exchange, which it agreed to do at Lowell if fifty subscribers could be obtained. Mr. Glidden, in 1877, commenced canvassing for subscribers in that city, and obtained the first subscriber to a telephone exchange. The first long-distance line was built by him in 1879 from Lowell to Boston. He organized and served as treasurer and president of several New England and Western telephone companies from 1876 to 1900, and raised, with others, $50,000,000 for telephone extensions.

At one time Mr. Glidden managed one-sixth of the Bell systems in the United States. During the year 1892 and 1900 he was president of the Traders' National Bank of Lowell.

Mr. Glidden is an automobile and aerial navigation enthusiast. He was the first to make the trip around the world in an automobile. He made this trip twice, travelling 46,528 miles, and crossed thirty-nine different countries, between 1901 and 1908. He crossed the Arctic Circle in Sweden and reached the most southerly road in the world in New Zealand. Mr. Glidden has travelled all over this country many times in the automobile, and on one occasion, took a message from President Roosevelt to President Diaz, of Mexico, using the railway tracks from Chicago to Mexico, with an automobile provided with flanged wheels. In 1906 he crossed the American continent from Boston, Mass., to Vancouver, B. C., using the railway wheels on the Canadian Pacific tracks from Minneapolis, Minn., to Vancouver.

Mr. Glidden made forty-nine balloon ascensions in various countries up to December 31, 1911. During his automobile world tours he was entertained by many kings and rulers, and he published accounts of his trips.

Mr. Glidden is a member of many clubs and societies in America, England and France, and keeps in close touch with automobile and aerial navigation development. He retired from active business in 1901.

The Morse Alphabet.

In 1854, and also at a later period, a movement was started to change the Morse alphabet by substituting new combinations for the spaced letters C, O, R, Y and Z. It was the subject of an official order by the New York and New England Union Telegraph Company, and also by the New York, Albany and Buffalo Telegraph Company, but was only partially carried out by the former, and not at all by the latter. Mr. O. E. Wood, superintendent of the Buffalo line, threatened to resign if the order were enforced. Both orders were revoked. The alphabet and numerals remain as first arranged by Professor Morse. The punctuation marks are of later date.

THE PENNSYLVANIA PUBLIC SERVICE COMPANY LAW.—The new law of the State of Pennsylvania for the regulation of railroads, telegraph, telephone and other public service companies, provides that telephone and telegraph corporations must furnish through and continuous communication without any unreasonable interruptions or delay. Telegraph corporations must connect their lines for through traffic whenever the commission may require; telephone lines are subject to similar requirements, the intent of the law being to secure efficient through service where it can be obtained without injustice to either company, and without impairment of its service. Such connecting companies shall make among themselves an equitable apportionment of the cost and revenue.

Course of Instruction in the Elements of Technical Telegraphy—XLVII.

(Copyrighted.)

(Continued from page 528, September 1.)

[The Course of Instruction in the Elements of Technical Telegraphy, which has been running regularly in this journal since October 16, 1911, has met with wide-spread favor and is being studied diligently by thousands of telegraphers and others throughout the world. It is being translated into Spanish, and printed in South American electrical journals, and has attracted universal attention for its clearness of expression and its practicability. It has been endorsed by the officials of telegraph, telephone, cable and railroad companies, many of whom have acknowledged the improvement in the technical standing of their progressive employes, and they commend the course as being of the most practical kind of instruction.

This course was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, and is being published now for the benefit of those of our readers who desire to fit themselves for higher positions in the engineering branch of telegraphy, and it has been a valuable aid in this direction. It is elementary, and devoid of higher mathematics, yet it is fundamental in character and extremely easy to learn.

Each chapter is complete in itself, and the chapters are arranged in natural order so that the student acquires the knowledge step by step in logical sequence. Each chapter is followed by test questions on the subject of the chapter, thus enabling the student to review his progress from time to time.

Back numbers containing these valuable lessons can be obtained at 10 cents per copy.]

The Condenser (*Continued*).

When two condensers are connected in series their joint capacity follows the law of joint resistance, being equal to the product of the respective capacities divided by their sum. To find the joint capacity when there are more than two condensers in series, the joint resistance law still applies. Thus, in Fig. 60, calling the capacities of C, C', C", 8, 4

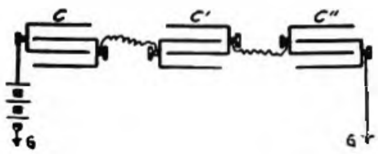

FIG. 60—THREE CONDENSERS IN SERIES.

and 2 micro-farads respectively, to find the joint capacity change the capacities into fractions, with 1 as a numerator and divide 1 by their sum. Changing into fractions and adding gives $\frac{1}{8}+\frac{1}{4}+\frac{1}{2}=\frac{1}{8}+\frac{2}{8}+\frac{4}{8}=\frac{7}{8}$ Dividing 1 by $\frac{7}{8}=1\times\frac{8}{7}=\frac{8}{7}=1.14$ micro-farads.

The capacity of all the condensers in series is thus less than that of the least of the condensers alone. In telegraphy it is rarely necessary to connect condensers in series. In testing it is occasionally done to secure a greater variety of capacities.

The Polarized Relay.

In the polarized relay the armature is in the form of a soft iron tongue magnetized by the induction of a strong permanent magnet.

Fig. 61 shows the principle on which it works. S is the South pole of the permanent magnet, slit to receive the soft iron tongue, which is pivoted in

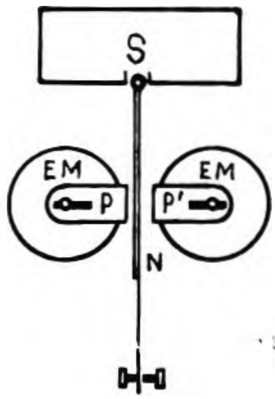

FIG. 61—PRINCIPLE OF CONSTRUCTION OF POLAR RELAY.

such a manner as to move freely between the pole-pieces P and P¹ of the electro-magnet E M.

The cross-bar connecting the two cores of E M rests on the north pole of the permanent magnet and the cores are consequently magnetized with north magnetism at their extremities P and P¹. The south pole of the permanent magnet, S, induces south magnetism in that portion of the armature which plays between the pole-pieces, and the tongue having no retractile spring will, therefore, when equi-distant from the pole-pieces, lie against either stop, but when brought nearer to one pole-piece than the other will remain under the stronger influence of the nearer pole. A bias corresponding to the pull of the retractile spring of the ordinary relay may thus be given to the armature which will hold it either against P or P¹, as desired. When the coils are wound in series the effect of a current passing through them is to make P and P¹ of opposite polarity. If, therefore, the direction of current be such as to cause a north pole at P, then P, being already north by the magnetism of the permanent magnet, becomes more strongly magnetized. But the north magnetism of P¹, being now opposed by the, perhaps, stronger south magnetism resulting from the electro-magnet, will be overcome, and the tongue, influenced by the attraction of P and the repulsion of P¹, will be against P. On the current being reversed the magnetism of P is overcome and a south pole established in its place, while P¹ is made stronger, and the tongue being now "pulled" by P¹ and "shoved" by P, moves over against the former.

It would seem, at first glance, that the reversals of polarity in the electro-magnet would affect the polarity of the permanent magnet and weaken the magnetism of the tongue, but, owing to the cores of E M being connected to the permanent magnet at their cross-bar, which corresponds to the neutral line of the electro-magnet, the permanent magnet is not affected and the tongue retains its south magnetism.

Fig. 62 represents the form of differentially wound polarized relay used by the Western Union Telegraph Company. P M is the permanent magnet, bent to the shape shown, on one pole of which, S P, the cross-bar connecting the electro-magnets rests. The electro-magnets E M are placed so as to bring their cores face to face and the magnet cores are extended beyond the edges of the coils by means of soft iron pole-pieces. The local contact point and back-stop are movable in a frame which is

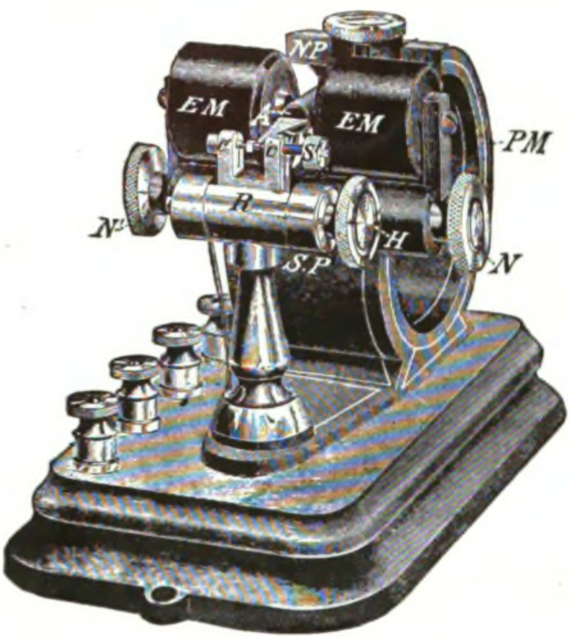

FIG. 62—GENERAL VIEW OF POLAR RELAY.

adjustable by the screw H, and the play of the armature regulated by the screw S¹.

Other forms of polar relays are now in general use, but the principle is the same in all.

QUESTION PAPER.

1. In Fig. 61, if it were desired to have the tongue rest against P, when no current is flowing through E M, how could this be accomplished?

2. What is an adjustable condenser?

3. Explain how a charge is accumulated in a condenser when connected as in Fig. 57.

4. In the same figure would it make any difference if the battery were joined to the right-hand terminal and the ground to the left-hand one?

5. (*a*) In Fig. 58, suppose the discs to be numbered 2, 4, 10, 20, 35, instead of 4. 8, 16, 32, 40, and that the total capacity is 2 m fs. With plugs inserted as shown in the figure, what is the capacity of the sections in use?

(*b*) What plugs would need to be inserted to obtain a capacity of 2 m fs.

(*c*) With all the plugs out, what is the capacity of the condenser?

6. (*a*) Find the joint capacity of 3 condensers of 5, 4 and 3 m fs. capacity, joined in parallel.

(*b*) The capacity when joined in series?

7. Fig. 61. When no current is flowing through the coils of E M, what is the polarity of P and P¹?

8. (*a*) Could a polarized relay with the coils wound in series be used on a single Morse circuit?

(*b*) If so, how would you adjust the armature?

9. Explain how a polarized relay responds to reversals of current.

10. What do you understand by the charge of a condenser?

11. What would affect the charge of a condenser?

12. Is the quantity of electricity contained in a non-adjustable condenser the same at all times?

(To be Continued.)

Chemical Effects of a Current of Electricity.

The chemical effects of an electric current are useful in many respects, while, in others, they are detrimental. Water pipes, gas pipes and ground wires are corroded by the same action which causes one plate of a copper or zinc voltameter to be eaten away, while the other plate is increased in bulk and weight.

Grounded water and gas pipes are damaged by electric currents when the positive pole of the source of energy is connected to them. As the current passes from the pipes to find the negative return it carries with it some of the metal, and this action will, in time, damage the pipes to such an extent as to render them useless. For this reason it is customary to ground the positive pole of the generator, the negative pole being connected to the pipes or other conductors. Under such conditions the current flows to the underground pipes and not from them.

ELECTROLYSIS OF WATER.—To electrolyze water a pressure of 1.4 volts is required, and when an electrolyte requires for separation more than this applied voltage, the metal in solution is not deposited, although hydrogen is formed. In metal refining copper is produced in large quantities and of a high degree of purity. The crude copper, containing varying amounts of other metals, such as silver, gold, lead, tin, etc., is prepared in the form of a cast plate, and is used as the anode in the electrolytic bath, and thus forms the positive terminal. For the negative, or cathode plate, a thin sheet of refined copper is used, and, assuming a suitable current density, the anode is gradually dissolved, and pure copper, in a finely divided state, is deposited on the cathode. When other metals are present in the anode they are separated, but are not deposited on the cathode; gold and silver fall to the bottom with other impurities in the form of a sediment. Lead falls as a sulphate and tin as an oxide, while, if the current density does not exceed a certain value, the metals zinc and iron remain in solution as sulphates.

ADDRESS WANTED.—The present address is desired of Mr. R. O. Holton, formerly manager of the Postal Telegraph-Cable Company, at Gulfport, Miss. Address Telegraph and Telephone Age, 253 Broadway, New York.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

In an electric generator, how are the terminals of the armature coils disposed on the shaft and what is the name of the parts constituting the terminals?

What is the name of the device used in collecting the electric current from the revolving commutator?

Why is it necessary that the brushes should bear against the segments of the commutator?

How many segments are there in the commutator?

How many brushes are required for the collection of current from a direct-current generator?

What is a shunt-wound generator, and what is the necessity of the shunt winding?

What is a self-exciting generator?

Do the exterior circuit terminals and the shunt-winding terminals require separate points of connection with the commutator brushes?

Study Fig. 146, on page 168, of the text-book, and note the directions of the flow of current in the external and shunt circuits.

In order to maintain a practically uniform difference of potential, how should the generator be driven?

What are the principal advantages of the electric generator over the electric battery?

In large offices where different lines vary greatly in length and resistance, by what means are the lines supplied by the same quantity of current?

How are generators connected in order to supply currents of different voltages?

Is such a combination of machines grounded at any point? If so, where?

How is the switchboard connected with the generators?

If we have five machines connected in series, each generating a voltage of sixty, what would be the total voltage at the terminals of the first and last machines?

What would be the voltage at the terminals of the first and third machines?

Is the same set of generators used to supply wires with positive and negative currents?

By what means are electric generators driven?

How are the shunts of the machines shown in Fig. 158, page 170, excited?

Is the internal resistance of a generator more or less than that of a voltaic battery of equal output?

Does a generator plant occupy as much space as a battery of equal output?

(To be Continued.)

Successful Management of Messengers.*

BY J. DIEHL, DISTRICT SUPERVISOR OF WESTERN UNION MESSENGER SERVICE, PITTSBURGH, PA.

The management of the messenger department is a duty which must be diplomatically handled, more so than any other department. We must never lose sight of the fact that we are dealing with boys, nor the importance of this branch of the service.

Every detail in the telegraph business has an important bearing on some other detail, but, perhaps, in the whole service there is no feature so imperatively important as the messenger service. The salesmen may develop any amount of new businesss, which the traffic department will handle with the utmost speed and care, and yet the efforts of both departments will come to naught if the messenger does not handle the telegram efficiently, the result of which will be a dissatisfied customer and the efforts of our fellow-workers of no avail.

The employe in charge of the department should understand his duties thoroughly, he should be a judge of human nature, and be able to judge quickly, for no two boys are alike. The first boy out may be able to deliver ten or more messages with very little delay and in a businesslike way, but the next boy may fail in delivering two or three.

If a delivery clerk is employed, he needs more supervision than the boys. Seventy-five per cent of our messenger troubles is due to irresponsible delivery clerks. If a delivery clerk fraternizes with the boys, jokes with them and is one among them, yet in the next breath endeavors to rudely enforce discipline, he finds they demur, and he promptly discharges the boys concerned, never considering that he is the cause of their demoralization.

Do not discharge a boy for trivial reasons. Good messengers are difficult to procure and once trained in the service, they become a valuable asset. It should, therefore, be borne in mind that a boy should be dismissed only when the offense justifies it. Other means of correction should be tried first, and, if unsuccessful, the boy's parents should be consulted.

Too much cannot be said of the advantage of dealing with the boy's parents. The parents of every messenger in our employ have visions of their boy some day occupying the President's chair, and to discharge him without their knowledge would blast their hopes, and, in many cases, work a hardship on them. If, however, the offense makes it necessary that the boy be discharged, that should be the end; under no circumstances should he be reinstated.

The greatest means to an efficient force are wages which correspond to those paid by other industries in any given locality, together with discipline.

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* *Commercial News.*

Wireless and Weather.*

BY A. H. TAYLOR.

It is a well-known fact that the night range of a long-distance wireless station is often several times as long as the day range. It is also a matter of very common experience that the day range and the night range are both subject to wide variations from day to day or night to night. Reference is not here made to variations attributable to unfavorable conditions at the sender or at the receiver, such as excessive atmospheric electricity, heavy rains with consequent poor insulations, or interference with other stations, but rather to variations that may be traced to general absorption over long stretches of land or sea.

There must be a vast quantity of data on hand bearing on this problem, as every operator must have noticed some connection between transmissivity and weather conditions, but the data are scattered and not very available. The writer is not aware that any serious attempt has been made to correlate the transmissivity over long distances with the weather conditions prevailing in the region traversed by the waves. There seems to be only one tenable theory as to the source of this absorption, and that is the sunlight theory mentioned by Zenneck, Pierce and others. Ionization of upper layers of the earth's atmosphere by the ultra-violet rays of the sun is supposed to develop a slightly conducting medium which would account for the absorption.

If this be true, it might reasonably be expected that on a night following a day which has been sunny over a long stretch of country between any two stations the transmissivity would be low, while if cloudy conditions prevail over the same area the transmissivity would be high. On the other hand, it may be argued that the ionization occurs in regions above the clouds, and that no connection between transmissivity and cloudiness should be expected.

There are few stations in this country more favorably situated for the investigation of the problem of absorption over land areas than the radio-electric station of the University of North Dakota, situated, as it is, in Grand Forks, just 1,200 miles from each coast, and within easy reach of the lake district.

The aerial is of the inverted L type, 12 feet wide, 130 feet long and 80 feet above the ground. An audion receiver, used with a loose coupler and suitable tuning condensers, has been found to be the most sensitive for long-distance work. The audions used were operated at a fixed current value somewhat less than the value necessary for maximum efficiency. This heating current was in all cases not far from 0.32 ampere. The sensitiveness of an audion receiver was tested frequently by means of a standard test-buzzer circuit, adjustable to any desired wave-length and damping. The applied voltage on the telephone circuit was varied so as to keep the sensitiveness at nearly the same value through a series of tests.

It was not possible to obtain United States Weather Bureau maps on the day preceding the test, but through the courtesy of Prof. Simpson, director of the University of North Dakota weather station, it was possible to get the maps on the day following the tests. This had one advantage, namely, that the observer was unprejudiced by any preconceived notions as to the bearing of the weather on results.

On February 24 the author listened between 7 p. m. and 11 p. m., and heard signals from the University of Michigan, at Ann Arbor, when 3.4 kilowatts was employed, as a subsequent letter from Mr. H. S. Sheppard, in charge of that station, indicated. Signals from some ten or twelve other stations along the Atlantic coast were also plainly heard.

It must be noticed that at this distance from the coast, and with a moderately high aerial (80 feet), coastal stations and ocean vessels are heard only under rather favorable conditions for transmission.

The weather forecast for Monday morning, February 24, showed two large cloudy areas moving over the northern part of the United States. The map also showed a clear area, some 500 miles wide, between the University of Michigan and the University of North Dakota. The test with the University of Michigan station was even more remarkable for the fact that the signals from the University of North Dakota station were heard faintly at Ann Arbor when calling with one kilowatt. This test is the only one so far in which good transmission has been noticed to follow clear weather conditions, and even in this case it is seen that the whole Atlantic coast lay within a cloudy area, which extended to the westward beyond Michigan.

On Sunday, March 2, the author was not at the station, but Mr. E. C. Reinecke, an amateur at Fargo, N. D., reported a very good night. Mr. Reinecke thought he heard signals from Colon, Panama, on that evening. The Weather Bureau map for Saturday, March 1, showed a general cloudy condition all along the Atlantic coast and from the Gulf to Winnipeg. The map for Monday showed very cloudy conditions prevailing throughout the Mississippi Valley, the lake district and the Northwest. Sunday was generally cloudy, and both Saturday and Monday maps showed general cloudiness in the area between Fargo and Key West.

On the evening of March 4 we were able to hear signals from the stations from both coasts, and Key West signals were received at the university and also at Fargo. The weather map for that date showed cloudiness all along the line between Grand Forks and Jacksonville, Fla., and the following day's map showed that this condition moved on down beyond Key West. The map for March 4 showed a cloudy belt to the northwest, toward Seattle and Vancouver, while the whole Atlantic coast was likewise cloudy.

The night of March 13 was one of the best as regards the number of stations from which signals were heard, but the excessive static electricity prevented any but a good operator from recognizing many calls. I have no hesitancy in saying, however, that more stations were heard from that night

*From *Electrical World*

than on almost any other. The weather map for March 13 showed cloudiness everywhere except in the southwest.

The next test was made on March 17, and practically no signals were heard between 8 p. m. and 11 p. m. The map on March 17 showed all the Eastern part of the country in a clear area. The connection seems to be obvious.

On the next evening the author thinks he identified three calls from the Pacific coast, near Vancouver and Seattle. It may have been a coincidence, but the map for the eighteenth showed a cloudy area between Grand Forks and Seattle, while the Eastern coast was clear. This seems to explain why signals from no Eastern stations were picked up that night.

The map for the eighteenth seemed to indicate that the cloudy condition would proceed eastward. Acting on this hypothesis, the author spent the evening of March 19 at the station, expecting to catch signals from many Eastern stations. Much to his surprise, not one was heard. Next morning when the map arrived, it was seen that the cloudy condition had turned and swung down South through the valley of the Mississippi, and that the East had remained clear. This seems to be rather definite evidence that cloudiness and transmissivity are directly connected.

It should have been noted in connection with the test of March 17, when no signals were heard, that Michigan called us by pre-arrangement at definite intervals, using from four to eight kilowatts, but we were unable to hear anything.

On Monday, April 21, the University of Michigan called several times and was heard very distinctly at the University of North Dakota, although the static disturbances were very severe. No Eastern stations were heard, but signals from several in the lake district came in very strong. The weather map showed a cloudy area between Winnipeg and Chicago, but a clear region along the Eastern coast. On the following evening the author listened at the receiver between 8 and 9:30 o'clock with no result. The Michigan station did not operate for our benefit that evening, but I should have been able to hear signals from any lake stations if they had operated in that interval, if the cloudy area in that district, as shown by the April 22 map, had any bearing. The Eastern coast remained clear.

On Wednesday evening signals were heard from the University of Michigan station, several stations in the lake district and several on the northern Atlantic coast. The Wednesday map showed a cloudy area over all of this territory. On Thursday, April 24, Mr. Reinecke, at Fargo, reported hearing signals from a number of stations with great distinctiveness, an observation which was checked at the University of North Dakota station. The map for this day also showed a cloudy area in the lake region.

It would be possible to multiply greatly these instances of the connection between cloudiness and transmissivity, as I have made many random observations after sunny days of the early winter when signals from very few stations were heard, and more often none at all. So far, of some thirty observations, I have found only two which do not clearly indicate that a general daytime cloudiness over a wide area is sure to be followed by on evening of high transmissivity. It still remains to be shown whether cloudiness at transmission station or at receiving station is more fortuitous, although I am inclined to think that the transmissivity is better when the sunny area, if there is such, affects only the receiving station and its neighborhood. The transmissivity is even then not so good, of course, as it is when the cloudy area includes both the receiving and the sending stations.

If the connection between cloudiness and transmissivity be conceded, it will be apparent that the general atmospheric absorption does not occur in the regions above the clouds to anything like the same extent that it does in the regions of lower level, which is contrary to previous speculations on this point.

It would also appear that far Northern stations operating in summer when the period of sunshine is of long duration should have a shorter range than in winter. It would be of interest to know if the operators of Alaskan and northern Canadian stations have any data bearing on this point. With the collection and correlation of more data on radio-transmission and meteorological conditions, doubtless some of the vagaries of wireless experimentation will be accounted for, and might even be put to practical use by weather bureaus.

Wave Lengths.

For ships the normal wireless wave length is 300 meters, and every ship must be capable of working on this wave length. Other wave lengths may be used if they do not exceed 600 meters. The wave lengths for coast stations are 300 and 600 meters, and every coast station open for public correspondence will use one or the other of these wave lengths, and will always be ready to receive calls on it. A coast station is sometimes authorized to use other wave lengths (not exceeding 600, or else exceeding 1600 meters) for communication of a special kind. Ships may also be licensed for receiving messages from coast stations authorized to carry on long-distance communication by means of wave lengths exceeding 1600 meters, but are not allowed to transmit, except on wave lengths of 600 meters or less.

The Telegraph in Morocco.—The French zone in Morocco is being rapidly linked up by telegraphic communication. Tangier, Casablanca, Rabat, Mogador and Fez are served by wireless. Land lines connect eleven other towns. Charges by land lines are two cents per word and by wireless five cents, American, per word. A land line in the Spanish zone connects Arzila with Tangier. Telegrams dispatched from Rabat are wired as far as Arboua, taken thence by courier (in twelve or fifteen hours) to Arzilla, where they are wired to Tangier. These are the measures adopted pending an agreement with the Spanish authorities for the further erection of telegraph wires in the Spanish zone.

Vibration of Telephone Diaphragms in Wireless.

No wireless waves, either continuous or non-continuous, make the telephone diaphragm vibrate to the wave-frequency. In the first place, says the *Wireless World*, no diaphragm has yet been made which would vibrate at the rate of fifty thousand per second—the wave frequency of the slowest waves in use—and, in the second place, the impedance offered by the coils of the telephones to alternating currents of such frequencies would be so great that the current passed would be too small to operate the telephones. This is where the "detector" comes in, performing the function of rectifying the oscillating currents into pulses of uni-directional current. These pulses are used to charge up the telephone capacity, and this discharges through the telephone coils. In the case of non-continuous waves, which are sent out in wave-trains either separated by periods of inactivity, or waning to zero and then increasing again, each wave-train is converted by the detector into a group of uni-directional pulses, which add up in the telephone-capacity, and then, discharging through the telephone-coils, produce a single movement of the diaphragm. Thus each wave-train produces a movement of the diaphragm, and the several trains, which form a "dot" or "dash," following each other—in the case of the modern Marconi discharger—at perfectly regular intervals, produce a musical note in the telephone. The truly continuous wave, on the other hand, has no succession of "trains." From the moment the transmitting key is pressed to the moment when it is again raised, the uni-directional pulses delivered by the "detector" remain at a dead level. The telephone diaphragm gives one "click" when the key is pressed, and one more when it is raised, but no note is produced in between. If, however, the continuous waves are split up by some means into regular groups, then, of course, each group produces a movement of the diaphragm, and a musical note results. Thus the "breaking up" does not cause each group to have only one effective wave, but enables the detector to deliver a large number of effective groups of uni-directional impulses instead of only the one produced by the pressing and raising of the transmitting key.

Inductive Effects Caused by High-Tension Lines.

High-tension power circuits paralleling long-distance telephone circuits produce in the latter disturbances that not only impair the service but sometimes threaten the existence of the telephone apparatus itself. The problems arising from this source are almost as serious and quite as evasive as those due to lightning, and they are of the same general nature. These problems apply directly to long telephone circuits paralleling high-tension lines for any considerable distance, and especially in the case of telephone circuits used in electric railway train dispatching, or in close proximity to or occupying the same poles as the high-tension wires.

Induction is the peace disturber, and apparently appears on the slightest pretext. A wet limb of a tree swinging against the 50,000-volt line for an instant; a heavy and saturating fog; an insulator cracked and full of moisture; a heavy surge in the high-tension circuit; a slight ground on the high tension—in fact, anything tending to unbalance the high-tension circuit for the briefest part of a second—and the ordinary telephone lightning arresters are grounded from one end of the line to the other, or worse, a serious burnout occurs. In either event, the line is put out of service at the very moment when it is most needed.

Extensive researches have been made by many electrical engineers to develop a lightning arrester to combat this class of trouble. The requirements of the situation demand that an arrester for this purpose shall, first, in no way interfere with the service currents. Second, its resistance must drop instantly to a very low point when the induction, cross or lightning is on the lines. Third, its resistance and insulation must automatically and instantly increase to a high point when the disturbance, due to the foreign current, ceases, with the added safeguard to service that no ground is left on the line after such disturbance.—*Electrical Record.*

Inductances in Wireless Apparatus.

The resistance of a solid metallic conductor of large section is not the same for currents of high and low frequency, but may be much greater for the former by an amount which depends partly on the frequency and partly on the thickness of the wire; the reason being that high-frequency currents, or oscillations, confine themselves to the surface of the conductor and penetrate to no appreciable depth. This increase in resistance may be avoided by using conductors built up of a large number of small wires, insulated from each other and joined in parallel. In the construction of inductances for use in the wireless sending circuit, however, it is hardly practicable so to construct them, as it is necessary that the inductance should be continuously variable, or, at least, variable in small steps. The usual practice, therefore, is to use tubes, or flat strips, having large surface, which have a similar effect in keeping the difference between the high and low-frequency value of the resistance small. In the Telefunken system they take the form of flat spirals, a form of inductance also used in the Lepel portable installations; in the Poulsen and De Forest systems the inductances consist of copper tubes wound around a cylindrical former, connection being made to various points by means of clips.

Mr. A. J. Coppin, of the Western Union Telegraph Company, at St. John, N. B., writes: "Telegraph and Telephone Age is indispensable to anyone connected with any branch of the telegraph or telephone service. It is the best medium for keeping in touch with recent changes and improvements. Those who are not subscribers cannot realize what they are missing. I shall continue to recommend it whenever the opportunity offers."

Telegraph Line Construction.

Telegraph line construction was naturally very crudely carried on in the early days, but, like everything else pertaining to the telegraph service, it has undergone constant improvement. The telegraph companies now build their own lines, employing expert line builders for this work, but from 1845 to 1855 most of the telegraph lines were built by contractors, whose gifts were used to see how cheap a product would fill the agreement. As the necessity of multiplying the wires began to appear, better and stronger structures followed. In the construction of the first line of the Magnetic Telegraph Company between Somerville and Fort Lee, N. J., the poles were small and were set 200 feet apart. A cross-arm, thirty inches long, with a pin at each end, bearing a glass bureau knob, was secured to the upper end of each pole. Around the pole knobs the conducting wires were wrapped. These wires were all copper, No. 14 gauge, and enameled. Compared with the present standards of construction these early efforts appear crude, indeed. The following abstracts, taken from the rules of the Postal Telegraph-Cable Company, governing the construction and repair of telegraph lines, will be instructive and interesting, showing, as they do, the latest development in this line of work.

The minimum depth that poles shall be set beneath the surface of ordinary firm earth is as follows: 25- and 30-foot poles, five feet; 35-foot poles, five and one-half feet; 40- and 45-foot poles, six feet; 50- and 55-foot poles, seven feet; 60- and 65-foot poles, eight feet.

When rock is encountered at the surface, and is of good, firm nature, 25-foot and 30-foot poles should be set four feet deep; 35-foot poles, four and one-half feet; 40-foot and 45-foot poles, five feet; 50-foot and 55-foot poles, six feet; 60-foot and 65-foot poles, seven feet deep. Where rock is encountered from one to two feet below the surface, six inches should be added to the depth for poles ranging between twenty-five feet and forty-five feet, and one foot for poles ranging from fifty feet to sixty-five feet; 25-foot poles may be set four and one-half feet deep where frost does not exceed a depth of one foot.

Gains for cross-arms must be cut deep enough to make a flat surface on the face of the pole and should not exceed three-quarters of an inch in depth on poles that are eight inches, or less, in diameter at the top. One pair of cross-arm braces should be used on each arm, the braces to be fastened to the back of the arm.

Poles must not be roofed or scarfed at the top, except through villages and towns, or other improved localities, where it may be advisable in order to give them a more sightly appearance. The top of the first gain must be placed eight inches from cut two feet between centers.

In places where the ground is uneven the line should be graded as far as practicable by using the longer poles in the low places and the shorter poles at high points, but in no case should a pole be set on a high point too short to clear the wires of the bottom gain twelve feet above the ground. the top of pole and each additional gain should be Poles must be so located as to leave a free passageway to all bars and gateways, barn doors, and so forth.

A lightning rod of No. 8 iron wire must be securely attached to every fifth pole with 1½-inch staples. The rod must extend from three inches above the top of the pole to the butt of the pole, and a hand coil of about six feet stapled to the bottom.

All office and cable poles will be equipped in the same manner, except two No. 8 iron wires must be used. In all exposed places, such as office poles, or adjacent to private or schoolhouses, stores, etc., the lightning-rod wire must be driven well into the pole and covered by a strip of board about three inches wide and eight feet long, to prevent danger of coming in contact with it during lightning storms.

At the first pole each side of an office pole, and at the first pole carrying open wires from a cable pole, cross-arm lightning arresters must be installed. These arresters are made from No. 8 iron wire, stapled along the cross-arms. Connection to the ground is made via a lightning rod.

The trench for 6-foot anchor rods should be dug five feet deep and five feet in length. At either side a pocket should be dug, and the log, or deadman, cut about one foot longer than the trench, so that both ends of the deadman are securely held by earth that has not been disturbed in digging the trench.

Boulders and rocks are very necessary in wet and swampy places, and, where possible to procure them, they should be used with the dirt for keying down the deadman. The anchor rod must be set in direct line with the lead of the guy wire.

Rock anchors should be used only where the rock is of a good, firm nature. Where the rock is level with the surface, a hole should be drilled not less than ten inches deep, and in it placed a rock anchor twelve inches long. Where rock is encountered under the surface, the holes should be drilled the same depth in the rock and two or three feet anchor rods should be used, according to the depth of the rock below the surface. The eye of the anchor, in all cases, should project at least two inches above the surface.

On corner poles, where the side strain is twelve feet, or more, double cross-arms should be used, equipped with standard blocking bolts and guyed by one or more anchor rods, attached to a log or deadman placed in a trench five feet deep, and the anchor rods placed in a direct line with the lead of the guy wire, which should be directly under the top cross-arm. If the line carries four or more cross-arms one guy should be placed under the top cross-arm and one directly under the third arm.

At square road crossings a log or deadman eight feet long should be placed in a trench eight feet back from the pole and parallel with the line. One anchor rod should be attached not less than six inches from either end of the log or deadman, and so placed that one anchor is at a right-angle with the line, and one leading ahead on line, to form a head as well as a side guy, and the line head guyed to the corner pole.

Guy wires should be wrapped twice around the pole and fastened with a three-bolt clamp. A clamp must also be used in attaching the guy to the anchor. All guys running to anchors in exposed places must be protected by guards of wood, or iron pipe, to make them more visible to pedestrians, horses and cattle.

Foremen will be advised when starting each piece of new line or reconstruction as to the number of poles to be set to the mile. The first pole from the corner must not be set to exceed seventy-five feet from the corner pole and the second pole not to exceed 100 feet from the first pole, and as much closer as necessity may require, excepting on very light lines, when these distances may be increased at the discretion of the foreman. The distance between the first and second poles from the corner should, in all cases, be determined by the weight of the line and the side strain on the corner pole.

Facing a corner, the two poles back of the corner pole each way must be set with arms facing the corner. In all other places the arms must be faced alternately. On slight curves side guys should be placed, and anchors used wherever possible. When necessary to attach a guy to a tree a lag bolt should be placed in the tree, well around to the back, and good, substantial blocks placed between the guy wire and the tree to prevent the wire from injuring the bark.

To protect working wires from foreign circuits crossing over them at right angles, two guard wires of No. 8 iron wire should be placed.

At all river crossings with spans of 200 to 400 feet, poles on either side should be equipped with double arms. At river spans from 400 to 1,000 feet, or more, two poles should be set in parallel on either side a reasonably safe distance back from the ordinary water line, and double cross-arms of special make should be placed on these poles. All river crossing poles should be thoroughly guyed back on the line and also on the upper side of the line, in order to hold the poles in their proper position when the flow of current, ice, etc., strikes them.

At all railroad crossings the poles at either side must be double-armed and of sufficient height to allow the arm in the bottom gain to carry the wires at least twenty-seven feet above the rail, unless otherwise required by law, or by the railroad company's regulations.

Poles on either side of a railroad crossing, if in a straight line, should be guyed on both sides to prevent the line from falling across the tracks if by reason of storm or decay the poles should break.

Where choice fruit trees are encountered poles of sufficient length should be set to carry the wires over them without seriously damaging the trees by trimming. Shade trees located near a residence should be trimmed very carefully, using a saw for taking off the large limbs and pruning shears for the light trimming.

Hard-drawn copper wire must be handled very carefully to prevent short bends or kinks and nicks or abrasions of the wire, and teams or vehicles must not be allowed to pass over it when stretched along the ground preparatory to placing it on the poles. It must never be thrown from a moving train. All joints must be made with sleeves. Such joints do not require solder.

For tying copper wire a standard soft copper tie wire twenty-two inches long, of the same gauge as the line wire, must be used. The tie wire must be placed around the groove of the glass and the ends crossed under the line wire, giving each end as many complete spiral turns—with the fingers—as the length of the tie wire will permit.

In tying iron wire place the tie wire, which should be No. 8 gauge, fourteen inches long, in the groove of the insulator; place the line wire on top of the wire and give each end of the tie wire one and one-half turns around the line wire. All joints in new iron wire must be made by the use of iron sleeves to fit the different gauges of wire.

When iron wires are to be soldered the two ends must be cleaned before jointing so that the bright metal is seen. A flux, made from muriatic acid, killed with zinc, must be used to insure a properly soldered joint. When the joint is finished, it must be wiped off with common machine oil, to neutralize the acid and prevent corrosion.

Wires on straight lines must be tied on the inside of the insulator (the side nearest the poles), except on curves or corners, where they must be tied so that the strain will be against the insulator. On the first pole at each side of a corner the wires must be tied on the same side of the insulator as the corner pole, to prevent the tie wires breaking and releasing the wires should the corner pole give way.

All taped or braided aerial cable must be suspended from a messenger by standard aerial rings. Lead-covered cables must be suspended in the the same manner, except on elevated structures, where vibration is liable to injure the sheath of the cable. In such places lead cables should be suspended from the messenger wire by the use of "S"-hooks and three-ply marline or hambroline.

The messenger wire must be securely attached to the side of the poles by suitable cable hangers, or by jay-bolts attached to the cross-arms. The messenger wire must be grounded. This should be done by connecting it with each pole lightning rod. In no case must the distance between grounds on messenger wires exceed one-quarter of a mile. On the outside of buildings procelain knobs must be used for securing cables to walls, ceilings, etc. Porcelain, or some other material approved by the electrical department must be used where cables enter buildings or pass through walls or partitions. Wire staples or wooden cleats of any description must not be used for fastening cables or wires to the walls. Standard cable boxes approved by the electrical department will be used. No. 14 B. & S. braided wire, as specified by the electrical department, must be used for connections between the main line and cable boxes, and such connections must be soldered to the main line. Acids must not be used on copper wire.

The Vancouver Telephone Cable.

In our issue dated July 16 was published an item regarding the laying of a loaded telephone cable between Vancouver and Vancouver Island, B. C., at a maximum depth of water of 1,300 feet.

At a meeting of the American Institute of Electrical Engineers in Vancouver, September 9, Messrs. E. P. La Belle and L. P. Crim read an interesting paper describing this cable.

This cable is of interest in that it is the only one of its type in use outside of Europe. It is laid across the Gulf of Georgia, between Point Grey, near Vancouver and Nanaimo, on Vaucouver Island, and its purpose is to provide such telephonic facilities to Vancouver Island that the speaking range could be extended from any point on the island to Vancouver and other principal towns on the mainland in the territory served by the British Columbia Telephone Company.

By using the new cable Nanaimo is made the center of distribution for Vancouver Island. The longest line that will ever be connected at Nanaimo will extend to the north end of Vancouver Island, and will be about 250 miles in length.

The new cable was manufactured by the Henley Telegraph Works, in England, and has the following mechanical properties:

Conductors. Four conductors, each consisting of a central wire, surrounded by twelve wires of annealed copper, having a total weight of 300 pounds per nautical mile; total diameter of conductor, 0.1385.

Loading. One soft-iron wire, 0.012 inch in diameter, wound around the conductor, and having seventy turns per inch.

Dielectric. Three coats of best gutta-percha, alternating with three coats of Chatterton's compound. Total weight of dielectric per nautical mile, 300 pounds. Diameter over gutta-percha, 0.409 inch.

Cabling. Four cores laid around a yarn center, wormed, brass taped and served with yarn.

Armoring. Fifteen galvanized steel wires, each 0.192 inch in diameter, separately tarred and served with tarred yarn.

Outer Serving. Two coats of tarred yarn and two coats of preservative compound.

Diameter of completed cable, 1.956 inches.

Weight of completed cable, eight English tons per nautical mile.

The same type of armoring was used throughout, and, on account of the armor wires each being served with tarred jute, the completed cable was very flexible.

The conductors of the cable have an electrical resistance of four ohms per nautical mile; an electrostatic capacity of 0.345 microfarad and an average dielectric resistance of 260 megohms.

The actual length of cable in use is 28.3 nautical miles. Speech tests showed a standard cable equivalent of eight miles, with zero loop on each end, and 5.75 miles, with 12 miles of standard cable at each end to reduce reflection losses.

The inductance of these cable circuits is artificially increased by a winding of soft-iron wire around the copper conductor, which increases the permeability of its magnetic field. This is the well-known Krarup system of continuous loading.

The two best known examples of coil-loaded submarine cable extend from England to France across the English Channel, and from England to Belgium. The former cable is about twenty nautical miles in length, and the latter about forty.

The Development of Insulators.

The insulation of telegraph lines has always been a problem of the highest importance and much thought and ingenuity have been devoted to this line of investigation and invention. In 1846 George Little, an English inventor, devised an insulator of glass with umbrella or saucer base. Glass insulators in the form of bureau knobs were in use at that time in America, and in 1847 insulators of the Little type were employed. Innumerable forms with this insulator as a basis have been in common use since.

The frequent breakage of glass insulators by school boys and hunters, who use the insulators as targets, directed attention to devising ways and means for their protection and preservation. Mr. David Brooks, of Philadelphia, produced an iron-covered insulator which stood, both in this country and in Europe, some extraordinary tests. They were extensively employed especially on lines having one wire.

The introduction of gutta-percha stimulated the hope that a perfect and permanent insulating material had been found. Messrs. John M. Bachelder and Moses G. Farmer constructed insulators from vulcanite or bone rubber. Experience with these, however, was not satisfactory and the simple glass insulator and wooden pin support was again used. The glass insulator has since become standard although the form has been changed with a view of making it more reliable. The umbrella water-shed form has, in order to secure constant cleanliness of surface, given place to straight vertical sides, while the addition of a screw-thread, formed on the inside of the insulators, fitted to a corresponding thread on the pin, renders its removal by wind or upward strain impossible.

The Wood Button Repeater.

The well-known Wood button repeater was the first device of this kind ever used in this country. It was applied by Professor Morse in 1838 and its success led him to remark: "If I can work twenty miles I can go round the world." The inventor of this early repeater was Merritt L. Wood, of Ithaca, N. Y.

Rapid Work on Press Wires.—On August 19 and 20 some speedy transmission was recorded on the southern circuit of the Associated Press. In 343 minutes, on August 19, 15,605 words were sent, and in 344 minutes, on August 20, 16,032 words were handled, the average rate of speed during five hours and forty-four minutes on the latter date being 46.6 words per minute, or 2,796 words an hour.

Notes on Grounding of Electrical Systems.*

BY H. P. LIVERSIDGE, PHILADELPHIA, PA.

During the past few years a considerable amount of investigation and experimental work has been done covering the subject of earth connections, or grounding, for electrical circuits.

A clearer understanding of this important subject has been made necessary by the marked increase in transmission and distribution voltages required for supplying energy for light and power uses. The increases in pressure have necessitated additional precautions for safeguarding against troubles due to direct electrical connections between high-voltage systems and those of relatively low potential.

The term "grounded," or "earthed," when applied to an electrical circuit is more or less relative, and depends largely on the characteristics of the system in question. Speaking broadly, every electrical circuit may be regarded as "grounded"; the degree of ground being determined by the resistance to flow of current from the circuits to earth.

Practical considerations, however, establish certain values for ground connections. These values, while comparatively low, may vary considerably depending on the protection which is required.

For station work, where the ground connections may be called upon to carry large currents, the resistance should be low, and may range from almost negligible values to a maximum of one or two ohms.

In secondary-distribution work, where protection is desired against accidental contact with high-voltage circuits, the resistance of the ground connection may safely be several ohms higher than a satisfactory station ground.

In the cases of telephone, telegraph, and signal systems, a slightly higher resistance than the values noted may be entirely practicable. The prime consideration in the installation of safe earth connection should be the fact that the current-carrying capacity of the grounding device is sufficient at all times to prevent a dangerous potential difference between the grounded circuit, the apparatus which it grounds, and the earth.

In telephone, telegraph and signal systems the ground is made particularly to protect against possible crosses with high-voltage lines. In some instances the reason is also to provide an earth connection which may be used for regular operating conditions. In any event, the conductors of the system always are comparatively small, and the amount of current that can be transmitted without melting the wires is low. The ground connection is deemed sufficient when it will protect against accidental crosses with series arc-lighting circuits. Here the maximum current does not exceed ten amperes.

When metal signal-boxes are installed on telephone, telegraph and signal systems, and are mounted on wooden poles or other insulating supports, care should be taken to properly ground the metal cases of the boxes as a protection against their remaining charged, due to accidental crosses of the signal circuit with high-voltage circuits.

Recent experiments and observations have defined exactly the more important factors determining a good ground connection. Within certain wide limits, it is possible to readily secure a ground connection of the character desired, provided the necessary precautions are taken in installing the ground terminal.

The observations made have covered a considerable number of tests of ground installations in various sections of a metropolitan district and its environs. The locations of tests were determined in the majority of cases by the station locations, where the grounds were installed in connection with the grounding of electrical apparatus in operation in the stations. Geographically, the whole district covered approximately a twenty-mile radius.

In nearly all the experiments the ground connection consisted of a galvanized-iron pipe of approximately two inches outside diameter, driven to various depths, ranging from six feet to twelve feet. An examination of the results obtained indicates a wide range in the resistances observed. The resistance values ranged from a minimum value of 0.01 ohm to a maximum value of 138.0 ohms. Various grades of soil were encountered, with corresponding variations in the amount of contained moisture; and these conditions, together with the various depths at which the grounds were driven, indicated very obviously the factors which determined the result secured. The general average of some other twenty-five different readings representing fairly average conditions in reference to character of soil, contained moisture, etc., give the following contact resistances:

Clay, 13.60 ohms; gravel, 6.01 ohms; top soil, 1.80 ohms.

From a study of the conditions affecting the results obtained, it was found that the three following factors may be considered as fundamental in determining the quality of the earth connection:

First, character of the soil; second, amount of electrolytic moisture present around the grounding device; third, area of contact surface between ground connection and earth.

The results which were obtained indicated in most cases that the limiting feature to the current-carrying capacity of a ground connection is the ampere discharge per unit area of contact surface. If the current density was high enough to drive off the electrolytic moisture, as a consequence of excessive heating of the earth immediately surrounding the grounding device, then the contact resistance would gradually increase.

Where conditions were favorable to a constant supply of moisture either furnished externally to the grounding device or incorporated in the device itself, or where the area of contact surface was sufficiently large to establish a low current density, then the current resistance of the ground connection was practically constant. These facts have suggested the great advantage of a grounding device which in itself shall combine a self-contained source of electrolytic moisture with ample design of area of contact surface.

* Extracts from a paper read at the convention of the International Association of Municipal Electricians, at Watertown, N. Y. August 19.

In most of the tests which were performed the ground terminal consisted of a galvanized-iron pipe approximately two inches in diameter, pointed at one end to permit it to be readily driven into the earth, and with the lower end drilled by perhaps fifteen quarter-inch holes, within eighteen inches of the end of the pipe.

After the pipes had been driven into the earth a concentrated salt solution was poured down them, and the small holes in the bottoms of the pipes allowed the solution to saturate the surrounding earth. In this way electrolytic moisture was provided in order to establish a low-resistance connection. Further, there was placed an additional amount of salt around the top of the pipes and several quarts of water were then poured in.

Such an arrangement of pipe grounds as this has proven very effective, and from experiences met with in installing this type of grounding construction, a design of grounding terminal has been evolved which it is believed fulfills all the necessary conditions for a satisfactory grounding device, and one which offers certain additional features found to be highly desirable.

In this type of grounding terminal the contact surface is approximately 500 square inches, and therefore is able to withstand heavy current discharges without undue heating. The compound contained in the ground receptacle being hygroscopic in nature, and in addition containing soluble electrolytes, assures a contact resistance of comparatively low value and one which is fairly permanent in nature. Therefore, in installing this type of "ground" it is no longer necessary to take additional precautions to insure electrolytic moisture around the ground terminal, which on the other hand is always necessary in the case of a pipe ground. Furthermore, the pipe extended from the top of the box provides a very rigid connection so that there is little danger of the circuit being broken due to mechanical injuries.

The method of ground connection offered by such ground box furnishes a path of very low inductance and so is therefore particularly suited to carry off discharges of abnormally high frequency.

Electrolytic corrosion causing a rapid deterioration of the ground terminal, particularly where dissimilar metals are exposed to the action of the current, as copper, lead, etc., is very effectually guarded against by a heavy galvanized coating over the entire box.

In conclusion, it may be said that within certain limits the general subject of obtaining a satisfactory ground connection resolves itself into a consideration of engineering judgment, coupled with the amount of expenditure which is deemed expedient in order to secure the results desired. These factors involve a study of the selection of location, methods of installation and maintenance.

Induction Coils and Transformers for Wireless Telegraphy.

In small-power wireless stations the condenser is charged by an induction coil. This piece of apparatus consists of a number of turns of thick wire, termed the primary, wound on an iron core built up of a large number of fine iron wires insulated from one another by a coat of varnish. The object of thus building the core is to prevent eddy currents from being set up in it and the consequent loss of energy.

Over the primary is wound the secondary, which consists of a large number of turns of very fine wire. The secondary is not usually wound on in layers extending the whole length of the coil, but in small sections, the object being to prevent high potentials from existing between adjacent turns, which might break down the insulation. The ends of the secondary are connected to the spark-gap terminals. In series with the primary is an interrupter of some kind, usually of the hammer type, which is actuated by the magnetism of the core. Across the break of the interrupter a condenser is shunted, the function of which is to suppress the sparking, and by so doing, to render the interruption of the primary current more sudden.

As the purpose for which the induction coil is used in radio-telegraphy is to charge a condenser, the secondary windings of coils intended for that purpose are wound with thicker wire than is usual.

The primary current is supplied usually from a battery of secondary cells, but sometimes the coil is worked directly off the lighting circuit of the ship or station, a regulating resistance being joined in series with it.

In stations intended for long-distance working it is necessary to use much larger energies than an induction coil is capable of dealing with; recourse is therefore had to an alternating-current transformer, which is supplied with current from an alternating-current generator, usually of the single-phase type. The construction of a transformer for alternating-currents is somewhat similar to that of an induction coil. It consists of a primary winding of large section and a few turns wound over a laminated iron core and a secondary of many turns wound over the primary. As the current supplied to it is alternating, there is no need for an interrupter. Care must be taken to secure perfect insulation, and to this end the transformer is usually immersed in oil of high insulating properties.

For the purpose of radio-telegraphy, it is usual to supply current at from 200 to 500 volts and to transform it up to 40,000 or 50,000, the ratio of transformation being determined by the relative number of turns on the primary and secondary windings.

In measuring the power in a circuit carrying an alternating current, the product of the volts and amperes as read on separate meters must be multiplied by the power-factor, otherwise it will be usually in excess of the true power in the circuit. This is due to the fact that if capacity or inductance is present in the circuit, it will tend to throw the volts and amperes out of phase—that is to say, they will not attain their maximum values at the same time. Since, however, the power-factor is in most cases an unknown quantity, it is better to measure the power by some suitable form of wattmeter, which takes account of the phase difference which may exist and gives the true power in the circuit in watts.

Wireless Time Signals.*

BY ALFRED GRADENWITZ.

The first attempts to use wireless signals for the transmission of the accurate astronomical time were made in 1906 and the first regular time signal service was organized in 1907 at the Camperdown radiotelegraphic station, near Halifax. Among other stations adopting a similar course were the Eiffel Tower, Paris, and the German coast station of Norddeich.

A wireless time signal service mainly consists of radiotelegraphic signals being sent out at given times of the day, in accordance with a conventional scheme, one of the signals signifying for instance the exact time at 1 p. m. The station at Norddeich receives its time from the Wilhelmshafen Imperial Marine Observatory. Radiotelegraphic signals are started automatically by a chronometer, the working of which is checked electrically from an observatory.

Wireless time signals were at first intended exclusively for providing navigators with the time data required for determining their position. Since nearly all large steamers have a radiotelegraphic station on board, while even smaller vessels, coasting, freight and fishing steamers, are being equipped more and more generally with radiotelegraphic sets, navigation derives extensive profit from this time signal service. Scientific institutions also take much interest in the new scheme, as evidenced by a number of plants recently installed.

In August, 1911, a receiving station for radiotelegraphic time signals from Norddeich and Paris was installed at the new Hamburg Observatory. A horizontal copper cable, 2.0 millimeters in diameter, reaching from the main building to the employes' dwelling house and back again, serves as antenna, this aerial conductor being 1,600 feet in total length and 26 to 50 feet in height above the ground. The receiving apparatus is fitted into a box of 180 by 170 by 260 millimeters, the detector and tuning coil being fixed on a caoutchouc plate. The wireless signals are received acoustically in a high-resistance double head telephone receiver, the incoming wave being tuned by means of a sliding contact and scale. Two thermo-detectors are provided, which are inserted alternately by means of a rocking switch so that, in the event of a breakdown of one, the other will always be available. The sensitiveness of the detector is controlled by turning a screw. The station also comprises a small musical sender which, like the stations of Norddeich and Paris, gives out a wave-length of 2,000 meters, thus allowing the station to be tuned in advance, so as to be always ready for reception. This small sender also affords the advantage of allowing the detectors to be tested at any moment. Two terminals connected to the antenna and earth conductor respectively are fixed at the side of the box. The apparatus weighs 12 pounds and has given excellent results in actual practice.

The receiver was installed in the time-service room of the Observatory, the observer equipped with a double head telephone receiver recording the signal and, at the moment a signal arrives, closing with a key the chronograph current. It may be said that the distance between Norddeich and Bergedorf in a straight line is 122 miles and that between Paris and Bergedorf 450 miles. The accuracy obtained in recording the time signals may be inferred from the following:

Norddeich Signals.—Mean error in recording a second signal, 0.075 second; mean error of daily average of 24 second signals, 0.015 second.

Paris Time Signals.—Mean error in recording a second signal, 0.075 second; mean error of daily average of three second signals, 0.043 second.

The average accuracy in recording an individual second signal thus is the same with both stations.

At Berlin there are two wireless stations, viz.: the installations of the Treptow Observatory and the "Normalzeit" (Standard Time) Company, a pole about 60 feet in height being used in both cases to carry the antenna.

The Normalzeit Company is a central organization for forwarding accurate astronomical time to the railway and postal departments, time signals in accordance with indications by the Royal Observatory being given automatically every morning to both these departments which, on their telegraph systems, effect their transmission throughout Germany. The receiving station also serves for the checking of chronometers of precision. The Treptow plant has been in operation since December, 1910, and that of the Normalzeit Company since September, 1911.

Much interest in the organization of daily time signals has from the outset been shown by watchmakers, and the simple and handy apparatus constructed for their special purposes, allows the benefits of wireless telegraphy to be utilized even by the man of limited means. Acoustic receivers are used generally at such stations. Being only destined for the receiving of time signals, these receivers are tuned once for all to a given wave-length and acoustic intensity. As the casing is sealed, the adjustment of the apparatus cannot be tampered with. The apparatus is designed as a wall station, its external dimensions being; diameter, 8 inches; height, 6 inches. It comprises a signal dial corresponding to the Norddeich or Paris signals or to the signal suggested by the International Time Conference.

Another watchmaker's receiver differs from the apparatus described by the addition of a watch permanently fitted to the casing. This keeps the receiver connections locked, releasing them only at the time of signalling, so that radiotelegraphic signals can only be received during these short intervals. As, however, at times fixed for the giving out of time signals, the emission of other telegrams liable to interfere is avoided as far as possible, there is no danger to the secrecy of telegrams. Another advantage of this receiver is that it allows radiographic signals of different wave-lengths to be received and a closer coupling to be chosen.

* From *Electrical Review and Western Electrician.*

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THE RAILROAD.

Mr. R. R. Hobbs, superintendent of telegraph of the Louisville and Nashville Railroad, Louisville, Ky., was a recent New York visitor.

Mr. W. A. Porteous, manager Western Union Telegraph Company, New Orleans, La., has been appointed local member of the entertainment committee of the Association of Railway Telegraph Superintendents, which will hold its next annual convention in New Orleans, May 19, 1914.

Wireless on the Santa Fe.—Mr. L. M. Jones, superintendent of telegraph, Atchison, Topeka and Santa Fe Railway, Topeka, Kan., after investigating the availability of wireless telegraph for railroad purposes has concluded that, for the present, the expense of installation and maintenance is too great and that the ease of interference also militates against its use for railroad purposes. Mr. Jones says: "We could use wireless to good advantage between Galveston and Port Bolivar. In talking with operators on ships having wireless, I find that they pick up all kinds of experimental and amateur stations. In one case an operator on one of the steamships plying between Galveston and New York reported that after rounding a certain point along the Florida coast it is customary to call the New York office and report progress. Some one answered the call and the operator found it was not the New York office at all, but a Brooklyn boy who stated that he had a crude home-made outfit. With so many boats equipped with wireless entering the port at Galveston, we decided we would have considerable interference to contend with."

Telephone Circuits on the New York, New Haven and Hartford Railroad.

In the discussion of the paper of Mr. P. J. Howe on inductive disturbances, read at the St. Louis convention of the Association of Railway Telegraph Superintendents last May, a communication from Mr. N. E. Smith, superintendent of telegraphs of the New York, New Haven and Hartford Railroad, New Haven, Conn., was read.

Mr. Smith pointed out the difficulties encountered in the endeavor to get rid of the inductive disturbances on the telegraph circuits when the railroad company's electric train-haulage system was put into operation.

The company is now, after much experimentation, installing "auto-transformers" on its entire electrified system, and, Mr. Smith states, it is expected that induction will be eliminated to the extent of ninety-five per cent.

Referring to the telephone facilities, Mr. Smith gave some interesting facts.

After the electrification was completed and put into operation between Stamford and Woodlawn, he said, a telephone circuit was constructed between Cos Cob and Greenwich, Conn., a distance of approximately two miles, as an experiment, for we had been led to believe by experts that telephone service through that electrified zone was an impossibility, and we wished to be convinced before believing. Number 16 gauge twisted-pair Okonite wire was used and attached to a messenger wire by means of marlin hangers. The messenger wire was attached to the catenary bridges which carry the trolley and feed wires. The twisted-pair wire was approximately fifteen feet from the trolley wires and twenty-five feet from the transmission wires. At each bridge the messenger wire was grounded and the Okonite was protected with a piece of flexduct, and hung about three inches from the bridge. This circuit, when free from grounds, was free from noise and worked satisfactorily in every way. However, the static induction on the circuit was so severe, that it was impossible to keep the circuit free from grounds. The wind blowing the wire, which was protected with flexduct against the iron bridges, would cause the static to jump through the wire insulation and flexduct, burning all insulation off the conductors and leaving them short-circuited and grounded when against the iron work.

We next removed the twisted Okonite wire and hung to the messenger wire in its place, a one-pair rubber-insulated lead-encased telephone cable, with circular loom on the outside of the lead. This cable was suspended from the messenger wire by means of lock rings, and the lead sheath was bonded to the grounded messenger wire every 300 feet. This circuit, like the twisted Okonite circuit, when free from grounds, worked very satisfactorily, not being affected by electro-magnetic induction; this, of course, being due to the frequent transpositions in the circuit.

After making these experiments, we decided that it would be feasible to work open wires, and we then constructed an open-wire line between Stamford and New Rochelle, a distance of approximately seventeen miles. Number 10 B. & S. gauge, bare copper wire was used, and attached to brackets, which were located underneath cross-arms on the Western Union pole line. In the construction of this circuit, everything was done to insure the best possible insulation. The circuit was transposed on every fifth pole, making the transpositions approximately 660 feet apart.

The distance between the circuit and the high-tension wires varied from ten to fifty feet. Upon completion of this circuit it was immediately put into use for service between the towers and the power station. There were thirteen telephones bridged across the line. The line in this condition, without any drainage coils, or protection at the instruments, worked very satisfactorily, there being only a very slight hum on the line.

The static induction on the New Rochelle line was very heavy, and could be felt through the receiver cords on the instruments, which made it necessary for the employe to stand on a dry floor and be entirely free from any contact with the ground when using the telephone. We then started experiments with a view of protecting the telephone apparatus and the men using the telephones against electrostatic and electromagnetic induction, which, in case of accidental grounds on the line, might burn out apparatus, or prove fatal to the users of the telephones, and also to protect against actual contacts between the telephone circuit and the 11,000-volt wires. We first connected repeating coils across the line at various intervals, grounding the middle point of the coil, with a view of draining the electrostatic from the line and dividing the electromagnetic into sections. This had a tendency to slightly unbalance the circuit, and not infrequently one or more coils would burn out, due to excessive current in the line, caused by grounds on the high-tension wires, or by an unusually heavy train load at some point on the system.

We then removed the repeating coils and tried other methods of draining the telephone circuit, but all devices, like the repeating coils, had a tendency to unbalance the line, and would frequently burn out, due to causes mentioned.

The idea of "draining" the line was then abandoned and we installed, as a protective measure, what is known as the Type Y-109 transformers at each telephone, locating them on poles just outside of the building, leaving no exposure between the transformer and the telephone instrument. This left the line free of grounds, the only ones remaining being those connected with the 58-A protectors on the instrument side of the transformers. The line has been operating under these conditions for the past fourteen months and the only interruptions experienced were such as happen under ordinary conditions.

In connection with the electrification of the Harlem River branch, we were obliged to revamp our entire telephone facilities between Harlem River station and Pelham Bay drawbridge, a distance of seven miles. In place of aerial circuits, we installed lead-sheath cable, conductors having double paper insulation, this cable being attached to a seven-strand steel messenger wire, strung on the catenary bridges, the messenger wire being clamped and grounded to the bridges, which are 300 feet apart, and the sheath of the cable bonded to the messenger wire every 600 feet. At Harlem River station we have a private branch exchange leased from the New York Telephone Company, and we were allowed to connect sixteen yard lines in the cable mentioned, and upon which are, all told, thirty telephones, with the switchboard, arranging type Y-109 transformers in a transformer house built for the purpose, the transformers being installed between the switchboard and the yard circuits, as a precaution against accidental damage to the telephone company's property or injury to their subscribers, in case of an actual contact between the 11,000-volt lines and telephone circuits. This installation was completed about a year ago, and, as yet, no line troubles have been experienced, and the telephone circuits are absolutely quiet. Transmission is somewhat reduced on account of the installation of transformers between line and each telephone as a protection to our employes.

Improvement in Telegraph Line Operation.

An improvement in telegraph line operation has been invented by Mr. G. P. Blessing, of Seattle, Wash. The object of Mr. Blessing's invention is to provide a means for keeping all stations in adjustment during wet weather. To accomplish this, he uses polarized relays at the way stations and reverses the main battery after each impulse. The positive pole of one battery and the negative pole of the other battery are grounded at the home station and the remaining poles are alternately connected to the line by the pole changer, which is operated by the armature of the main line relay, thus giving the way offices control of the pole changer. The device includes a duplex relay, which provides means for maintaining the magnetism in the pole changer magnet during the time the battery is cut off from the line.

The duplex relay may be used as an automatic repeater between two or more polarized circuits, with battery at one end only, and by slightly modifying the construction of the instrument it could be used as an automatic repeater between two Morse circuits, either at a battery station or way station requiring no local battery for its operation.

Mr. Blessing states that this apparatus works very satisfactorily on a short wire, and thinks that it will work equally well on long circuits.

The First Telegraph Tournament.—The attempts to invent rapid processes of telegraphic transmission led to several interesting challenges among operators. In 1868 a trial of speed took place between New York and Philadelphia, the sender being M. Bagley, of New York, and the receiver Nicholas J. Snyder, of Philadelphia. The first nine minutes of the test hour D. F. Marks sent 373 words; the next eleven, Bagley sent 450; and each ten minutes thereafter severally 374, 400, 430, 433; total, 2,520 or forty-two words per minute. The copy at Philadelphia was clear and legible. The whole matter was sent and received without break or error.

Abandoning Telegraph Lines in Africa.—Several large mines operated in central Africa have recently abandoned their telegraph lines from the railroads to the mines and established connections by wireless. The reasons given for this action are that it was difficult to maintain the wire lines on account of the demand for the wire by native women for ornamental purposes.

Future Meetings of Associations, Societies, etc.

Telephone Pioneers of America, at Chicago, Ill., October 16 and 17. Secretary, Henry W. Pope, 15 Dey street, New York.

Association of Railway Telegraph Superintendents, at New Orleans, La., May 19, 1914. Secretary, P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill.

Old-Time Telegraphers' and Historical Association and Society of the United States Military Telegraph Corps, at Kansas City, Mo., September 15, 16 and 17, 1914. Secretary of Old-Timers, F. J. Scherrer, 30 Church street, New York. Secretary Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

PHILLIPS CODE.

The popularity of Phillips' Code, by Walter P. Phillips, was never more apparent than at the present time. Its acceptance by the telegraphic fraternity, as a standard work of the kind, dates from its first publication, and the constantly increasing demand for this unique and thoroughly tested method of shorthand arranged for telegraphic purposes has necessitated from time to time the issuance of several editions. The present edition was carefully gone over, a few revisions made, and a number of contractions added, until now this "staunch friend of the telegrapher" is strictly up-to-date in every particular. It has been declared that an essential qualification of a "first-class operator" is a thorough understanding of Phillips' Code.

The use of this system promotes rapid transmission, and for press reports especially was long since declared to be the best ever devised. By common consent it is recognized as standard, and everywhere is regarded in the profession as indispensable in contributing to the operator's fund of practical knowledge. In fact, not to understand Phillips' Code acts as a distinct embarrassment to the operator.

The price of the book is $1 per copy. Address J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Operating Fire-Alarm Systems in Smaller Cities.*

BY A. C. FARRAND, ATLANTIC CITY, N. J.

A poor fire alarm system is worse than none, said Mr. Farrand. The less complicated a system is the better it is, as a rule. The simplest system would consist of a single circuit, with from ten to twenty boxes, a gong and punching register in the fire station, a public alarm, perhaps, and sufficient source of current to operate the circuit. The next in line would be such a system duplicated with from two to twelve circuits, operated by an automatic repeater. Next would come the semi-manual office, where an alarm turned in on one circuit goes directly through to the fire stations, and an alarm coming in on any other circuit is received on a register and sent out on a manual transmitter after the first has gone through the repeater. The most complicated of all the systems is the one having a manual office, with its box, joker and gong circuits, receiving registers and transmitting apparatus, keyboards, relay boards and complicated switchboards. This system is much slower than any of the other three, as the first round of an incoming box has to be received by the operator before it can be sent to the fire stations. It is made still slower in some cities, where they have no registering apparatus in the fire stations, by the operator sending in ten taps over the joker circuit to let the fireman on watch know a fire alarm is about to be turned in. In some cities having a system like this the police offices are under orders to pull a box two or three times when turning in an alarm of fire, in order to make sure that the operator will get at least one round of the alarm correctly. This fault, however, is largely due to having too many boxes on a circuit, with all of them of the interfering type. A good 20-ohm telephone receiver is one of the most useful appliances for testing a fire-alarm box. The terminals of the leads to it should consist of a pair of good, substantial snap connectors. When connection is made across the binding posts of a box there will be a slight click in the receiver, showing that the resistance of the box has been cut out and the receiver and its connections are in good shape; when the box is pulled the click in the receiver will be much sharper, as the code wheel opens the alarm circuit. The telephone receiver can also be used to make tests for any irregularity caused by dirty or corroded code wheels, poor contacts, and the like. The practice of testing an alarm box by sending in an alarm is not to be recommended; for it is criminal to have a fire-alarm circuit open for even one second when this can be avoided. In making mechanical tests or repairs to fire boxes, where they have to be plugged out, it is a good thing for the lineman to carry a set of plugs in his pocket, consisting of one or more attached to each end of a piece of fish-line, six or eight inches long; thus the liability of his leaving a box plugged out is greatly reduced. It is also good practice for him to carry an extra inner shell, with a break wheel having a different number from the ones in regular use, for, if a box has to be carried to the shop for repairs, this can be slipped in its place without disabling the system. The repeater comes next in importance to the street box. Most of the troubles with this are purely mechanical. One of the best is to have all gongs, bells, etc., on circuits separated from the box circuits and have them work from the barrels of the repeater. Then, if possible, a different box circuit should run to each fire station. The gong should be put on the striking circuit and the indicator on the box circuit. The grounding of the shell of fire-alarm and police telegraph boxes is not to be encouraged, except where all the circuits are underground. Grounding the shell only protects the person sending in an alarm where there is a cross with the box pipe. The safe thing to do is to ground the interior mechanism, and, then, if there is proper insulation between this and the shell of the box, there will be little danger of persons receiving shocks.

* Extracts from paper read at the convention of the International Association of Municipal Electricians, Watertown, N. Y., August 20.

Improvements in Police Signaling Boxes.*

BY P. I. PATTON, PHILADELPHIA.

The old battery system of police signaling formerly in general use, said Mr. Patton, is being replaced by one which involves the use of motor-generators, storage batteries, punching registers, etc. The equipment in one office consists essentially of a small motor-generator on the wall, beside which there is fastened a wooden shelf on iron brackets, on which a storage battery is installed. Above the motor-generator, iron brackets attached to the wall support a slate panel-board, on which are mounted double-pole, single-throw fused knife switches, a 10-ohm pony relay, two automatic protectors, an impedance coil and a resistance lamp for each of the circuits. Current for the motor-generator set is taken from the same source as the lighting current. The automatic protectors protect the motor-generator in case of overload, and the pony relay is used to automatically open the circuit from the generator when the machine is shut down. The circuit is from one side of the generator through fuses and a knife switch, through coils of the pony relay, then through contact points of the relay, and then to the signal circuits leaving the house. The wire on one side of the storage battery is connected to the wire from the points of the relay to the lines. The wire from the other side of the storage battery is connected to the conductor from one side of the generator. In operation, the motor-generator is started, then the generator switch is closed, and the armature of the pony relay shoved toward the coils until the contact points close. This closes the circuit from the generator through the coils of the pony relay to the lines of the battery, and, as long as that circuit remains closed, the armature will hold the points together, and the current will be supplied directly to the signal lines from the generator, and also to the storage battery for charging purposes. When the batteries are fully charged the motor-generator can be closed down.

* Extracts from paper read at the convention of the International Association of Municipal Electricians, Watertown, N. Y., August 19.

Convention of Municipal Electricians.

The eighteenth annual convention of the International Association of Municipal Electricians was held at Watertown, N. Y., August 19 to 22, and was well attended, there being about 400 members and guests present. President John W. Kelly, jr., of Camden, N. J., occupied the chair and conducted the deliberations.

The first paper read was that of Mr. P. I. Patton, of Philadelphia, entitled "Improvements in Police Signaling Boxes." The author described the police signaling system in Philadelphia. An abstract of this paper will be found on another page in this issue.

Mr. Patton's paper was followed by one entitled "Operating Fire-Alarm Systems in Smaller Cities," by A. C. Farrand, of Atlantic City, N. J. An abstract of this paper will be found on another page in this issue.

Mr. Clayton W. Pike, of Philadelphia, read a paper entitled "Allowable Voltages in Overhead Construction in Cities." The author discussed the tendency toward the use of constantly increasing voltages in transmission lines and raised the question as to what the highest voltage allowable on lines in city streets should be. The various disturbances that may occur on high-potential lines were enumerated and discussed at some length, special attention being paid to the effect of high-voltage lines on neighboring telephone and signal circuits. The author also discussed the question of life and fire risk from high-voltage lines in the cities and towns.

In the discussion of Mr. Pike's paper, Dr. C. P. Steinmetz, of Schenectady, N. Y., took a leading part.

The new equipment of the St. Louis fire-alarm office was described by Mr. George McD. Johns, superintendent of fire and police telegraph in that city, in a paper entitled, "Central Energy for Fire-Alarm Circuits."

Other papers were read and discussed, as announced in the previous issue of this journal.

Representatives of the National Fire Protection Association, National Electric Light Association, Western Association of Electrical Inspectors and the Bureau of Standards were present and took an active part in the discussions. A resolution was passed, endorsing the new work of the National Bureau of Standards in investigating electrical life hazards, and the assistance of the association was offered in gathering data and in making effective any regulations promulgated by the bureau.

Dr. C. P. Steinmetz spoke quite fully on the proper standards from which electrical problems must now be viewed and how these problems were passing beyond the confines of cities and states. He suggested the possibility of Federal regulation of construction and methods of operation. As consulting engineer for the city of Schenectady, he was, by acclamation, made a member of the association.

The following officers were elected for the ensuing year:

John W. Kelly, jr., president (re-elected); Dr. Charles P. Steinmetz, of Schenectady, N. Y., first vice-president; Robert J. Gaskill, of Fort Wayne, Ind., second vice-president; E. D. Fitzgerald, of Tampa, Fla.; third vice-president; and Howard Joslyn, of Seattle, Wash., fourth vice-president. Messrs. Clarence R. George, of Houston, Tex., and C. E. Diehl, of Harrisburg, Pa., were re-elected secretary and treasurer, respectively.

CONVENTION NOTES

Mr. D. M. Gardner, of Boston, delivered a lecture, with practical demonstrations, on the prone-pressure method of resuscitation from electric shock.

Mr. A. M. Paddon, of Syracuse, N. Y., represented the National Fire-Alarm Protection Association.

The Okonite Company, New York, was represented by Mr. J. Delmar Underhill.

The Gamewell Fire-Alarm Telegraph Company made an exhibit of a line of its standard fire-alarm apparatus and showed samples of a new electrical horn for street-crossing signals. The company was represented by Messrs. A. L. Tinker and O. P. Croker.

The National Electric Specialty Company, Toledo, Ohio, exhibited a complete line of "Vac-M" lightning arresters. It was represented by Mr. B. H. Chapman.

JOSEPH C. EICHMEYER, aged fifty-four years, an inventor and designer of fire-alarm and police-telegraph signal systems, died at Utica, N. Y., August 31.

LETTERS FROM OUR AGENTS.

PHILADELPHIA WESTERN UNION.

Mr. and Mrs. I. D. Maize will celebrate their golden wedding anniversary at their home in this city in the evening of September 17.

PITTSBURGH WESTERN UNION.

Mr. Allen Woodle, of general manager A. G. Saylor's office, New York, was in Pittsburgh recently on company business.

Mr. A. C. Terry, district commercial superintendent, spent two weeks at Atlantic City during August.

Mr. L. L. Leith, district commercial agent, spent the first week of September in Detroit. Mr. Leith was formerly general wire chief for the Michigan Central Railroad, in that city.

Miss Lucy Price, formerly operator at Pittsburgh, has been promoted to manager of Beaver Falls, Pa., office.

Mr. A. F. Westcott, formerly employed by the Erie Railroad at Lakewood, N. Y., has been appointed manager of this company's office at Titusville, Pa.

Mrs. L. H. Dean, of Eldred, Pa., formerly connected with the Postal Telegraph-Cable Company at Jamestown, N. Y., and at other points, has been appointed manager for this company at Jeannette, Pa.

Miss Florence M. Cowan, manager at Grove City, Pa., has resigned.

Mr. George F. Stadtmiller, district commercial manager, Erie, Pa., spent his vacation at Bemus Point, N. Y.

Mr. J. Diehl, district supervisor of messengers, has organized an association of messengers, to be known as the "Wutco Club." The club meets twice a month and discusses ways and means of increasing the efficiency of the messenger service.

Martin O'Rourke, assistant cashier of this office, died August 30.

The following appointments of managers have been made in this district: Messrs. Hyman Smalley, at Somerset, Pa.; E. H. Reiter, at Homestead, Pa., and J. Starsky, at Grove City, Pa.

Mr. W. J. Dodge, district traffic manager, has returned to his office after a rest in the Adirondacks.

A joint meeting of the Commercial Efficiency Promoting Association and the Traffic Efficiency Promoting Committee was held in the office of district traffic superintendent W. J. Dodge, September 8. The subject of efficient handling of the business was thoroughly discussed. This was the first joint meeting of the two associations since their organization.

Mr. F. G. Wyman, Postal Telegraph-Cable Company, Binghamton, N. Y., writes: "You certainly did the correct thing in renewing my subscription for the ensuing year. To stop the paper would be like removing the waters from the North Woods and still expect to catch speckled trout."

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, Telegraph and Telephone Age, 253 Broadway, New York.

Telegraph and Telephone Age

No. 19 NEW YORK, OCTOBER 1, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Current, Contact-Points and Relays.

Notwithstanding the fact that certain values of current; width of air-gap between contact-points and between magnet and armature; amount of play the lever-bar of a sounder should have, etc., are specifically stated in the official instruction papers given to employes for the operation of telegraph and telephone apparatus generally, attendants should understand that such values are for use as a guide only during normal conditions of weather and operation.

The quantity of current allowed for the operation of telegraph apparatus is, in many cases, much greater than is actually required; but it is necessary, because some laymen and the ever-present newly appointed attendant require considerable working "margin" to override the faults due to crude adjustments, while they are gaining practical experience. It is also necessary in some cases to override those counter electrical influences developed between adjacent conductors, known under the general name of "induction," which is one of the most formidable opposing influences telegraph and telephone operation is subject to. Induction of this kind is due to the interaction of the various separate currents flowing in parallel conductors; the greater the volume of current, other conditions being equal, the greater the induction developed. Yet, strange to say, the remedy usually applied for overcoming it in any single telegraph conductor, *i. e.*, increasing the volume of current, is directly opposite in principle to the true method, which should be to reduce the currents flowing in the disturbing wires. However, as telegraph companies have no control over electric light and electric power concerns they can only fight with the same weapon, *i. e.*, stronger currents, thus adding strength to the enemy they would gladly destroy.

The ideal telegraph system is one in which the apparatus would be operated by very small currents supplied by lower potential generators. Were it not for the detrimental influences of the wires of those electrical industries which demand high potentials and large volumes of current in their operation, such a system could easily be arranged and "induction" would be practically eliminated. Lower potentials would also tend to minimize pole line "escapes" during wet weather.

It is obvious, therefore, that it is not merely a theory, but a condition that confronts us. Engineers have constructed apparatus having wide ranges of operation for combatting the different conditions they meet in the service. For instance, nearly every modern relay will operate on one, and, sometimes, less than one, milliampere of current on a non-inductive circuit, if properly adjusted, yet there are comparatively few operators that could get a click from the instrument with so small a current. Their failure would be due to the too common ignorance of the fact that the width of the air-gap between the relay contact points plays a most important part when the strength of the current becomes less than four or five milliamperes.

During wet weather the amount of current that reaches the relay in stations remote from the battery is often reduced to nearly that figure, while the fluctuations of current between open and closed key values nearer the battery stations are frequently as low. The degree of skill an operator, or a repeater attendant, may acquire depends upon the nicety of adjustment he is capable of making on circuits in which the strength of the effective current is very feeble.

Operators at way stations, distant from the battery station, should understand that it is possible to read signals quite distinctly on wires in which an effective current as feeble as four or five milliamperes reaches the relay. In addition to getting the magnet as close to the armature as possible, and decreasing the tension of the retractile spring, they should first close up the contact points until the movement of the lever is scarcely perceptible. If the points are permitted to have a width of air-gap usually allowed, the relay cannot be adjusted for satisfactory operation unless there is at least eight or ten milliamperes.

By effective current is meant the difference between the amount of current that flows through the coils of the relay when the key is closed and that which flows when the key is open, when there is an "escape" of current down the wet poles.

It is, therefore, a wise plan to invariably keep the contact points as close as practicable, not only to be prepared for emergencies, but to insure a wider range of adjustment despite small fluctuations in the strength of current flowing in the wire.

Telegraph and Telephone Patents.

ISSUED SEPTEMBER 2

1,071,819. Combined Typewriter and Telegraph Transmitter. To H. H. Steele, Marcellus, N. Y.

1,072,400. Automatic Battery Cut-Out for Telephone Circuits. To A. R. Nelson, Janesville, Cal.

ISSUED SEPTEMBER 9

1,072,513. Attachment for Telephone Transmitters. To E. M. Schollenberger, Chicago, Ill.

1,072,537. Individual Telephone Mouthpiece. To C. S. Warren, Milford, Ohio.

1,073,018. Signaling and Telephone System for Railroads. To W. J. Bailey, Cedarville, W. Va.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, September 25:

American Telephone and Telegraph Co.	131¼
Mackay Companies	80
Mackay Companies, preferred	66½
Western Union Telegraph Co.	64¾

PERSONAL.

Mr. and Mrs. Francis W. Jones, of Spring Valley, N. Y., have gone to West Palm Beach, Fla., for the winter.

Dr. W. D. Gentry, of Chicago, a well-known old-time telegrapher, was a recent New York visitor. He was accompanied by Mrs. Gentry.

Mr. Charles A. Tinker, formerly general superintendent of the Eastern Division of the Western Union Telegraph Company, is now making his home with his son in Stamford, Conn.

Mr. A. C. Terry, district commercial superintendent, Western Union Telegraph Company, Pittsburgh, Pa., has been elected fourth vice-president of the recently organized Pittsburgh Commercial Club.

Mr. Fidel Villacorta, chief of the telegraph office at San Salvador, Salvador, is in New York, where he will spend two years investigating telegraph, telephone and wireless matters. He is accompanied by Mr. Victor M. Escobar, of the same office.

Mr. F. G. Creed, of the Creed automatic printing telegraph system, Croydon, England, arrived in New York on the steamer "Lusitania," September 19. He will spend two or three weeks in this country. Mr. H. Bille, of the same firm, sailed for London, September 25, on the steamer "Cedric," after a visit of eight months in the United States.

Mr. W. Y. Nolley, manager of the Mackay Telegraph and Cable Company, Dallas, Tex., writes: "To be without the Age is like losing a life-long friend. Keep it coming."

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

Mr. H. R. Waterbury, chief clerk to superintendent George W. Ribble, Atlanta, Ga., was a recent New York visitor.

Mr. W. I. Capen, vice-president, is on a trip of inspection covering the line between Denver, Col., and Salt Lake City, Utah.

Messrs. F. J. Kernan, auditor, and J. F. Skirrow, associate electrical engineer of this company, spent a few days in Washington, D. C., recently, attending a conference at that point.

The Office of Mr. Charles A. Lane, superintendent of construction, New York, has been moved from the sixth floor to the tenth floor, adjoining the office of vice-president W. I. Capen.

Plans are well under way by this company for the construction of a line between Muskogee and Verdark, to Tulsa, Okla.

A New Office has been opened at Baroda, Mich. Mrs. E. G. Niece is manager.

Appointments of Managers.—The following managers have been appointed: Messrs. George A. Bailey, at San Bernardino, Cal.; Fred. Bennet, at Woodville, Miss., and G. D. Millspaugh, at Buchanan, Mich.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

Mr. A. G. Saylor, general manager, Eastern Division, New York, has returned from a business trip through New England and the Maritime Provinces.

Mr. C. W. Frey, formerly district wire chief at St. Louis, Mo., has been appointed assistant supervisor of wire service at New York.

Mr. S. P. Luchie, manager of the Hull, Mass., office, was retired on September 1, on account of ill health.

THE CABLE.

Mr. William Miles, secretary of the Anglo-American Telegraph Company, London, Eng., sailed for home on the steamer "Celtic," from New York, September 18, after a business visit of a week.

Mr. Frank J. Sherry, of the French Cable Company, New York, and Mrs. Sherry, celebrated the twenty-fifth anniversary of their marriage at their home in Brooklyn, on the evening of September 27.

New French Cable Steamers.—The French Government proposes to acquire two new cable-laying steamers for use in connection with the maintenance of submarine cables.

Dividends.—The regular quarterly dividend of two per cent of the American Telephone and Telegraph Company, was declared September 16, payable October 15. The regular quarterly dividend of $2.00 per share has been declared by the Western Electric Company.

THE TELEPHONE.

MR. A. S. HIBBARD, advisory relation, executive department, American Telephone and Telegraph Company, New York, has returned to his office after a vacation of several weeks spent in Maine.

MR. H. F. THURBER, vice-president of the New York Telephone Company, has returned from Europe, where he spent six weeks.

MR. J. J. CARTY, chief engineer of the American Telephone and Telegraph Company, New York, has returned to his office after a five weeks' rest at his summer residence in Pemaquid, Me.

MR. H. D. PILLSBURY, vice-president and general attorney of the Pacific Telephone and Telegraph Company, San Francisco, Cal., was a recent New York visitor.

MR. W. B. CLARKSON, division manager, Central District Telephone Company, Pittsburgh, Pa., has been elected a member of the board of directors of the recently organized Pittsburgh Commercial Club.

MR. C. P. MORRILL, commercial engineer of the Pacific Telephone and Telegraph Company, San Francisco, Cal., spent a few days in New York recently on business.

MR. P. KERR HIGGINS, general manager of the Texas Independent Telephone System, Waco, Tex., is the author of a pamphlet entitled, "Tact in Handling Patrons." It is an interesting discussion of this important subject and should be read by every telephone employe.

BELGIAN-SWISS TELEPHONE SERVICE.—Telephonic communication is to be established between Belgium and Switzerland.

TELEPHONES IN BOMBAY.—There are now 4,170 telephones in operation in Bombay, India, and 250 private line installations.

SCANDAL IN FRENCH TELEPHONE SERVICE.—Five telephone operators in Paris have been accused of being in the pay of a corn broker, for giving him communications to the detriment of other subscribers and cutting off certain rivals from all communication with the Corn Exchange when operations were in full swing. It is stated that the scandal is serious and of wide extent.

BRITISH TELEPHONE SYSTEM.—British Government statistics of the telephone trunk system in the United Kingdom show that within ten years the number of the trunk telephone lines in use in that country has nearly trebled. In 1903-4 there were in use 1,363 trunk lines with a total wire mileage of 49,000. In 1912-13, the post-office controlled 3,180 trunk lines of 117,900 miles.

RADIO-TELEGRAPHY.

VERDICT REVERSED.—The United States Circuit Court of Appeals has reversed the verdict of $460,175 in favor of Reginald A. Fessenden rendered in the United States District Court. Professor Fessenden sued the National Electric Signal Company and others for damages through a breach of contract.

MARCONI COMPANY ABSORBS FRENCH WIRELESS COMPANY.—The British Marconi Wireless Telegraph Company has acquired a majority of the shares of the Universal Wireless Telegraph and Telephone Company, of France, and the directors have asked for authority to increase the capital stock by 500,000 common shares, in order to be in a position to carry out the contract.

WIRELESS IN THE SOUTH PACIFIC.—It is stated that Germany is planning to establish an independent wireless telegraph system among the islands of the South Pacific. A large station is to be built at Samoa, with a range of 1,870 miles, with stations in New Guinea and the Marshall Islands, all interconnected and in direct communication with Europe by means of the Dutch cable from the Island of Yap.

RADIO STATIONS OF THE UNITED STATES.—The Department of Commerce, Bureau of Navigation, Washington, D. C., has just issued a book, giving a list of radio stations in the United States, and other relative information. The book contains a list of the commercial shore stations, ship stations and amateur stations, licensed up to June 30, 1913. Copies may be obtained of TELEGRAPH AND TELEPHONE AGE, at thirty-five cents per copy, including postage.

WIRELESS IN ARGENTINA.—The Chamber of Deputies of the Argentine Republic has approved a bill regulating the wireless telegraph service within the country. It provides that the wireless service within the territory of the nation and for international communications up to a distance of 620 miles shall be carried out exclusively by the State. The use of this service is declared obligatory on all vessels entering or leaving Argentine ports with fifty or more persons on board, including crew and passengers. The wireless stations are to be capable of transmitting messages a distance of 125 miles along the rivers and 3,000 miles at sea.

OBITUARY.

CARL T. IWERS, aged twenty-one years, a Western Union operator at Sioux City, Ia., died at that place September 13.

CHARLES F. GREGG, aged thirty-four years, late operator for the Postal Telegraph-Cable Company, died at Birmingham, Ala., September 12.

GEORGE M. HUGHES, aged seventy years, formerly agent and operator for the Erie Railroad, at Passaic, N. J., died in Brooklyn, N. Y., September 6.

DENNIS S. SULLIVAN, aged fifty-six years, an old-time operator at 195 Broadway, New York, died in that city September 2.

CHARLES E. McMANUS, aged 61 years, formerly chief operator of the Great North Western Telegraph Company, at Toronto, Ont., died at Maitland, Ont., September 23. He was well known both in Canada and the United States.

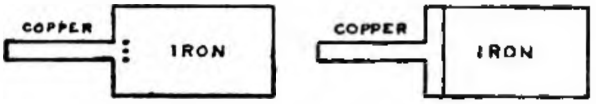
JOHN W. BROWN, aged sixty-six years, former manager of the Western Union Telegraph Company at Augusta, Ga., died in that city September 16. Mr. Brown retired from active service March 19, 1911. During the Civil War he served in the Southern Army as an operator, being attached to General Bragg's headquarters.

Ground Wires.*

The question of ground wires is not fully understood by the craft, and the object of this article is to explain what a perfect connection is and how to construct it.

The subject is fully explained by David Brooks in his pamphlet upon lightning rods, published in 1872. The following diagrams are helpful in studying the scientific points involved.

Copper is about seven times as good a conductor of electricity as iron. If, therefore, we construct an iron wire, it must be seven times as large as a copper wire, in order to become equally as good a conductor. In Fig. 1, the iron weighs seven times as much per foot as the copper, and the two are joined together, but the compound conductor is not as good a conductor as if it were all iron or



FIGS. 1 AND 2—GROUND PLATES.

all copper, for the reason that the joint is defective. A current passed through the compound conductor is compelled to pass through a section of the iron no larger than the copper (see dotted line), in order to pass from one metal to the other.

To make the joint perfect it is necessary to enlarge the copper so that at the joint it will cover the entire sectional area of the iron. This is shown in Fig. 2.

The conductivity of a No. 8 gauge iron wire is approximately seventeen million times as good as the same quantity of dry earth; and, in order to make a perfect joint between the two, we must enlarge the sectional area of the iron to seventeen million times its size in order that it may come into contact with a quantity of earth, having the same conductivity as the iron.

The earth is a good conductor only because of its enormous size. Extending an iron wire or rod a foot into the earth makes a poor connection, because it comes into contact with only a small quantity of earth. Gas and water pipes buried in the earth come into contact with an immense quantity of earth; hence, they are called, and, in fact, are, generally, perfect ground connections. As the earth becomes saturated with moisture, its conductivity increases. The rule to be observed, therefore, in constructing ground wires is to bury very large metal plates in moist earth, or what is its equivalent, connect the wires with gas or water pipes.

Limitations of Wave Lengths.

A certain amount of inductance is necessary in a closed wireless circuit in order to transfer energy to the open circuit, whether the circuits are direct or inductively coupled. Since condensers of any desired capacity can readily be obtained, it is easy to make the closed circuit any electrical length we desire.

There is, however, a lower limit to this, depending on the material and arrangement of the condenser and leads. Other things being equal, the larger the capacity, the longer the connecting leads; and the shortest wave length that can be obtained for a given capacity is that found when the leads from the condenser are connected in the most direct manner to those from the closed circuit and spark gap.

The standard wave length for ships and shore stations was first set at 320 meters. It is now 600-1,000 meters for ships. The increase in frequency to 500 cycles will, though the standard voltage has been lowered, permit a decrease of capacity, and thus permit the radiation of larger powers on shorter wave lengths than is now practicable.

Experience shows that aerials with short wave lengths radiate more efficiently than those with long ones, and that up to several hundred miles, short waves travel over salt water with no great absorption; when transmission over land is necessary, and for long distances over water, we gain more by the reduced absorption of long waves than we lose by decreased radiation efficiency.

The open circuit, while it has concentrated inductance like the closed circuit, has distributed capacity which is comparatively small, and though any electrical length we desire can be obtained by adding inductance, it is found that concentrated inductance beyond that necessary to receive energy from the closed circuit lessens the radiation, and on that account it is necessary to increase the period of the open circuit by adding capacity in the shape of additional wires to the aerial. Unless they are quite a distance apart, two parallel wires do not have twice the capacity of one, so that it is practically difficult to get very long wave lengths in the open circuit, especially on shipboard. The wave lengths that we can efficiently use in the open circuit are, therefore, limited by practical considerations.

Since the energy in any discharge varies as the square of the voltage, and since any desired voltage can readily be obtained, the work that can be stored in a condenser of given capacity depends only on the dielectric strength of the condenser material. But, in the case of the open circuit, when the first transfer of energy is completed, unless it is radiated nearly as fast as received, the maximum voltage in the open circuit, on account of its capacity being very much smaller, is much greater than that in the closed circuit. And we find that very high voltages, on account of insulation, break out in sparks at all points of the circuit, that the aerial wire glows throughout its length, and the whole apparatus generally, acts like a dry linen fire hose when subjected to a high water pressure—*i. e.*, it spurts electricity at all points, in all directions.—*Extracts from "Manual of Wireless Telegraphy."*

BULL FROGS IMITATE ENGINE WHISTLE.—Two large bull frogs in a swamp adjoining a western railroad imitate an engine whistle so perfectly that the officials of the road fear that the false signals will cause a wreck some day. The best way to avoid a wreck would seem to be to have a frog leg dinner.

* Seventh District Blue Book.

Convention of Telephone Pioneers.

As already announced, the third annual convention of the Telephone Pioneers of America will be held at the Congress Hotel, Chicago, Ill., October 16. The business meeting will be called to order at 10 a. m., and, in the afternoon, addresses will be made by Messrs. Thomas A. Watson, N. C. Kingsbury, vice-president of the American Telephone and Telegraph Company, New York; Thomas B. Doolittle and Michael J. Carney. In the evening there will be a theatrical entertainment by telephone talent.

On October 17, the entire day will be given over to entertainment, and, in the evening, there will be a banquet at the Congress Hotel.

At the business meeting, on October 16, one of the subjects to be brought to the attention of the members for action will be certain proposed changes in the constitution and by-laws. It is proposed to amend Section I, Article II, of the constitution to more clearly define the qualifications for membership; an amendment of Article III relates to the election of officers and members of the executive committee; and an amendment to Section I of the by-laws refers to the duties of the various officers. Sections II, III and VII of the by-laws are down for amendment, and it is proposed to amend Section VIII to read as follows:

"The membership shall consist of honorary pioneers and pioneers. Honorary pioneers shall be entitled to all the privileges of membership, except that they shall not be entitled to vote or hold office."

It will be noticed that the proposed amendment of Section VIII will wipe out the title "Junior Pioneers."

The question of increasing the annual dues will also be brought up for consideration and it is proposed to amend Section XII of the by-laws to provide for this change.

Mr. Henry W. Pope, 15 Dey street. New York, is secretary of the association, and will be glad to give further information.

Think for Yourself.

The following extracts are taken from an interesting article, entitled, "Think for Yourself," by Mr. George S. Walters, district commercial manager, Western Union Telegraph Company, Parkersburg, W. Va., published in the *Commercial News*, of Pittsburgh, Pa.:

"Think for yourself." My interpretation of the subject is: Do your own thinking and do not let others do it for you. In other words, use your own judgment, and do not be guided by the other fellow's. This should not always be taken literally. There are times when the other fellow's thoughts are better than yours, and therein lies the problem of selection. The only safe rule is this: If you are absolutely convinced his thoughts are better than yours, use his. Otherwise stick to your own, but do not waver and do not doubt. In the realms of thought, he who hesitates is lost, and, while you are still thinking, the other fellow, who has already thought, has beaten you.

Man is guided by the impulse of thought. He cannot get away from it. It is thought and the physical expression of thought that control our destinies. It makes or mars our lives.

Thinking is a silent expression of speech and association. We think in words simply because we know of no other way. Thus, if we think of a bird, we think of its form, color, size, etc. We see the bird itself in our mind's eye. A good thinker, therefore, can express himself and impart such expressions to others. Never, under any circumstances, does he permit others to think for him. He will listen patiently to others, he may be influenced, to an extent, by their thoughts, but, in the end, his own will predominate.

Proper thinking, or thinking for yourself, can be acquired, to a great extent, by mental discipline. A mind trained to think correctly, holding it in leash, so to speak, has a tremendous advantage over the untrained mind. The erratic thinker, who does not think for himself, flits about like a butterfly from flower to flower. Here he sips a little good from another's thoughts, here a little bad, and yonder a poison, jumbling them all into a confused, irrational hodge-podge, without sequence or sense. The logical thinker, who thinks for himself, on the other hand, goes straight to the goal without fuss or feathers.

The following hints may help those who desire to think for themselves:

Concentrate your mind. Place your thoughts in regular order. Take them up in order, step by step, and follow out each link of the chain to the end.

Practice concentration by taking one line of thought and carrying it out to the end. Let nothing interfere. Banish all other thoughts.

Do not hurry unless it is a case of emergency. Examine carefully every phase. Make a mental blue-print. Take a positive and negative viewpoint and then decide.

Get all the facts. Do not jump at conclusions. Be patient. Avoid prejudice. Prejudice is a blind barrier to common sense. It weakens any argument, and is unfair to an honest decision.

Think for yourself. Do not accept the thoughts of others until you are sure they are better than your own. The other man may be a good thinker, he may be even a better one than you. If you think he is, accept such of his thoughts as will benefit you, and add them to your own. Work out your own problems first, then compare them with the best thoughts of others, step by step. Place them in a mental scale, weigh carefully. Eliminate here, add there, and stand by the result.

Take a few moments each day. Select a subject. Line up your ideas. Consider yourself a general and your ideas the soldiers. Bring them up before you for inspection, one at a time. Look them over carefully. Listen to what they say, and then pass your word. You will have trouble in keeping them in rank at first. They will wander away. Go after them patiently. Keep going after them until you have them so drilled that their manœuvres will be a pleasure and not a task.

Early Methods of Signaling Between Distant Points.

In all ages, men have resorted to signals to quicken intelligence. The burning brand by which the Highland chieftain gathered his clans to battle, as it flamed through the Scottish mountains, borne by men of swift foot, and the smoke of the signal-fires of the Sioux and Blackfoot Indians, curling up from the mounds of our Western prairies, were only hints of a time coming when an instrumentality which was to bring men all over the earth side by side, was to be also the agency, to a large degree, of universal peace. As civilization advanced, torches, flags, birds, drums, trumpets and other modes of conveying the vocabulary of signaled thought and information were employed.

An interesting account of the early methods of signaling between distant points is given in Reid's "The Telegraph in America."

The first application of what is called a "telegraph," although that word (meaning "writing at a distance"), belongs to the modern times, was a system of wooden blocks of various shapes, to indicate letters, arranged by Dr. Hooke, in 1684. A century later, in 1794, three brothers, named Chappé, were confined in schools in France, situated some distance apart, yet within sight of each other. Free communication, under the rigorous rules of these schools, was denied them. They yearned for intercourse. Finally, affection suggested a plan by which a pivoted beam could be used to convey the signs of letters, by pointing it in different directions. The variety of signals was enlarged by adding small movable beams at the ends of the main beam. In this way, these brothers arranged 192 different signals, and, by correspondence, thereby relieved the tedium of their confinement. After their release, the system they had devised for communication with each other was exhibited to the government of France, and adopted for a service of signals. One of the brothers Chappé became telegraphic engineer for the government. Semaphoric signal houses and signals were rapidly established along the whole French coast, in 1803, with Chappé as manager. These were continued in use for a number of years, until electrical discovery provided the modern means for that purpose.

In 1795, Lord George Murray, of England, improved on Chappé's original plan by using two frames in which six Venetian blinds were inserted, thus adding greatly to the ease in operating and translating, as well as to the variety of the signals. Murray's system was adopted by the British Government and continued in use until 1816.

In Russia, all along the great routes of travel, may still be seen the towers erected for the government telegraphic service.

In 1807, General Pasley, and in 1816, Sir Home Popham, contrived modifications of the Chappé and Murray systems, introducing lamps for night service. Jules Guyot, of France, and Treutler, of Berlin, also perfected similar systems, but with little practical advantage over those previously in use.

In the American Revolutionary War, one of the signals employed was a flag-staff, surmounted by a barrel, beneath which a flag and basket could be so changed in their combinations that a number of announcements could be thus communicated. It will be remembered, also, how the farmers of Middlesex, Essex and Worcester, on the night of April 18, 1775, sprang to arms to meet the foe, having been aroused by Paul Revere, who having seen the signal agreed upon in the North Church tower, which told the movements of the British troops from Boston, had started on his famous ride to warn the people that the storm had burst.

It is a curious circumstance that, as late as 1846, signals, on Murray's plan, erected on high or prominent points of land, were used between New York and Philadelphia by some enterprising street brokers, who long kept the matter secret, using it even after the introduction of the Morse electric telegraph, and whose means of information for a long time confounded the members of the Stock Exchange. One of these gentlemen, known as Bull Bridges, when at last the Morse instrument began, in 1845, to click in the second story of the Philadelphia Merchants' Exchange, was able, by practicing privately on telegraphic sounds, to catch by ear the messages coming over the wires. He could also, with his large lustrous eyes, wink a figure to a confederate conveniently waiting for the information. He took great enjoyment in these private lines of his, and was probably the first man, in Philadelphia, at least, to take the Morse characters by sound. The "visual" line was soon abandoned.

Elementary Telegraphy.

An excellent little volume on elementary telegraphy is that of H. W. Pendry, of the Central Telegraph office, London, England. The fundamental principles of electricity and their application to telegraphy are clearly explained, and, after the student has thoroughly mastered the contents of the book, he knows a great deal about the principles which are, afterwards, of easy application to practical work.

There are chapters on batteries, instruments, telegraph lines and telegraph systems, and, although the English practice is described, the principles are the same for all systems, whether American, English, French, or German. Principles are the important things to know.

The mathematics used are of the simplest kind, yet they are of the highest importance and value to the student, as they show how to arrive at results.

The price of this book is $1.50 per copy, and copies can be obtained of Telegraph and Telephone Age, 253 Broadway, New York.

Mr. R. D. Morris, secretary of Creed, Bille and Company, Ltd., Croydon, Surrey, England, writes: "As a reliable record of the progress of telegraphy, as well as the personel of the telegraph world, we find your journal both interesting and useful. We should be sorry to miss it."

The Manufacture of Porcelain Insulators.

The Florida insulator clays are mined by dredges under water, or by other hydraulic methods, and clay, sand and water are sucked up through long lengths of pipe by means of centrifugal pumps. The sand is settled out by means of various contrivances, while the clay is kept in suspension in the water. The clay and water is then run into settling tanks, where the clay settles and the clear water is drawn off. This leaves the clay about the consistency of very thick cream, and in this shape it is pumped by slip pumps into filter presses, where the remainder of the water is forced out, and the cakes of clay are then taken from the filter presses and put upon racks of galvanized steam pipes to dry. The North Carolina and Georgia clays are mined either in open cuts or from pits and shafts with pick and shovel, and then thrown into agitators, or disintegrators, where water is added, and then the process is practically the same as in the case of the Florida clay.

When the clays are received, the manufacturer first determines the percentage of moisture they contain. Knowing this, he proceeds to make up a mix, consisting of the several kinds of clay, each in its proper proportion; and after adding the required amount of water, the mix is ready for the blunging process. The blunger is a tank-like machine, in the center of which is provided a rotating member supplied with heavy blades for breaking up the lumps of clay, and thoroughly mixing all the constituents to the consistency of very thin mud.

When the blunger has ground the lumps all out of the mix, a valve in the bottom is opened and the mix is allowed to run out and through a very fine mesh copper lawn, or screen, into a pit under the floor of the room called an agitator. The purpose of the agitator is to keep the slip, as the mix is now called, in constant motion, so that the clay will not settle to the bottom.

From the agitator the slip is pumped by means of high-pressure pumps into a press consisting of a framework holding about fifty iron disks, or leaves, so shaped, that when pressed together by means of the screw at the end of the press, a disk-like cavity remains between each two leaves.

After being taken from the press, the moist clay is put away in cellars and allowed to "age." When the clay is taken from the aging cellars it is ready for pugging.

The pug mill consists of a vertical cast cylinder, in the center of which is a revolving member, provided with projections similar to one of the blades of a boat propeller, and so arranged that when the clay is thrown into the open top of the mill it is constantly being worked or kneaded by these blades, and, at the same time, forced to the bottom of the mill. At the bottom, and on the side of the mill, is provided a circular hole, through which the clay is forced. The cylinder of clay gradually being squeezed through the opening, is cut off into convenient lengths and is carried away to be made into ware.

The process of shaping the clay into the various forms is called jollying.

As each mould is taken from the wheel it is placed in a hot room, where the drying of the piece begins.

When the piece approaches a state which may be called bone dry, the parts that were next to the mould have to be finished to remove surface or lap cracks made when the wad of clay was first put into the mould. This is done by mounting the piece on a revolving wheel and scraping the surface, then finishing with sandpaper. The grooving of the parts to be in contact with cement, and the turning of the side-wire groove are also done at this time.

In order to apply the glaze to the piece it is only necessary to dip the piece into the glaze, protecting those surfaces that are to be left unglazed. If this latter is impossible, it becomes necessary to scrape the glaze off such parts after dipping. All parts on which the piece rests when placed in the saggers for firing must be left unglazed to prevent the piece from sticking to the saggers.

The sagger is a fire-clay vessel, serving two purposes: (*a*) to contain the ware, thus protecting it from direct contact with the fire; (*b*) to allow of piling up the ware in order to fill the kiln.

The pieces to be fired are placed in saggers of proper size and shape, and the saggers are piled one above the other in "bungs" placed in circles around the kiln, one row within another, until the kiln is full.

The firing of the kiln is one of the most important parts, if not the most important in the manufacture of any ceramic ware, and it is of more importance in the manufacture of high-voltage insulators than in many other ceramic wares.

There are two common fuels used for firing kilns, coal and natural gas. Hard coal is used in some factories, but soft coal is almost universally used where natural gas cannot be obtained.

The actual firing of a kiln takes about forty to forty-eight hours, depending on the size of the kiln, and, also, somewhat on the nature of the ware it contains. The smallest kilns are twelve feet in diameter and the largest are sixteen feet six inches.

Nearly as important as the firing of the kiln is the cooling process. This must be regulated as nicely as the firing, or the glaze will be "off color," crazed, or even the ware itself may be badly damaged. The time of cooling depends on the size of the kiln; a fair average for "setting," "firing," and "drawing," or one complete cycle for a kiln is about eighty hours.

When the kiln has cooled sufficiently the saggers are removed and the ware taken from them and carried to the sorting room. All ware that is not "high voltage" is here sorted, the perfect being packed for shipment, the rejected being scrapped.

No man can learn what he has not prepared to learn, however near to his eyes is the object.—*Emerson.*

Important and Valuable Electrical Books for Study.

"Electrical Instruments and Testing," by Norman H. Schneider, is the latest work on this important subject, and has been brought up to date. It is an extremely practical book, and every telegrapher who is preparing himself to fill positions in the engineering branch of the service should make a copy of this work his text-book in testing. It is thoroughly reliable, and was written by a practical engineer. The section on the testing of telegraph wires and cables was written by Mr. Jesse Hargrave, a well-known telegraph engineer, and the illustrations, of which there are many, are very clear and understandable. The price of this book is $1.15 per copy.

"American Telegraph Practice," by Donald McNicol, is the other book to which we desire to call especial attention. This book contains the latest information and descriptions of telegraph apparatus and systems, and it constitutes a complete course in telegraph engineering. It is well illustrated and a careful study of its contents will give the student an immense advantage in the line of promotion. The more a man knows of it, the more will he be sought when a vacancy occurs. The book deals with every detail of the telegraph engineering and construction services and is written in so clear English that anyone with average intelligence can readily grasp the facts set forth. The telephone in its relation to telegraph operation is also covered to a liberal extent. It is a book that gives one a desire to know it from beginning to end, and, with patient effort, this result can be easily attained. The price of this book is $4.00.

"Handy Electrical Dictionary," by W. L. Weber. This little book, which is of vest-pocket size, is a necessary companion of the two books referred to, as it supplies the key which unlocks the meaning of the technical terms met with in these volumes. To the beginner this little dictionary is really indispensable. It will remove all doubt as to the meaning of technical words and phrases and is a guide post in the study of electricity. Progress in study is much more satisfactory and really enjoyable when one knows that he is on the right road and thoroughly understands what he is reading. This book is a library in itself, and is complete, concise and convenient. The price is 25 cents per copy for cloth binding, and 50 cents for leather binding.

Wireless Telegraphy and Telephony.

Although there are many books on the subject of wireless telegraphy, one of the most comprehensive and practical is Mr. A. Frederick Collins' "Manual of Wireless Telegraphy and Telephony," the third edition of which is now on the market. Mr. Collins is a well-known wireless expert, inventor and author, and has kept ahead of wireless development from its earliest days; he is, therefore, qualified to write intelligently and clearly on this interesting subject.

In his latest book Mr. Collins treats wireless telegraphy and wireless telephony in considerable detail, and by the aid of clearly drawn illustrations and views of apparatus, he has succeeded in treating the subject in so clear a manner that the novice will readily grasp the information and the expert receive new light.

The contents by chapters are: A Simple Wireless Telegraph System; Elementary Theory; Apparatus of a Commercial Station; The Aerial Wire System; Wiring Diagrams for Transmitters; Wiring Diagrams for Receptors; The Apparatus in Action; Adjusting and Operating the Instruments; Different Makes of Equipment; Suggestion to Operators; Wireless Telephony. The appendix gives a list of books on wireless and a glossary of terms, words and phrases. The book covers much ground and will be of great value as a text-book in study and for reference. The price is $1.50 per copy.

Telegraphers of Today.

An excellent opportunity is offered to telegraph people in general to become acquainted with over 600 prominent telegraph officials and others identified with the telegraph, the railroad, the submarine cable and press associations of the past generation, through their portraits and sketches of their careers as published in "Telegraphers of Today."

This work was issued in 1894 and includes photographic engravings and biographical sketches of all the individuals connected with the interests mentioned at that period, many of whom have passed away from their earthly labors. The younger generation, however, will find much of interest in looking upon their portraits and reading of their achievements in life. Many of them are still alive and in harness in the telegraph and other fields of activity.

Mr. J. J. Ghegan, president of J. H. Bunnell & Co., New York, who recently received a copy, expresses his appreciation of the work as follows: "Copy of 'Telegraphers of Today' received. I casually saw a copy of the book when first published, but never had I an idea that it was so beautiful, interesting and historically accurate. It should be of great interest to telegraphers with any sentiment in their make-up. It is magnificent, unique, and I truly pity those of the fraternity who fail to secure a copy before the edition is exhausted. Kindly send me five additional copies. I can use them to good advantage."

This book, which is 11½ x 14 inches in size, was originally published at $5 per copy, but in order to close out the remaining copies we offer them at $1 per copy by express, charges collect.

Address orders to J. B. Taltavall, Publisher, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

FOR SALE.—Bound volumes of TELEGRAPH AND TELEPHONE AGE for 1912. Price $3.50. Sent by express, charges collect. This price covers the bare cost of binding and handling in addition to the regular subscription price of the paper. The binding is of substantial black cloth, with neat gilt lettering.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, OCTOBER 1, 1913.

Profanity in Telegraph Offices.

On another page of this issue we publish a letter from a correspondent who refers to the disgusting habit of using profane language by employes in telegraph offices. It might be inferred from this correspondent's statements that the habit is common, and that telegraphers must be a profane lot, indeed.

The habit, of course, is a disgusting one under any circumstances, and is extremely repugnant to every well-bred person, but, as far as our own knowledge goes, the average operator does not indulge in profanity—certainly not to excess—and those who do are growing fewer in number all the time. The telegraph is an educator in morals through association, as well as in practical knowledge, and it would certainly be unfair to assume that all are offenders of morality because a few are.

A particularly demoralizing feature of the situation, as pointed out by our correspondent, is the habit, as he alleges, of superiors indulging in profanity toward their subordinates. The moral tone of such an office must, indeed, be low, and there must be a woeful lack of discipline. It is hard to think that such a condition of things can exist in a telegraph office in a civilized community. The effect of such conduct on the part of those in authority must necessarily be demoralizing in the extreme. If they have no respect for themselves they should have for others, especially for the public.

Employes should, above every other consideration, be respectful and courteous toward the public, work for the company—not against it. Courtesy should be practiced at all times, whether in public or private relations, and this is one of the qualities that the companies are requiring of their employes in their dealings with the public.

The Telephone Pioneers' Convention.

The Telephone Pioneers of America, which association will hold its third annual convention in Chicago, October 16, is one of the youngest of the national electrical organizations, and one of the most vigorous and enthusiastic. Its membership embraces the highest officials of the leading telephone company and all classes of employes who have been identified with the telephone interests in the manner and during the time prescribed by the constitution.

The association is more of a social than a practical character, and it is proposed to extend the object of its existence by adding an historical feature to its responsibilities. This will more closely accord with the provisions of the constitution.

There is only one important electrical industry that is younger than the telephone—that is wireless telegraphy; but the telephone transcends all electrical utilities in that it more directly affects the individual than does any other. Many people think it is the most wonderful of all electrical inventions, and they certainly have good grounds for their belief.

The association is particularly fortunate in having in its membership the inventor of the telephone himself and most of his immediate associates; therefore, the history of the invention and its remarkable development are recorded at first hand. There is no tradition or hearsay about it. Future generations will find an authentic and definite record of the instrument, its development and use, and historians will not be required to gather up fragmentary reminiscences here and there and put them together in order to form a history. The history is already prepared for them—unadulterated.

It was fitting that the first convention was held in the birthplace of the telephone—Boston. The next meeting was held in New York, where the telephone has attained its greatest development, and the third meeting will go to the City of Chicago, where the manufacture of the instrument is carried on. The association now has 1,150 members, and, each year, a large number of persons become eligible to membership, automatically, by reason of the operation of the constitutional time limit. There are, under the constitution, three classes of members; *i. e.*, honorary, pioneers and junior pioneers; but, inasmuch, as the "pioneer" class will, under the present constitutional provisions, eventually disappear through death or resignation, it is proposed to amend the constitution at the Chicago convention so as to classify all members as pioneers, except honorary members, and thus avoid the anomaly of calling the association one of pioneers, when, in reality, it had no such class of members.

Every telegrapher who has his profession at heart should subscribe for TELEGRAPH AND TELEPHONE AGE.

The Joy of Achievement.

Mr. Charles W. Eliot, former president of Harvard University, Cambridge, Mass., read a paper before the Electrical Manufacturer's Club at its Hot Springs, Va., meeting, in which he made some interesting remarks on "The Fortunate or Happy Conditions for a Life of Labor." Regarding the joy of achievement, he said:

"A source of genuine satisfaction in one's daily labor lies in achievement, that is, in doing and accomplishing something worth while. This is a motive, which should be constantly appealed to in education, from its earliest through its latest stages; and it should be appealed to in all industries, and be kept constantly in the minds of the working people. Competitive achievement is more pleasurable than achievement without competition; because competition needs liberty, hope, and a determination toward improvement. The sense of achievement is heightened if the achievement is the result of the co-operation of several or many persons, particularly if the co-operation is effected by any sort of rhythm, or harmony, or team-play. The industries, like the sports, afford innumerable instances of the satisfaction which naturally springs from such competitive effort. Human nature responds with joy to competitive effort toward any productive or collective end, just as it does to the desire for victory in a ball game or a boat race.

"Another important source of satisfaction in any life-work is the hope or expectation of improvement, as times goes on, improvement in the amount of earnings, in personal skill, and in the utilization of mental capacity and moral responsibility."

Patents.

Mr. F. P. Fish, Boston, Mass., former president of the American Telephone and Telegraph Company, read a paper on "Letters Patent in Relation to Modern Industrial Conditions" at the recent meeting, in Montreal, of the American Bar Association.

No one doubts that industrial prosperity is essential to the welfare of a community, he said among other things, and if it is clear that a liberal patent system is essential to industrial development, all must favor it, whatever side they may take in the acute controversies of the day. No form of reward so fits the achievement, is so productive of advantage to the community and is attended by so few disadvantages as the grant to an inventor of a monopoly of his invention for a limited time. While many other forms of reward have been suggested (such suggestions were made at the convention which adopted the national constitution), they have nowhere been adopted as part of the machinery of society. Everywhere some form of exclusive control, for a limited time, has been recognized as the best method.

The encouragement of patent protection does not alone stimulate the inventor to intellectual effort; it excites to strenuous effort a long line of intermediaries, capitalists, investors, business administrators, licensees and users, who work with or under the patent, and whose co-operation is vitally necessary that the invention may not be confined to a paper description, but may actually get into use. The ultimate consumers get their advantage from the invention, even during the term of the patent, in lowered cost, added facilities, increased comfort and greater convenience.

This form of reward for invention is strictly automatic and comes only to those who meet a public need and give the community something it desires and will use. Practically every civilized nation in the world now has a patent system, although Switzerland had none until 1888, when, finding that there was no stimulus to invention or industrial progress, the lead of more progressive nations was followed. Holland, in 1869, abolished her patent law, undoubtedly in the hope that domestic industry would be thus stimulated, but found the reverse to be true and more than a generation later re-established the patent system.

Inventors and business men who develop inventions and introduce them to the service of man, to exactly the same degree and for the same reason, are stimulated by the protection afforded by a patent to efforts which they would never otherwise make. Each class would be helpless without the other. It is only when both are encouraged and protected, as they are by the grant of a patent, that the progress of the useful arts is promoted. Even if the invention meets a real demand, there is frequently the opportunity and occasion for the expenditure of a vast amount of money and of the greatest intelligence and energy on the part of those who are introducing it into use before commercial success can be attained, and always there is the chance of utter failure.

Very few inventions are the result of a happy thought which comes without cost or expense, and is complete and perfect at conception. Most of them spring first from a clear recognition of the given problem or opportunity, requiring exact knowledge and trained judgment, and then require the intellectual effort to find a solution. Next comes experimentation, attended so freqnently by failure, and lastly, realization of the goal after much patient expenditure of money and time.

If the industrial workers of a nation are discouraged from inventing, they are likely to stagnate—they lack the training and the right habits of mind. On the other hand, when stimulated to invent, there is developed also the capacity or instinct to make mechanical improvements not amounting to invention, but of great value in the arts. Such improvements are by-products of the inventive habit.

The American patent system differs from the English system, which alone preceded it, and from most others, in two important respects: First, a patent here is granted only to the first inventor himself, whereas, in England, the reward goes to him who first introduces the invention into the realm, whether he originated it himself, or found it in some other country; second, the patentee and those with whom he elects to share his right in working his patent have absolute and exclusive control of the invention for the statutory period.

Course of Instruction in the Elements of Technical Telegraphy—XLVIII.

(Copyrighted.)

(Continued from page 558, September 16.)

[The Course of Instruction in the Elements of Technical Telegraphy, which has been running regularly in this journal since October 16, 1911, has met with wide-spread favor and is being studied diligently by thousands of telegraphers and others throughout the world. It is being translated into Spanish, and printed in South American electrical journals, and has attracted universal attention for its clearness of expression and its practicability. It has been endorsed by the officials of telegraph, telephone, cable and railroad companies, many of whom have acknowledged the improvement in the technical standing of their progressive employes, and they commend the course as being of the most practical kind of instruction.

This course was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, and is being published now for the benefit of those of our readers who desire to fit themselves for higher positions in the engineering branch of telegraphy, and it has been a valuable aid in this direction. It is elementary, and devoid of higher mathematics, yet it is fundamental in character and extremely easy to learn.

Each chapter is complete in itself, and the chapters are arranged in natural order so that the student acquires the knowledge step by step in logical sequence. Each chapter is followed by test questions on the subject of the chapter, thus enabling the student to review his progress from time to time.

Back numbers containing these valuable lessons can be obtained at 10 cents per copy.]

The Rheostat.

A rheostat, or resistance box, consists of a number of bobbins wound with fine wire.

German silver wire is used in the construction of these spools on account of its being very little affected by change of temperature, and because, owing to its high resistance—about thirteen times that of copper—a large resistance can be put into very small bulk.

The coils are arranged as in Fig. 63. Brass blocks mounted on an ebonite slab, which covers

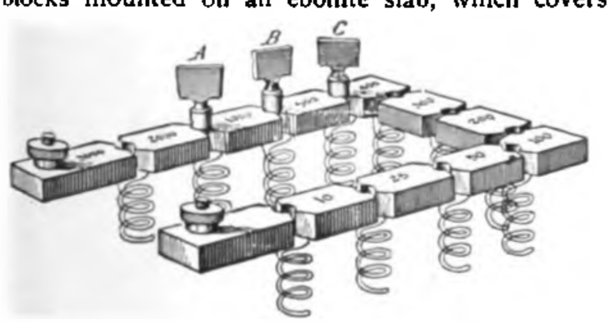


FIG. 63—WINDING AND MOUNTING OF RESISTANCE COILS

the top of the box, form the terminals of the coils and are so arranged that, by inserting a metal plug between any two of them, the corresponding coil is short-circuited. As it is not desirable that the current flowing through the resistance coils should create a magnetic field, the coils are wound non-inductively, that is, for each turn in one direction, a turn is wound in the opposite direction, the magnetic effects being thus neutralized, for the tendency of the current in one portion of the coil to set up a magnetic field is counteracted by the same current flowing through a parallel portion of the coil in the opposite direction.

The usual method of winding a spool is to measure off the length of wire required and fold it in the middle, then, starting at this fold, the two parts of the wire are wound on as one wire, the current passing through one half in one direction and through the other half in the reverse direction. When finished the coils are plunged into hot melted paraffin, which protects them from damp.

The box of coils may be made circular and contact made by movable levers arranged to move like the hands of a watch, or, as in Fig. 63, where metal plugs make the connection between the brass blocks. The numbers on the blocks represent the number of ohms resistance of the coil to which they are connected. Thus, in the illustration, the plugs A, B, C, short-circuit the 500, 1,000, and 2,000-ohm coils, leaving a total of 4,085 ohms in circuit, which can, obviously, be increased or diminished by the removal or insertion of plugs.

Stearns' Differential Duplex.

The method of simultaneous transmission in opposite directions known as Stearns' differential duplex system, is the invention of Mr. Joseph B. Stearns, of Boston.

It is evident that in any duplex system the home relay, to be in a condition to respond to the currents from the distant station, must not be affected by the outgoing currents of the home battery.

It has been shown that, by using a differentially

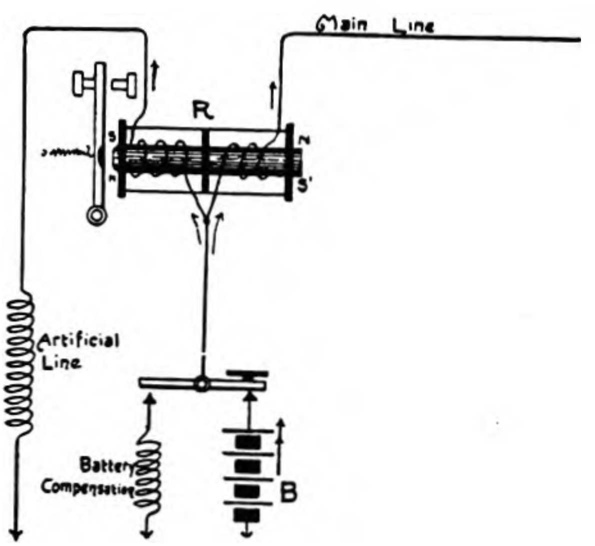


FIG. 64—PRINCIPLE OF STEARNS' DUPLEX.

wound electromagnet, no magnetic effect was produced on the cores when currents of equal strength were flowing through the coils, and it is on this principle that the differential duplex is based.

In Fig. 64, when the key is depressed, the current from battery, B, flows round the coils of R in the directions indicated by the arrows. One of the coils is connected to the main line, the other is joined to an artificial line composed of resistance coils and condensers arranged in such a manner that the charging and discharging effects closely resemble those of the main line.

(To be Continued.)

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What were the conditions which led to the invention of multiple telegraphs?

What is a diplex?

Is the diplex used at the present time?

How many messages can be simultaneously transmitted over one wire with the quadruplex and how many with the duplex?

What is the principle of operation of the diplex, duplex and quadruplex?

Upon what does the attractive force of an electromagnet depend?

What is meant by ampere-turns?

How is the polarity of an electromagnet determined?

How may two equal currents be made to neutralize each other in an electromagnet?

What is a differential magnet?

Describe the construction of a differential magnet?

Why is it necessary to wind a differential magnet with two wires, or their equivalent?

What are the different methods of winding differential magnets?

Name the essential instruments used in a duplex.

What is the function of the transmitter of a duplex?

Why would not the ordinary Morse key answer the purpose of a transmitter?

What is the function of the spring contact of the transmitter?

The principle of the duplex is shown in Fig. 149 of the text-book. Study this diagram, trace the circuits and study the description of the device.

When the home office transmits on a duplex, why are the signals not recorded on the home relay, while the distant signals are recorded on that instrument?

What is the artificial line and in what respect does it resemble the actual line?

What constitutes an artificial line?

What are the variable factors in the actual line and what means are provided in duplex apparatus to meet such changes?

What is meant by the electrostatic capacity of a line?

Life of Poles.

Some interesting facts concerning the life of poles in various parts of the world are published in *Archiv für Post und Telegraphie.*

Reinforced concrete poles are to be found in various countries, says that journal, but seem to offer no decided advantages over wooden poles, due to the fact that they are more expensive than the latter.

Iron poles are used in a few places in Europe, not more than twelve or thirteen thousand being found on the Contintent. They are used, as a rule, more for supporting points for high-tension lines, or else to support a large number of wires meeting at one point. In South America more than 100,000 are found. The tropics, African colonies, India and Ceylon show a large number of iron poles. The poles weigh, as a rule, no more than 150 pounds. In spite of their high cost they are indispensable in tropical countries, as it is impossible, at present, to furnish enough treated wooden poles, and untreated poles would be destroyed in a short time by insects.

Living trees are used in a few wild and uninhabited regions as telephone poles, especially in Tunis, Asiatic Turkey, Congo, Senegal, Australia. In Europe (Bavaria and Sweden), a few such cases are found, and only then when the cost of transportation or the natural advantages of the country would eliminate the use of the usual poles.

At least ninety-five per cent of all poles used in the world are of wood. Only very few types of wood are worth using in an untreated condition.

A table shows the average life of poles, in years, of different kinds of wood, as follows: Poplar, two years; Norway pine, four to eight; oak, seven; pitchpine, fifteen; cypress eight to ten; red larch, ten; chestnut, eight to fifteen; cedar, fifteen to sixteen.

Treated poles have about the same life and usefulness in all parts of the world. Those treated by the Boucherie process have an average life of fourteen years, cyanization, sixteen and a half years, tar oil saturation, twenty-five, zinc chloride, twelve.

In recent years the Rüttger and Rüping processes have been introduced, which do not treat the timber to complete saturation, but use only as much as the timber will absorb. The advantage lies in greater cleanliness and in saving of oil. In the northern portions of Europe the tar oil is used; in the southern portions where the poles sweat a great deal, due to the heat, the salt solution is used. Tar-oil treatment is best where the poles are to be used within close proximity to the factory where they are treated. This is due to the great weight of poles treated with tar oil. With the latest tar-oil processes the pole weighs at least five pounds per cubic foot wood, while the poles treated with copper sulphate or corrosive sublimate weigh only 0.06 pounds per cubic foot. The cyanization and Boucherie methods, however, can be built for very small capacities, and there are a number of plants owned by smaller telephone companies that have a capacity of only 100 poles annually.

LETTERS TO THE EDITOR.

Earth Currents.

Editor TELEGRAPH AND TELEPHONE AGE:

SIR:—Under the heading "Earth Currents" in your issue of September 1, Mr. D. B. Grandy refers to tests on a telegraph wire between Chicago and St. Louis, in which measuring instruments showed currents were at the same time flowing into or from the line at both ends; that is, in opposite directions in the same circuit, made up of wire and earth return.

As suggested by Mr. Grandy, it is possible that this condition results from earth currents led into the line at some point of low insulation, but it seems to be more probable that the currents are more properly termed and explained as "air currents." It is well known that conductors in the air may become charged by flakes of snow, drops of rain, or particles of sand or dust being blown across the wires. The charges carried by raindrops are not ordinarily noticed on telegraph or telephone lines, as the general insulation of the line is at the same time lowered sufficiently to permit the escape of the charge to the ground at a number of points along the length of the line.

It is to be hoped that Mr. Grandy will give you an opportunity to publish further information on this point, if he has tabulated any readings and recorded the polarity of the current flow at different times of the year and under different weather conditions.

JOHN B. TAYLOR.

SCHENECTADY, N. Y.

Profanity in Telegraph Offices.

Editor TELEGRAPH AND TELEPHONE AGE:

SIR:—The efforts of TELEGRAPH AND TELEPHONE AGE to better the telegraph service are not, I am sure, being appreciated by anyone more fully than by the telegraphers themselves. They constitute an important factor in the service, and, consequently, any great change that is instituted has its effect upon them.

Equipment and management, of course, must be considered in efforts to better the service, but satisfactory progress will not be made without also taking into consideration the operators, the great human element in the business. The articles published in your journal, therefore, have had a wholesome effect. They tend to arouse the men from their apathy and so create in them a desire for advancement. They also make the men alert to the opportunities for bettering themselves and their profession, thus creating a higher efficiency in the service.

Progress, indeed, has been made, but there still remains great room for further endeavor. Profanity, I am sorry to say, is quite prevalent in the profession, especially in the offices of the larger cities. Not only is it indulged in by the operators and clerks, but also by officials of the force. The use of profane words brings anything but on elevating atmosphere into the office. It rather stultifies the intellect, making man more like an animal, devoid of intellect and will; it brings into the office the atmosphere of the jungles where might is right; it creates a spirit of contempt and fosters pride, conceit and jealousy.

An outsider certainly places a low estimate upon the management of an office where such conditions prevail, and, as regards the public, the use of profanity entails injurious results to the business. The public looks for courtesy and goes where courtesy is given when transacting business. I doubt whether there can be anything more discourteous and disgusting to employes and public alike than profanity.

D. J. ALBERT.

CLEVELAND, OHIO.

Parasitic Wireless Waves.

Prof. M. Frank Duroquier, a French meteorologist, has, after investigation, established the fact that the telephone receiver is remarkably sensitive to climatic conditions, so much so that an intelligent wireless operator can foretell the weather from the character of the noises in his receiver.

The noises heard in a receiver Prof. Duroquier attributes to the "parasitic waves" of the atmosphere, which, says the *Wirless World*, are set in motion by each change in the weather. Hitherto it has been believed that the wireless system could only foretell storms, by means of a very clever, if complicated, arrangement which causes the greater disturbances to register themselves automatically through the medium of a pendulum. But the use of the telephone makes it possible to obtain the same results in a much less roundabout way.

"By these means," says the professor, "we have studied the parasitic waves of the atmosphere for a whole year, and we were not only surprised at the great variety of these parasites, but at the accuracy with which they register the character of atmospheric disturbances." Connect a telephone receiver with a wireless system and you can tell from the character of the noises whether a gale, or a thunderstorm, or cold, or rain is coming.

A strong crackling signals the approach of a thunderstorm. A fall of hail causes a slight whistling in the receiver. Asthmatic, irregular noises betoken a coming fall in temperature and frost. If the wave-lengths of the parasites shorten and give the impression that the noises are grouping together, a change in the wind may be safely predicted. Great barometric depressions and very violent storms are heralded by very frequent cracklings, which now and again almost develop into a sound as of an explosion.

MR. W. B. STUART, manager of the Postal Telegraph-Cable Company, at Columbia, S. C., writes: "It is needless to say that I always want my subscription renewed. I congratulate you on the class of periodical that you are now and have been for some time furnishing the craft, and hope that the fraternity are appreciative and supporting you as liberally as your efforts so richly deserve."

Elaborate Grounding System for High-Power Wireless Stations.

One of the essential features of long-distance wireless stations is an effective grounding system.

In selecting the sites for the erection of the new Atlantic coast stations of the Marconi Company, a number of elements had to be considered, says the *Marconigraph*. The location required for the transmitting site and receiving site had to be more than twenty miles apart and corelated in such a manner that a line connecting them would be at right angles to the direction of desired transmission. The sites had to be chosen on low, marshy land on the coast, or near some waterway that would afford a direct electrical connection with the ocean.

These two essentials to location were difficult to find in the sites available, so where it was not possible to get the whole property in a marshy location it was necessary to have the land around the power-house at least damp and moist. Then, by burying a network of copper wires and zinc ground plates a good electrical earth connection was possible.

With the middle of the oscillating circuit as a center, wires radiate to a circle of zinc plates at a radius of 100 feet. This circle is continuous, all the plates being bolted together, and buried vertically in a trench, so that the radiating wires can be led down to the ground and soldered to the upper edge of the zinc ring. From the center of the system about 224 copper cables, made up of stranded copper wire, are led from two sides of the building through insulators to the top of eight poles, set on a circle of eighty feet radius. From the insulators, on the top of these poles, the cables are separated and led down to the earth and soldered to points along the circle of zinc plates. The location of the eight poles and the separation of the cables is so arranged that the length of each cable from the center of the system to the point it enters the ground is approximately the same.

Radiating from the ring of zinc plates there are about 112 copper cables soldered to the ring at equal distances. Each of these cables extends about 300 feet beyond the zinc ring and terminates in a zinc plate thirty inches by eighty-four inches, buried vertically. From these outer plates, on the side of the circle under the aerial wires, extends a further grounding system parallel to the aerial and extending under its full length and a little beyond.

The foregoing description applies to the transmission stations in general, but, in each particular case, local conditions usually make it necessary to alter the arrangement slightly to obtain a grounding system equally effective. Thus, the location of the power station at New Brunswick, N. J., is situated in a swampy meadow and bounded by the Delaware and Raritan canal on the northeast side. Running beside the canal is a stream connected to the Raritan River by culverts under the canal. In view of this condition, it was deemed advantageous at this station to straighten out one side of the circle of zinc plates and bury a large number of plates in the bed of the stream, by this means assuring a good electrical connection through the Raritan River with the ocean.

At the receiving stations the grounding system follows the same general arrangement as at the transmitting stations, but its scope is not nearly so extensive. The circle of ground plates is made with a fifty-foot radius, with the receiving room of the operating house as the center. The only wires extending beyond the circle of zinc plates are a number of cables radiating from the center and extending in a marsh, or waterway, near which the operating house is situated. Each of these lines terminates in a zinc plate, as at the transmitting site.

A precaution, which is essential in the construction of the power-house and the running of power and lighting circuits, is to run all lines in iron conduit and thoroughly ground the conduit at frequent intervals. If this precaution is not taken, considerable difficulty might be caused by the current induced from the high-frequency oscillating circuits. Wherever possible, all circuits are carried underground, and especially the main power supply in stations where the power is supplied by a commercial power company. The supply is run in conduit underground for about half a mile and approaches the power plant in a direction at right angles to the direction of the aerials.

Testing Reinforced Wooden Poles.

Some interesting tests were recently conducted in Pittsburgh, Pa., to determine the break-down limits of poles which had been equipped with a reinforcing collar. In this system of prolonging the useful life of a wooden pole, a collar and sleeve of concrete, reinforced with rods and expanded metal, are applied at the ground line—the part which is most subject to decay. The poles under test comprised five forty-foot and ten thirty-foot chestnut and ten thirty-foot cedar poles which had been reinforced several months before.

When tested, the cedar poles broke off above the reinforcing collar at an average pull of 2,000 pounds and the chestnuts at an average pull of 3,000 pounds. The load was applied thirty feet above ground on the forty-foot poles and nineteen feet above ground on the thirty-foot poles. The ultimate strength of the reinforcement was satisfactory, but in nearly every case cracks developed in the concrete collars at 1,500 pounds. The poles for the second test were reinforced to withstand a pull of 2,000 pounds.

Under test, five of the strengthened forty-foot poles withstood an average pull equivalent to 2,335 pounds, applied thirty feet from the ground before developing any cracks in the collars and withstood a pull of 3,040 pounds before failure. In three cases the upper part of the poles split or broke. Six thirty-foot poles withstood an average load equivalent to 2,444 pounds with a nineteen-foot lever arm before developing cracks in the collar, and 2,961 pounds before failure.

Eight other reinforced poles were broken on which reinforcing rods lighter and shorter than the standard rod were used, so that a thorough experimental test of the reinforcement was obtained.

Psychology and Telegraphy.

BY E. E. BRUCKNER, SPOKANE, WASH.

The telegraphic aspect of psychology, as observed by Mr. Rex D. Miles, in the September 1 issue of TELEGRAPH AND TELEPHONE AGE, is essentially correct, but I think he leaves somewhat obscure the mode of applying practical psychology to actual operation. Therefore, a little more said on the subject can neither do harm nor become exhaustive. Nothing said, at this stage of intellectual development, can prove quite satisfactory, because psychology is yet an infant among the sciences.

The sub-conscious mind, the subject of Mr. Miles's dissertation, is that inner man that, when directly impressed, as in hypnotism, enables a diffident person to talk fluently, a rheumatic to walk, a stutterer to enunciate faultlessly, and banishes aches either from the teeth or corns. It permeates the entire body, like the pores of a sponge, and its influence may be felt wherever directed.

The sub-conscious mind may be impressed through the conscious mind as effectively, though sometimes more laboriously (due to inability readily to concentrate), as by direct means.

Strongly to desire anything within the possibility of human achievement is to impress the sub-conscious, and make that wish more than probable of realization. Hence, prayer, devoutly addressed and implicitly relied upon, is hardly more than a deep impression upon the sub-conscious mind, and results in accomplishment, whenever it be within the power of the individual to effect such result. For instance, persons mentally perturbed over difficulties of various kinds, sometimes ask for "divine guidance"; and, having absolute faith that such "prayer" will be "answered," usually arise from their knees to find themselves stronger, calmer, and, on the whole, mentally better fitted to meet the difficulty. An air of serene tranquillity and firmness of purpose replace, in a large measure, and relegate absolutely indecision and timidity to mere adumbrations of their former proportions. An electro-physical force, however, seems more productive of results, and, therefore, somewhat superior to prayer, when rain is the thing desired. Suggestions to the sub-conscious mind are best offered after one has gone to bed.

A deep desire for a stronger arm, a steadier nerve, and more perfect signals—provided the supplicator knows the difference between good and bad Morse—and absolute confidence in the ability of the sub-conscious to bring such desire to a complete realization, are the prerequisites to success. The solicitous one, however, must not try to force or command the sub-conscious. In this respect it is like a mule. It is susceptible to coaxing, but not to urging.

Confidence is an essential element in the application of psychologic principles and laws for the same reason that absolute faith in the power of the hypnotist on the part of the victim is necessary before the "operator" can subdue opposing forces. As a matter of fact, the operator or hypnotist does nothing; it is the confidence the subject has in the "ability of the operator" that is the real anesthetic.

A strong desire, then, and perfect confidence are the indispensable essentials and the specific. In making suggestions there should be complete relaxation of muscles. If the suggestions are followed by an agreeable sensation—as if something akin to an electrical current were flowing down the arm, which is almost invariably the case—it is a good sign.

In sending, the operator should never force his arm. The purpose is more easily and less violently attained by impressing the sub-conscious through the conscious mind of a desire to send more speedily. Let the arm remain free at all times to obey the will of the sub-conscious.

In conclusion, the sub-conscious mind may be likened to the phonograph. The impression is made upon the sub-conscious by and through the conscious, and from the sub-conscious it comes out mechanically in the expression; the impression made upon the wax record has a conscious source, and from the record it is reproduced mechanically through a tin horn.

Telephones on the Steamer "Imperator."

The steamer "Imperator," of the Hamburg-American Line, the largest steamer afloat, has a very complete telephone equipment. The captain's bridge has six loud-speaking telephone sets for connection with the main engine room, the turbine room, the center deck bridge, the anchor watch, the crow's nest and bow of the boat. This is, however, only a very small part of the extensive telephone equipment of the steamer. The installation is of the common battery type, with automatic call lamp signal system and double automatic cut-off signals. The switchboard is on the first deck and has 100 connections. There are no telephones in the various cabins, as past experience has proved this to be unnecessary. Instead, the cabins have been provided with a push-button signal system, which is much better and just as efficient. The steamer is also connected with land while in dock in Hamburg or New York. At present the steamer has to lie out in the Elbe during the reconstruction of the docking and harbor facilities at Cuxhaven. Two double lines were laid in the usual way from Cuxhaven to the Elbe River, and then, in a submarine cable, out to the place where the "Imperator" anchors, where the cable ends in a rigid, box-like arrangement which is always above water level. When the "Imperator" has anchored, a flexible aerial cable, provided with plug terminals, is connected to this box and its terminals, and connection between land and boat is finished. This, besides ten other trunk lines, are operated from the switchboard, and as there are ten trunk lines, there can be ten different conversations at the same time between ship and Hamburg exchanges.

At the bow of the steamer is a huge figurehead. This is so capacious that the "lookout" is stationed inside of it. Openings are provided so he can see ahead, and he reports by a special telephone connection to the captain on the bridge.

Vibrating Cable Relay.*

BY K. GULSTAD

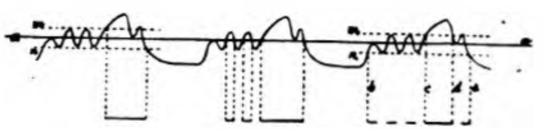
It is well known that signaling impulses sent into a cable suffer both attenuation and distortion, before they arrive at the receiving end, and that both of these increase rapidly with the length of cable, and as the speed of signaling increases.

The failure of the polarized relay, when employed in such connection, results from its lack of sensitiveness and its inability to respond to the attenuated current ripples, representing the signals, which are all that arrive at the receiving end of the original impulses sent into the cable, even at a speed that would be considered very moderate were it done over an overhead wire of the same length.

In the vibrating relay the magnetic attraction may be neutralized, or even reversed, by the local application of an e. m. f. causing currents in auxiliary windings on the magnet cores.

A further valuable feature is that by the use of suitable electrical accessories with these windings a means is provided of not only accelerating the transit of the armature from one side to the other, but also of improving the contact made by the tongue.

In Figs. 1, 2 and 3, the undulatory curve illustrates the shape of a cable current curve through the



FIGS. 1, 2 AND 3.

windings of a polarized relay at the receiving end of a cable, when the signal - - - - — - is sent through the cable by a Wheatstone transmitter. Let *a* be the current zero line, or neutral line of the relay, and let the equal distances between *a* and lines *m* and *n*., Fig. 1, represent the current strength necessary for overcoming the magnetic attraction. As indicated by the Morse signals shown below the undulatory curve, the relay will record the received signals in different ways, according to whether this attraction is neutralized or not, as in Figs. 2 and 1 respectively, the signals in the former case being somewhat less distorted.

Fig. 3 illustrates a still better result and refers to a case of repulsion, the particular point to be dealt with here. The repulsion of the armature is obtained by arranging the relay as an interrupter such, that it will cause the armature to vibrate with a certain frequency between the contacts, if the interrupting current be made sufficiently strong. In Fig. 3 this frequency is supposed to be equal to the frequency of dots sent into the cable. If, as before, the distances between *a*, *m*, and *n* represent the strength of current required to stop the vibrations, the relay will accordingly record three dots between *b c* and one dot between between *d e*—*i. e.*, the Morse signal as shown.

By employing a vibrating relay the effect of distortion is reduced—and all the energy required to move the armature is supplied by the local relay current itself, the work left for the cable current being solely to stop the motion of the armature when wanted. This work may be made very small indeed, whereby the relay becomes exceedingly sensitive. One thing is, however, needed; namely, that means should be provided for adjusting the vibrations of the tongue to any desired rate.

This is generally effected by means of a local arrangement shown in Fig. 4, where *F* is the arma-

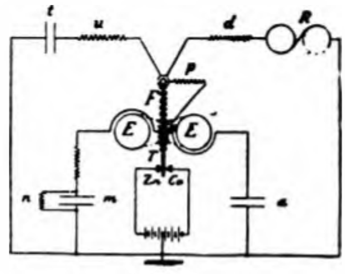


FIG. 4.

ture, *T* the tongue of the relay, *E* the electromagnets, *t* and *u* respectively a condenser and a resistance in connection with the tongue, *a*, *m* condensers, and *p*, *r*, *n* resistances all in connection with a pair of windings differentially disposed and specially intended for producing the vibrations; this set of windings is hereafter called the auxiliary windings. *R* is an instrument (undulator) for recording the signals from the relay, and *d* a resistance varying the strength of the local current through the undulator.

The conditions and adjustments being assumed to be such as would be used for working, it will be well to consider a cycle of events supposing the tongue to have just made contact with the contact point on the right.

The first result, as a consequence, of the condenser *a* becoming charged, is to cause a temporary current of relatively high initial strength through the winding on the right. The magnetic effect of this tends to draw the armature still further to the right, and so to improve the contact between the tongue and the contact point. At the same time, there is developing a current in the winding on the left, the effect of which is to draw the armature over to the left, as soon as this current (which may be designated the "pull off" current) attains the necessary strength. At the instant the tongue leaves the contact on the right the battery e. m. f. becomes obviously inactive, and, in the absence of any force to carry on the work started by the "pull off" current, the armature would, under the attraction of the pole-piece on the right, return to that point.

The condenser *a*, however, at once begins to discharge, causing, in doing so, a temporary current through both windings, the effect of which is to complete the work begun by the original "pull off" current and to carry the armature over to the left. On arrival of the tongue on the left contact there will be a repetition of events in the reverse direction.

* Abstract.

i. e., a current through the condenser on charging, improving the contact, the "pull off" current breaking it, and the condenser discharge current carrying armature and tongue once more over to the right, and so on. Thus, it is seen that the normal condition of the relay is one of oscillation of armature and tongue from side to side.

By using suitable values of the different condensers and resistances in the arrangement, the relay armature and tongue will vibrate through the action of the local relay battery current at a certain rate, which may be altered at will by changing the values of one or more of the capacities or resistances.

It only remains to connect the usual main winding to the cable circuit, and to a shunted line condenser, as customarily employed at the receiving end to convert the relay into the complete vibrating cable relay.

It will be understood that the name does not refer to a specially constructed relay for Morse signaling, but to a polarized relay in connection with an arrangement of condensers and resistances, whereby the following advantages, most desirable for relay working through rather long cables, etc., can be obtained:

1. Any desirable sensitiveness of the relay.
2. Troubles due to contacts sticking or bad contacts may be overcome.
3. The relay may be made to respond to small variations in the strength of current, even if the current does not change direction (positive or negative), although the tongue is fixed to the relay-axis and moves between fixed contact points, *i. e.*, the distortion of these signals may be, to a large extent, eliminated by employing the relay arrangement described.

Fig. 5 shows diagrammatically the essential parts of the relay arrangement in connection with the

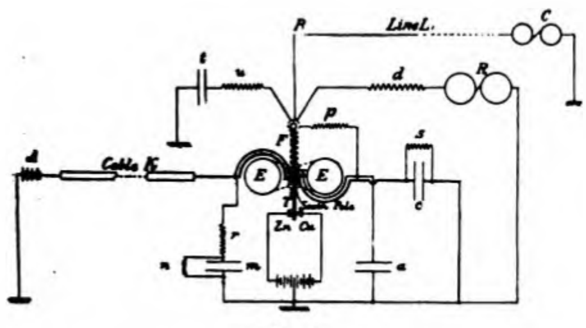


FIG. 5.

A, The cable station; *B*, The translating station; *C*, The receiving station. At station B: *E*, Electro-magnets of relay (upper poles); *F*, Armature of relay (say, south pole); *T*, Tongue of relay; *Zn*, and *Cu*, Zinc and Copper poles of relay; *c*, Condenser; *s*, Resistance, belonging to cable circuit through one relay winding; *a*, *m*, Condensers belonging to local relay circuit; *r*, *n*, *p*, Resistances belonging to local relay circuit; *t*, Condenser, *w*, Resistance, in connection with tongue; *R*, Receiving apparatus in leak circuit; *d*, resistance in leak circuit; L_1, Line in connection with relay tongue.

cables between England and Sweden. The thick line indicates the cable circuit and the line windings of the relay, the other set of windings shown being the auxiliary windings.

It will be understood that the tongue of such a relay worked by Wheatstone would, although there are two different currents acting on it, remain undisturbed against the contact point, which corresponds to the direction of the cable current, as long as this current is increasing normally, according to duration of contact at the sending station, because the magnetic effect due to the cable current is exactly neutralized by the same effect, but in opposite direction of the local current; but, as soon as the cable current is diminished in the slightest degree in proportion to the local current, which happens whenever the current is reversed at *A*, the tongue will instantly be moved from one contact to the other, causing a corresponding diminution of the strength of current through the auxiliary windings, and so on. In other words, no magnetism will be produced in the electromagnets, except when reversals take place at *A*, and the relay will translate these correctly through L_1 independent of the amount of distortion to which the signals may be subject in passing the cable *K*.

At high-speed working, dot-signals emitted from the transmitter at *A* would practically have no influence upon the relay vibrations, on account of the small amplitude of the received current, it being, in this case, the positive and negative dashes which only control the correctly translating of the signals, provided, of course, that the frequency is sufficiently well adjusted.

As to the actual speed attainable, I may refer to the relay performances at the station of the Great Northern Telegraph Company at Gothenburg, where signals from Newcastle, through one of the North Sea cables, are repeated to Nystad in Finland. In this case, a sensitive cable relay, well adjusted and worked in the old fashion, will operate up to thirty words a minute, while a maximum speed of 120 words per minute has been attained by using the vibrating relay, the play of the tongue between the battery contacts, at the same time, being greater than in the former case. The ordinary daily working speed from month to month is ninety words per minute on this circuit.

Organization of the Military Telegraph Service During the Civil War.

During the Civil War, the telegraph lines in Ohio, Illinois and Indiana were taken possession of by the Government, and placed in the control of Mr. Anson Stager for military purposes. At General McClellan's request, Mr. Stager accompanied him in his West Virginia campaign, establishing the first field system of telegraphs during the war. When, afterward, General McClellan was transferred to Washington, Mr. Stager was called by him to organize the military telegraph at the capital. In this department he remained until November, 1861, when he was commissioned captain and assistant quartermaster, and, by order of E. M. Stanton, Secretary of War, appointed Chief of United States Military Telegraphs. He was subsequently placed in charge of the cypher correspondence of the Secretary of War. The cryptograph used in this correspondence, and which successfully baffled the ingenuity of the enemy to translate, was the work of Mr. Stager.

The A B C of Wireless.

Among the modern methods of establishing rapid communication between distant points, none creates more interest in the mind of the average person than a wireless telegraph station, says *Wireless News*.

There is hardly a seaport of importance in the world at the present time, where the approaching traveler, by scanning the horizon, may not see either a steel tower or a wooden mast supporting several copper wires. These, the aerial wires, are universally called "antennæ." In the smaller stations the antennæ is of simple construction, consisting of a single tower, with ten wires suspended from it. In a higher power station two, or four, or even more of these towers are used, supporting a great number of wires.

Wireless telegraph communication is carried on by means of electromagnetic waves, sometimes called Hertzian waves. These waves were first made use of in the year 1880 by Prof. Amos Dolbear, of Tuft's College, Mass., who, at that time, applied for a patent on a wireless system, which contained all the essentials of the wireless telegraph system of to-day. Dolbear's patent was granted in the year 1886, two years prior to the discoveries of Dr. Hertz, along the same lines. These men discovered that whenever an electric spark took place, in that vast medium which scientific men are wont to call the ether, magnetic lines of force were set up around the spark gap terminal, which quickly detached themselves from their creative medium, traveling through space at an enormous speed, known to be 186,000 miles per second. Furthermore, it was noted that these waves, which detached themselves so quickly, had a definite length, which could be measured in feet, or meters.

It might be well to state that the exact method by which these invisible waves are propelled through space is not definitely known, and statements regarding it are purely theoretical. Dr. Hertz also found that the waves from this electric spark could be detected across a room by a device known as the "Hertz Loop," which consisted of a loop of copper wire, with the ends slightly separated. He saw that an electric spark made on one side of the room would cause a small spark to take place in the copper loop when it was held several feet distant.

Several years later, Sir Oliver J. Lodge, Marconi, and others, using this same spark gap, connected one side of it to a copper plate buried in the earth and the opposite side to the aerial wires, or antennæ. Prof. Dolbear used the spark gap connected this way in the early 80's, and it is established beyond doubt that he invented the modern antennæ. When so connected, the electric spark caused electrical oscillations to surge up and down on these aerial wires, thereby creating an electromagnetic wave, which could be detected at a considerable distance. These surgings take place very rapidly, oscillating from 100,000 to 2,500,000 times per second.

The modern wireless station contains appliances for regulating the wave length, and such a device is generally termed the "helix," due to the fact that it consists of a spiral of copper tubing. This device, while extremely simple in its mechanical and electrical make-up, plays a very important part in wireless telegraph transmitting apparatus, and to the engineer presents some very great problems.

The normal length of electromagnetic waves used aboard ship varies between 1,000 and 1,800 feet. However, some of the land stations, especially those used in very long distance work, use wave lengths in the vicinity of 12,000 feet, and even greater lengths are being contemplated.

While the simple spark gap of Dr. Hertz suffices to show the general principle of wireless telegraphy, it is proper to state that the modern wireless station includes some very marked improvements. Alternating current is employed, at 110 volts, then stepped up through a transformer to 30,000 volts, which, in turn, charges a condenser consisting of a battery of Leyden jars. This causes a discharge to take place across the spark gap, which, in turn, sets up oscillations in the antennæ, as previously described. The crashing sound of the spark is familiar to all. In some cases it is so loud that it is necessary to enclose the spark in a wooden cylinder, or box, known as the "muffler."

Credit should be given to American genius for the development of this alternating current apparatus. It should also be stated that in the modern wireless telegraph station, the copper loop of Hertz, as a receiver, has been considerably improved upon. In the early days, it was replaced by a detector known as the "coherer." This instrument has long since passed out of use, and replaced by a much more sensitive device, the discovery of which is due to American ingenuity.

Thus, we have the Hertz loop replaced by what is known as the "electrolytic" detector. It is a simple device, and consists of a very fine platinum wire, about one-ten-thousandths of an inch in diameter, which dips into a platinum cup filled with nitric acid. In action, this detector is connected with the same antennæ which is used to transmit the wireless waves. When these invisible electromagnetic waves leave a distant station they travel in all directions. Thus, they impinge upon the wires of a distant receiving station, causing electrical surges to take place in those wires, which, in turn, affect the detector, giving an exact reproduction of the note of the transmitting spark at the distant station.

The electrolytic detector has since been replaced by one of another type, equally sensitive and much better suited for general work on account of its greater stability and freedom from atmospheric disturbances, viz.: the carborundum detector. This detector consists simply of a crystal of carborundum supported between two brass points. When connected to the antennæ, it is affected by the oscillations caused by distant transmitting stations. These wireless signals are reproduced in telephone receivers, one on each ear, constituting what is known as a "head 'phone," not unlike that used by the girls at a central telephone station.

The spark of the transmitting station is controlled by a telegraph key, and the same code is used as in the ordinary wire telegraphy, *i. e.*, American Morse or Continental.

To prevent interference, each ship installation operates on a different wave length. We must then have a device at the receiving station to enable us to "cut in" or "tune in" on those various lengths, if we wish those installations to be intercommunicative. So we have the "tuner." This instrument, sometimes simple, sometimes exceedingly complicated, plays a very important part in present-day wireless equipment, and may be said to take the place of the switchboard at a telegraph or central telephone station. While the tuner, in its mechanical and electrical make-up assumes various forms, in each instance it plays the same part. It enables us to change the wave length of our receiving antennæ, so as to throw it in harmony with wireless waves of various lengths from other stations. maintained between the transmitter and the receptor.

One frequently hears the statement: "I fail to see where there is any secrecy in wireless telegraphy." As a matter of fact, there is more secrecy in wireless telegraphy than in wire telegraphy. The click of a telegraph sounder is familiar to all. Any operator can stand several feet distant from one of these sounders, and read all that is being said. It is not so in wireless telegraphy. The signals are for the operator's ear only, and, usually, these signals cannot be heard six inches away from the head telephones. Therefore, the secrecy of the wireless message rests entirely with the operator. In wire telegraphy, communications which are intended to be private are sent in code, and the same is done in wireless telegraphy.

It is always interesting to "listen in" at a wireless station, and the reader may now imagine himself sitting beside the wireless operator, in a station in the vicinity of New York City. By means of switches and sliding contacts, he throws his receiver onto a ship's wave length. Presently he hears a buzz, and from far off at sea comes the report, carried by these invisible waves, as follows: "8 P M UVR 1680 SO HOOK," which, being translated, means that at 8 p. m. the steamship *Vasari* is 1,680 miles south of Sandy Hook." The operator immediately O. K.'s this report, entering it on his log. Another buzz starts: A ship many miles off the coast of Florida calls the operator, saying he has several messages, which he then dispatches to a land station, in the order in which they were filed. Such communication is kept up constantly, and, by manipulation of the tuner, the operator may keep in communication with all points within a radius of 1,600 miles.

Information as to the whereabouts of their ships is extremely valuable to steamship owners; not only in times of distress, but for everyday use, and, especially when the ship is nearing port, as then matters at the dock can be so arranged that both the incoming and outgoing freight can be handled with dispatch. A complete record of the movements of all ships is kept on file and can be referred to at any time.

Another feature of every wireless telegraph station aboard ship must not be overlooked—the wireless newspaper. At specified hours of the day, and especially at night, when the air is not so busy with commercial messages, certain wireless telegraph stations are designated to send out "press," consisting of general news, stock quotations, market reports, baseball, etc. This matter is copied simultaneously by all ships within the radius of a given station. It is quite common for ships to copy this matter at a distance of 1,600 to 1,800 miles at sea. Thus the passengers are kept well informed of events on shore.

Only the essential features of wireless telegraphy have been, so far, taken into account, and its value, as a means of communication in isolated places, such as the tropics, and islands of the sea, has not even been mentioned.

In line with the advent of wireless telegraphy, it is fitting that we should have the wireless telephone. While this instrument has not attained a high degree of perfection, in fact, is still in the experimental stage, some very promising results have been attained. A ship operator on nearing New York harbor is often entertained with strains of Beethoven, followed by a selection from grand opera, or, perhaps, one of the popular airs. There are several experimental wireless telephone stations in New York City, and, in order to carry on tests at these stations it is necessary to have some one talk in the transmitter almost constantly. It is far easier to connect the reproducer of a phonograph to the transmitter of the wireless telephone with a rubber hose, and it is surprising how distinctly this music, or speech, is received. It is unaccompanied by any of the disagreeable rasping so often heard in the ordinary phonograph. It does not interfere with the regular business being carried on between the wireless telegraph stations. The wireless telephone employs what are known as undamped oscillations, created by the electric arc, and it is very easy to "tune out" such electrical vibrations. Such a station is at present located at Kingston, Jamaica, and the operator at that point frequently entertains those of his own brotherhood aboard ship by playing "God Save the King," "Yankee Doodle," and the like, depending upon the nationality of the man who is being entertained.

Rapid Press Work.—In our issue dated September 16, we published a reference to some rapid sending on the southern circuit of the Associated Press on August 19 and 20. This circuit was 1,800 miles long, and ran between Washington, D. C., and Tampa, Fla., with thirteen operators copying at different points along the line. It is thought that this performance is the world's record for so long a circuit. The sending operators at the Washington office were John A. Esslinger and E. T. Wolford. Both of these gentlemen are rapid handsenders, but have adopted sending machines. Mr. Esslinger, on this particular occasion, used a transmitter of his own construction, and the receiving operators declared that the sending on this machine was perfect.

Common Battery Equipment for Fire-Alarm Offices.*

BY GEORGE M'D. JOHNS, SUPERINTENDENT FIRE AND POLICE TELEGRAPH, ST. LOUIS, MO.

The new St. Louis fire-alarm office equipment has been in operation since November 14, 1912. The office is manually operated, and the new switchboards, while entirely different in design and wiring from the old, have made no change whatever in the methods of handling alarms.

We have forty-four signal-box lines, seven joker-alarm lines, and thirteen bell-striker lines. Our signal circuits are staggered throughout the city, so that near boxes are on different circuits. This is so well carried out that we average about thirty-five boxes to the circuit, all boxes being the simple type, without non-interfering or successive features.

The joker lines are arranged to strike both telegraph signals and alarms, make-and-break relays and keys being placed both at the office and engine-house end, and the engine-house is, furthermore, equipped with a polar relay which operates a tape register through a local circuit. For operating the polar relays the joker-line current is reversed in the office by a pole-changer, operated from one of the well-known four-dial Gamewell transmitters.

The first idea which entered the writer's mind upon taking charge of the office in July, 1911, was that of placing the entire service upon one source of power. To do this with the type of switchboard then in use would not have been possible. After a series of experiments covering several months, I found that the difficulties to be overcome were the following: Troubles due to short-circuiting of the batteries when two or more lines became grounded at once; the failure to receive and answer back signals to the fire department from signal-boxes under grounded conditions; danger of shorting the batteries when working around the switchboard connections with metal tools; and, lastly, the danger from lightning due to slight ground leakage on all lines and the grounded system resulting therefrom. This latter consideration I ignored, because of the fact that all telephone systems operate without difficulty from this source of trouble, and, as is well known, they operate their lines from a common battery. Ground troubles are eliminated in the new switchboards by the placing of two relays in each circuit, one on each side of the line. When two or more lines become grounded, the relays offer sufficient resistance, 150 ohms each, on each side of each line, so that the current divides in the lines depending in quantity on the distance of the grounds from the office. Under such grounded conditions, signals sent into the office from boxes located to the right side of the ground are received on the right relay, and signals sent in from boxes located to the left side of the ground operate the left relay.

Now, in order to answer back from office to signal box, it is necessary to break the circuit in the office on the same side of the ground as that from which it is received; or, in other words, the transmitter and receiver must manipulate the line upon the same side of the ground. This may be done in two ways; first, by using a double-pole key, thus breaking both sides of the line at once, and second, the manner in which I chose, as follows: A double-pole, double-throw switch is placed in each circuit, which reverses the polarity of the line, and, at the same time, cuts the telegraph key on the office switchboard into the left side of the line instead of the right side, where it normally is. Thus the operator in the office may, by throwing this switch, break either the right or left side of the line.

Each circuit is provided with a milliammeter and each of the line relays lights up one-half of a bull's-eye on the switchboard, this being accomplished as follows: A shield is placed in the middle of a four-inch red bull's-eye, an incandescent lamp on each side of the shield, thus each relay is made to light up its corresponding half, the normal operation of both relays lighting up the entire bull's eye. These lamps are inserted directly in the local circuit, and also act as a resistance to protect the circuit; current for the local circuit is taken from the common battery, passes through the relay contacts, through the lamps, and then through a large-size sounder for making the alarm audible.

The negative side of the common battery is grounded through a small switch, whereupon the grounding of any line drops the relay on the negative side of that line, lighting the left half of the bull's-eye, and attracting immediate attention.

It is obvious that by reversing the polarity of the lines by means of the double-pole, double-throw switches mentioned, grounds showing on the positive side of lines may be made to show on the negative side. By this means the grounds on a number of lines may be all put on one side of the battery circuit, thus balancing the lines one to another. The result is shown on the milliammeters by the return of the needles to normal position, such position being designated by an indicator hand on the instrument.

The City Hall has its own power plant, and, in addition, has an outside power connection which is used when the local plant shuts down. For supplying our new switchboards with power we use a 2-kw., 60-volt generator, driven by a three horsepower, 110-volt motor. Across the 60-volt leads we float two 60-volt, 200-ampere-hour storage-battery sets: these are, of course, always fully charged, and will each run the office for twenty hours, or a total of forty hours should the motor-generator fail. The charging board is so arranged that these batteries may be charged individually from the 110-volt power circuit. As a side feature, I may mention that when the City Hall plant shuts down we are without light, therefore a switch has been provided by which the operating-room lights are thrown on to our storage battery, so that we are independent as regards power features for a considerable number of hours.

In the storage-battery equipment are also two telephone-battery sets and two bell-striker sets.

The cables enter the room at the left rear cor-

* Extracts from a paper read before the Eighteenth Annual Convention of the International Association of Municipal Electricians at Watertown, N. Y., August 19 to 22

ner and come down the wall, terminating in a cross-connecting rack. From this rack the cables enter the floor and rise behind a terminal board. This terminal board is of slate panels, corresponding with the main switchboards. Each panel represents a division of the office—signals on one panel, the jokers on another, etc. Each line is terminated on this board with a single-pole knife-switch on each side of the line and through carbon and heat-coil protectors. On this board and throughout the room all wiring is insulated with flame-proof braid. From the terminal board the cables again enter the floor, and passing around behind the signal board, are brought up behind their respective panels.

The power for the boards is fed through two bus-wires which lead around the entire switchboards from the power board on the left to the panels to the right. Each circuit, local and signal, is tapped to these buses and every positive tap is made through a porcelain resistance unit limiting the current to its circuit.

The cost of the entire equipment was as follows:

Switchboards	$2,736.59	
Terminal Board	417.00	
140 Telegraph Relay Keys	404.60	
Cable	569.61	
Nickel-plating	182.50	
Total for Operating-room		$4,310.30
Two Common Battery Telephone Switchboards	$1,261.11	
Storage Battery and Equipment	1,537.50	
		2,798.61
Grand Total		$7,108.91

It was considered necessary to have some system by which all alarms are automatically registered on a tape as they are received. The writer conceived the idea of using one four-pen register, and of introducing a selector between the forty-four signal circuits and this register so that each of the three circuits in possible operation at the same time would automatically take possession of the three pens on the register and record the alarm, the fourth pen registering the alarm as it is struck in the fire department on the joker lines.

The writer designed and built such an apparatus which is now in operation. This selector cost in the neighborhood of $200.

The Allowable Potential of Overhead Wires in City Streets.*

BY CLAYTON W. PIKE, CHIEF OF ELECTRICAL BUREAU, PHILADELPHIA, PA.

The prevailing tendency is toward voltages ever higher and higher. Not long since we looked askance at 2,200 volts in our streets; then came 5,000, 6,600, 10,000, and now the Public Service Corporations want 13,000. Indeed, there are some cities where they have voltages even greater carried overhead.

Probably most of us have a feeling, more or less pronounced, against such conditions; but many of us are now, and sooner or later all of us will be, face to face with the question of whether or not we shall attempt to place any restriction upon the corporations as to pressure; and, if so, what is the limit we are willing to approve.

The question is, "Are the disadvantages of high voltages sufficiently great to warrant a city in restricting some of its citizens in the development and profit of their business?"

The principal disadvantages are: 1. Disturbances produced in other circuits, generally telephonic or telegraphic circuits; 2. Increased danger to the public; 3. Any additional encroachment upon the streets. Disturbances are due to either—(a) Electromagnetic effects; (b) Electrotatic effects; (c) Coronal discharge; (d) Leakage.

The third of these effects—coronal discharge—does not appear below 50,000 volts, and there is no valid reason for using such a voltage in our streets.

Commercial light and power transmissions use a current which varies from zero to a maximum, then back to zero, then to a maximum in the other direction, and then back to zero again, the number of such cycles varying from 25 to 125 per second. Most lighting circuits now operate with a frequency of 60 cycles per second. Long-distance transmissions and those used for power exclusively are generally operated at 25 cycles, as the disturbing effects of capacity and self-induction become less as the frequency is lessened.

A power circuit disturbs a telephone circuit because it sets up lines of magnetic force, which spring out in increasing circles and cut the disturbed circuit. When the current reverses the lines collapse and again cut the telephone circuit. The more rapid the cutting, the greater the disturbance. Hence, the stronger the current in the power circuit, the greater the disturbance.

Since the electromagnetic disturbance is proportional to the current in the disturbing circuit, it is evident that any restrictions upon the maximum voltage will increase the disturbing effect, for the lower the voltage, the stronger must be the current to transmit a certain amount of power. Electromagnetic disturbances can be largely obviated by transposition if the circuit is all metallic.

The conductor of a power circuit forms one plate of a condenser. The other plate of the condenser is the disturbed wire. The dielectric of the condenser consists of the air and the insulations of the wires. The power wire also forms a condenser, with the earth as the other plate, as does the disturbed wire, but this effect may be neglected at ordinary heights of suspension, when the wires are several feet apart.

This condenser takes a charging current which is proportional to its capacity and to the voltage. The capacity is proportional to the length of disturbed wire parallel to the disturbing wire, *i. e.*, to the exposure. It is inversely proportional to the distance between the wires; therefore, the charging current increases proportionately to the voltage of

* Extracts from a paper read before the Eighteenth Annual Convention of the International Association of Municipal Electricians, at Watertown, N. Y., August 19 to 22.

the disturbing wire and to the "exposure," but diminishes as the wires are placed farther apart. It is this charging current and its equivalent discharging current which flows when current is reversed in this disturbing power circuit, which causes a large amount of the trouble on telephone lines. Of course, the telephone companies transpose their lines, or use twisted pairs, but it is practically impossible to entirely obviate the electrostatic disturbance by this means, as experiment shows that the two wires of a telephone circuit do not have the same capacity to earth, even though they be twisted pairs in a lead cable.

No lines are perfectly insulated; hence, there is always a current which leaks off from the disturbing power circuit, and uses a part of a neighboring telephone or signal circuit for its path. If the insulation of the power circuit or that of the telephone circuit is high, the leakage current will be infinitesimal and the disturbance negligible. This is the proper state of affairs for high-class lines under normal working conditions.

But let an insulator break, or a tree branch come in contact, or a storm break a wire, and note how the telephones will buzz, although part of this buzzing is undoubtedly due to electrostatic disturbances. These leakage disturbances are especially troublesome upon the telephone circuits of police patrol systems, which cannot, from their nature, be maintained at such high insulation as a telephone circuit, running, as they do, into iron boxes on poles which are opened one or more times per hour in all kinds of weather.

Therefore, so far as the question of disturbances is concerned, high voltages increase two, viz.: electrostatic and leakage; and diminish one—the electromagnetic. The first two are not only greater, in telephone circuits at least, but cannot be overcome by simple transposition, so that the use of higher voltages on overhead lines works an injury to telephone companies, and eventually the public pays for it.

From this standpoint it does not seem any more of a hardship upon the power companies to restrict their voltages than it would be upon the telephone and telegraph companies if we allow the higher disturbing voltages; nor is it any worse to make a few power consumers keep on paying their present prices for power than it would be to cause poorer telephone service or increased rates for it.

In some cities telephone circuits are, to a large extent, underground, and the amount of overhead wires "exposed" to disturbances is not very large. Hence, the effect of the disturbance is not of much account. Another factor which contributes to this result is, that the telephone companies have designed their protective devices against a voltage of not over 5,000, and when any higher voltage is used, they do not place their wires on the same poles, nor on the same side of the street, and the increased separation of the disturbed from the disturbing wire cuts down the effect.

The city's own wires, fire alarm, police patrol, or telephone wires, may not be underground. The ordinances of the lighting or power company frequently require giving the use of its poles to the city free. The introduction of a higher voltage—say the jump from 6,000 to 13,000 volts—brings greatly increased disturbance, so much as to practically prevent the city from using this line of poles for attaching its wires.

In New York City, the department regulations prohibit the use of more than 10,000 volts on overhead wires, and, indeed, the use of overhead wires of any voltage is considered only temporary, and they are to be taken down upon order of the department.

In Boston (in fact, in the entire State of Massachusetts), wires carrying more than 5,000 volts alternating, or 10,000 volts direct current, must be placed underground.

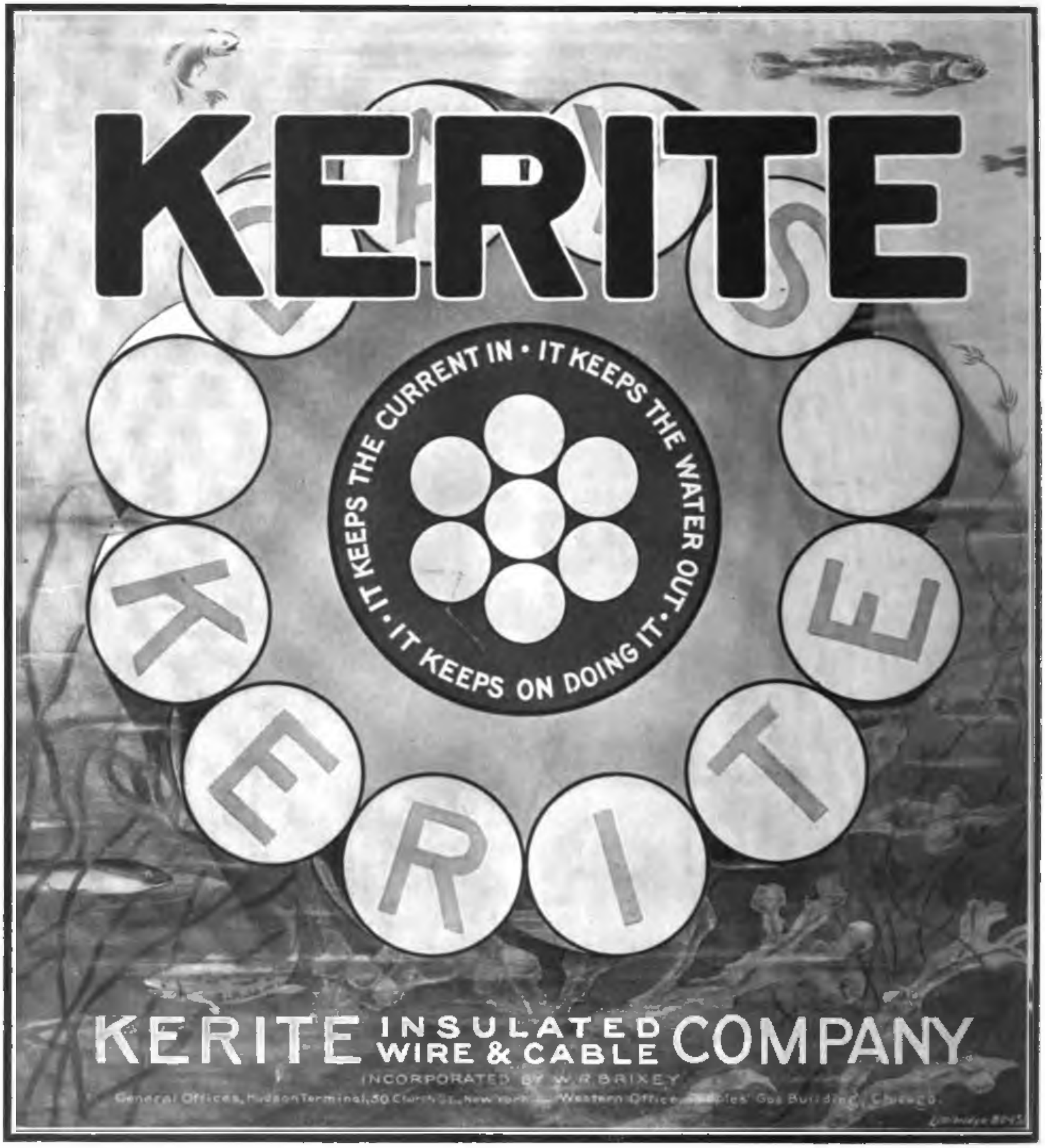
There are a large number of circuits in existence in cities, carrying 6,600 volts alternating, which have been in use for several years; industries have been built up, dependent upon such a supply. To establish a limit less than this amount would be an exceedingly difficult matter, causing tremendous losses, not only to the power companies, but to their consumers. As the telephone and other companies have equipped themselves for protection for 5,000 volts with a factor of safety, and as the statistics will not show that there is any inordinate loss of life from these voltages, I consider that it is much better to permit the use of 6,000 volts alternating to continue, using our energies to improve the construction methods and in better inspection. But I do not feel that we are warranted in permitting any higher alternating voltages overhead. If the companies want to use them, let them place the conductors underground.

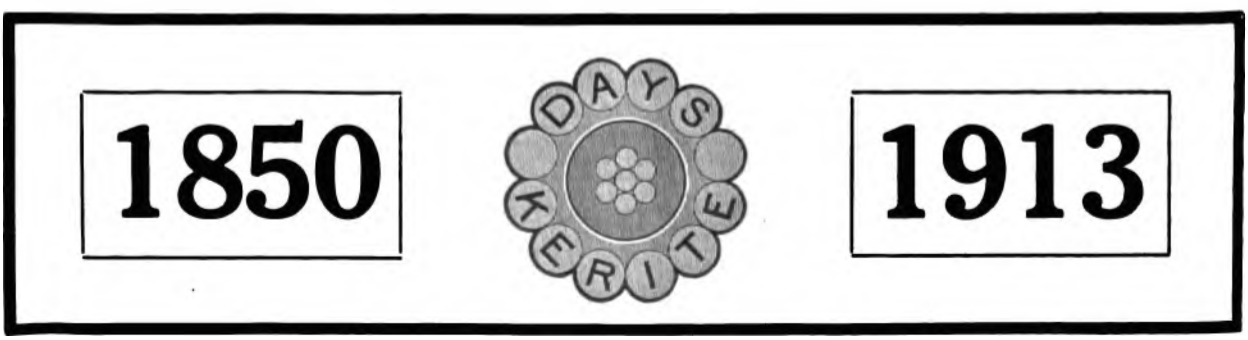
Copper-Wire Fusing Currents.

It sometimes happens that regular alloy fuse wire cannot be obtained quickly when circuits have blown their protective links. Copper wire of the proper gauge may be used temporarily to restore service. The following table, taken from the *Electrical World*, has been tested for copper-wire fusing currents, and the figures have been found to be closely correct for average conditions:

Size Wire, B. & S.	Fusing Current, Amp.	Size Wire, B. & S.	Fusing Current, Amp.
30	10	18	80
28	15	17	100
26	20	16	120
25	25	15	140
24	30	14	160
22	40	13	200
21	50	12	240
20	60	11	280
19	70	10	330

Mr. N. E. Smith, superintendent of telegraph of the New York, New Haven and Hartford Railroad Company, New Haven, Conn., writes: "Herewith my check covering my subscription for Telegraph and Telephone Age for the coming year. You may add me to your list of subscribers who desire that you continue their subscriptions until further notice. I consider your paper too valuable to be dispensed with even for one issue."


KERITE
IT KEEPS THE CURRENT IN · IT KEEPS THE WATER OUT · IT KEEPS ON DOING IT ·
KERITE
KERITE INSULATED WIRE & CABLE COMPANY
INCORPORATED BY W. R. BRIXEY


1850
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THE RAILROAD.

Mr. Charles Selden, superintendent of telegraph of the Baltimore and Ohio Railroad, on September 16 read a paper on "The Use of Telegraph Wires," at the staff meeting of all the officers of the operating, engineering and transportation departments of the Baltimore and Ohio Railroad System.

Pictures of Railroad Telegraph Superintendents.—*The Railroad and Current Mechanics* for October contains an interesting article entitled "The Men Who Manage Railroad Telegraphy," written by Mr. Thaddeus S. Dayton. The article contains the portraits of fifteen railroad telegraph superintendents.

Association of Railway Telegraph Superintendents.

The Topics Committee of the Association of Railway Telegraph Superintendents, of which committee Mr. M. H. Clapp, of the Northern Pacific Railway Company, St. Paul, Minn., is chairman, has issued a circular letter to the members of the association, inviting suggestions as to the subjects and authors of papers to be presented at the annual meeting in New Orleans, La., May 19, 1914.

The committee believes that a portion of the papers to be presented should be written by men having railroad experience and the remainder by special men in the commercial telephone and telegraph fields upon subjects in which the railway telegraph superintendents are vitally interested. A variety of both the practical and theoretical is desired. The committee desires suggestions as to subjects and authors not later than November 1. The committee has prepared a list of the papers read at the last five annual meetings of the association, together with the names of their authors.

The Committee on Topics consists of Messrs. M. H. Clapp, chairman; G. O. Perkins, E. P. Griffith, J. M. Walker, E. A. Chenery, V. T. Kissinger, W. J. Camp.

Printed copies of the specifications for crossings of wires or cables of telegraph, telephone signal and other circuits over railroad rights of way, tracks or wires, are being distributed to the members, which specifications were adopted at the St. Louis convention last May.

Testing Wires.

BY J. P. CHURCH, SUPERINTENDENT OF TELEGRAPH, WABASH RAILROAD, DECATUR, ILL.

I am glad to note that an article in Telegraph and Telephone Age states that a standard method for testing open wires has been evolved.

When I was wire chief for the Western Union Telegraph Company, at Toledo, Ohio, from about 1877 to 1893, I could locate crosses and grounds, and even swings, by means of the Varley loop and Wheatstone Bridge, and was able to save considerable money on maintenance expense in connection with the old Atlantic and Pacific lines, which ran along the highways and had to be reached by horse and buggy. I remember that our tests often came within two or three poles of the trouble.

The only way we had then of testing an open wire was by its static capacity, and we could, generally, estimate the approximate distance of the trouble from the office by the amount of current it took to charge the wire. The first test we always made was to ascertain, by charging the wire, whether the open was close to the office or distant. This enabled us to get after the near or distant test office, as necessary, and saved a little time in making the test.

In thinking of the old times, I recall one of my standard battery tests which has caused some amusement and doubt among the modern wire chiefs when I have had occasion to put it into practice in recent years.

I always tested my batteries by the sense of feeling, and after long practice, was able to locate the nature of the trouble in my own or distant quadruplex batteries by the sense of touch. I have often located broken cells in either end of the quadruplex battery, and do not remember that I ever failed to make a correct test of this kind. I remember on one occasion one of the Chicago wire chiefs was rather incredulous when I located a loose connection in his tap-wire after considerable delay in getting the quadruplex started.

New York Telegraphers' Aid Society.

The statement of the New York Telegraphers' Aid Society, for the quarter ended September 6, is as follows:

Balance on hand, June 6		$26,448.84
Receipts		1,392.00
Total		$27,840.84
Disbursements.		
Death Benefits	$ 600.00	
Sick Benefits	1,311.38	
Expenses	179.75	
		2,091.13
Balance on hand, September 6		25,749.71
Total		$27,840.84
Relief Fund.		
Balance on hand, June 6		$ 6,346.42
Receipts		170.30
Total		$ 6,516.72
Disbursements		287.00
Balance on hand, September 6		6,229.72
Total		$ 6,516.72

T. & T. L. I. A. Assessments.—Assessment No. 538 has been levied by the Telegraph and Telephone Life Insurance Association, to meet the claims arising from the deaths of T. E. Chatham, at San Benito, Tex.; J. E. Cantor, at Wabash, Ind.; M. Breslin, at New York; W. H. Thompson, at Harbor Grace, N. F.; D. S. Sullivan, at New York.

Hens as Operators.—A Michigan operator, it is stated, is teaching a couple of his hens the Morse alphabet, and they can cackle dots and dashes, as well as any operator can send them on a key.

Transpositions in Telephone Train-Dispatching Circuits.*

BY JOHN A. KICK.

Telephone transposition systems are constructed from studies of the subject on a basis of a full telephone service. There are several existing standards which are effective when the wire lead is exclusively telephone, but are not fully effective when high-potential telegraph and printer circuits are carried on the same lead. Neither are they proof against inductive troubles from parallelling high-tension circuits.

Standard transposition systems have been devised for a combination telephone and telegraph line, but, owing to the irregularities in assignment of pin positions on such lines, and the variable number of each class of circuit, these systems frequently require further modification. A telephone circuit transposed in accordance with these systems and parallelling one or more telegraph circuits on the same line, will be free from induction from the telegraph, provided there are no irregular conditions or other source of disturbing influence.

Induction from a telegraph circuit is usually an indication of an irregular telephone circuit condition, as the relatively low potential and low frequency of the telegraph circuit is not productive of trouble, either on the open wire line or in twisted pair cable.

Twisted pair cable is always necessary where telegraph and telephone circuits are to be included, as the two classes of circuits through a telegraph straight cable will produce a noisy telephone circuit. The noise may be slight and considered negligible during the time the telephone circuit is clear and perfectly balanced, but may become so severe as to interrupt the service when the telephone circuit becomes "leaked" or otherwise unbalanced.

Transposition systems are not so designed that high-tension induction is overcome in every case, and it then becomes necessary to give special treatment to particular cases. One of the most effective treatments of inductive troubles from the three-phase high-tension line is a transposition scheme applied to the power line, which, at one stroke, is effective to the entire telegraph and telephone lead.

The ablest telephone engineers have worked for years on the general subject of transpositions, including the complex condition produced by maximum phantom facilities to be derived. It is rather ill advised to entirely ignore the results of this extended research, as other than a systematic method of transposing eventually leads to a general rearrangement being necessary.

To follow the general standard scheme, with modifications, by adding multiples of the general system where necessary, places every circuit in condition to eventually be continuous in two given pin positions and transposed correctly. As it stands to-day, wires on railroad leads are rarely continuous in a given pin position from terminal to terminal. The latter construction and reconstruction is provided for, finally arriving at a more desirable condition. To hasten and simplify the transformation, every new telephone circuit should be transposed in accordance with the pin position it occupies, so that when the time for cut-over arrives, the several disjointed sections will fit into place.

When high-tension interference is encountered, retransposing should not be resorted to until an investigation is made of the offending circuit. Some of the smaller power plants at times continue to operate for extended periods with their transmission lines in poor physical condition and out of balance, causing severe disturbances on neighboring telephone and telegraph circuits.

Transposing a telephone circuit to overcome disturbances due to irregular conditions on adjacent power transmission lines is a severe task, but, when the power lines are regular, the remedy is easily applied. In so doing, the standard transposition positions should be maintained, if possible, and the necessary additions made multiples thereof.

Transposing against disturbances from power lines which parallel the telephone line for one or two miles should not be limited to that section, but should be extended beyond the high-tension zone in both directions. The greater the number of other wires on the telephone lead, the longer the extension should be. To overcome a two-mile exposure, it may be found necessary to quadruple the transpositions in a four-mile section and, in addition, at least double the number in a two-mile, or longer, section at each end of the four-mile section.

Almost every exposure is a study in itself and requires special treatment, as the characteristics of the disturbing circuits are rarely similar, owing to the presence of feeder wires and other circuits.

In constucting a dispatching or message circuit, the first circuit should be assigned to pin positions, which will be adjacent to pin positions for a like circuit to be paired and transposed for a phantom. When the standard transposition scheme is followed on the first and second physical circuit, the phantom transpositions will be easily assigned.

* Telephony.

Seasoning Timber by Electricity.

A process of seasoning timber by electricity has been invented by a European scientist, Dr. Nodon. He claims that his process can be applied in the forest where the trees are felled, says the London *Electrical Review*. The process depends on the electrolysis of cellulose and its derivatives. The newly felled trees are sawn into thick planks and laid on a false flooring, one on top of the other, with the interposition, however, of moistened matting, or similar material, between each layer, to act as electrodes for the introduction of alternating current, which is passed for ten hours or more. The effect of the current is to produce chemical changes in the cellulose and the sap, rendering them impervious to decay. Further, the sap loses those gummy and hygroscopic characteristics which normally prevent rapid drying. It is claimed that timber thus treated is ready for use a few weeks after it is felled, and is harder, stronger, more homogeneous, easier to work and less warped by moisture than timber which has been seasoned by the ordinary air-drying process.

PHILLIPS CODE.

The popularity of Phillips' Code, by Walter P. Phillips, was never more apparent than at the present time. Its acceptance by the telegraphic fraternity, as a standard work of the kind, dates from its first publication, and the constantly increasing demand for this unique and thoroughly tested method of shorthand arranged for telegraphic purposes has necessitated from time to time the issuance of several editions. The present edition was carefully gone over, a few revisions made, and a number of contractions added, until now this "staunch friend of the telegrapher" is strictly up-to-date in every particular. It has been declared that an essential qualification of a "first-class operator" is a thorough understanding of Phillips' Code.

The use of this system promotes rapid transmission, and for press reports especially was long since declared to be the best ever devised. By common consent it is recognized as standard, and everywhere is regarded in the profession as indispensable in contributing to the operator's fund of practical knowledge. In fact, not to understand Phillips' Code acts as a distinct embarrassment to the operator.

The price of the book is $1 per copy. Address J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

MUNICIPAL ELECTRICIANS.

J. Elliot Smith, aged seventy-nine years, superintendent of the fire-alarm telegraph system in New York from 1873 to 1895, died in Portland, Me., on September 12. During the Civil War Mr. Smith was made superintendent of telegraphs of the Department of the Gulf when the Federal Army occupied New Orleans.

New Fire-Alarm System for Cambridge.—Messrs. Ralph Sweetland and George L. Fickett have been appointed by Mayor Barry, of Cambridge, Mass., to consider the advisability of establishing a new fire-alarm system for the city.

Fire Alarm in Augusta.—Mr. Warren C. Davenport, city electrician and superintendent of the fire and police telegraph system, is installing a new fire-alarm system in Augusta, Ga., and expects to have it in operation by December 1.

The D'Arsonval Galvanometer.

The underlying principle in all galvanometers, with the exception of the D'Arsonval type, is the comparison of the value of the magnetic field produced by a current in the coils of the instrument with that due to the earth. In the D'Arsonval galvanometer the interaction is between the magnetic field of the coil and that of a strong, permanent magnet. This type of galvanometer consists essentially of a coil of insulated copper wire, wound upon a light copper frame, with a mirror attached, suspended in an intense magnetic field by means of two thin conductors. The current is conducted through the coil by these fine suspension wires, which also serve to hold the coil in position. The direction of the magnetic field generated by the current is at right angles to the plane of the coil, and the tendency is, therefore, for the coil to turn into such a position that its lines of force are in the same direction as the permanent magnetic field. This tendency is opposed by the torsion of the suspending wires, and the coil, therefore, takes up a position in which the tendency of the suspending wires to untwist is exactly equal and opposite to the tendency of the coil to still further deflect. It will, therefore, be obvious that the angle through which the coil turns is dependent upon the value of the current. The current may be assumed to be proportional to the deflection indicated upon an equally divided scale. Where great accuracy is necessary, it is advisable to calibrate the galvanometer, although it is possible to theoretically arrive at the approximate value of the necessary correction.

The intense magnetic field is produced by a large compound magnet of the horseshoe type, and, in order to avoid the reduction in its value, which would take place if only the coil intervened between its poles, a large piece of soft iron is introduced. This piece of soft iron is supported from the back of the instrument and just leaves space for the coil to swing between it and the magnet. The resistance of the magnetic circuit is, therefore, greatly reduced, and the number of lines of force (or the flux, as it is termed) is consequently greatly increased.

The light spring to which the lower suspension wire is attached serves to hold the coil in a central position, and is adjustable by means of the screw above it. The top screw is chiefly used for bringing the spot of light to zero by removing any torsion upon the suspension.

New Book.

"The Inspector and Troubleman" is the title of a book by S. R. Edwards and A. E. Dobbs, just published by Telephony Publishing Company, Chicago, Ill. The book is written in conversational style and contains much valuable and practical matter for those engaged in telephone work. It is intended, primarily, for practical men in small exchanges, and in a simple manner deals with many of the problems encountered in every-day work. In reading the book, one unconsciously acquires considerable valuable information relating to the theory of electricity, as applied to telephone operation. The scope of the work is wide and covers every situation likely to arise in the management and operation of a small exchange.

The book has seventy-nine illustrations and 196 pages, and the method employed of imparting the information makes interesting reading. Most people like to have facts presented to them in an entertaining manner and, in this instance, it is like reading a story, the facts are given in such a way that the reader little realizes that he is learning.

The price of this book is $1.00 per copy, and orders may be sent to Telegraph and Telephone Age, 253 Broadway, New York.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

E. C. Thackeray, formerly of this office, died in this city September 5. His remains were sent to Elkton, Md., for burial.

Elmer S. Blake, formerly of this office, and late of the Canadian Press Association, died suddenly in Brooklyn, September 6. His remains were buried in Flint, Mich., his former home.

PHILADELPHIA POSTAL.

Manager J. A. McNichol has returned to his desk after two weeks' vacation.

Among recent visitors at this office were Mr. M. M. Davis, electrical engineer and chief engineer of telephones, New York, and J. F. Munson, traffic chief, Pittsburgh, Pa.

ST. LOUIS WESTERN UNION.

The following changes have recently been made in the plant department: Mr. C. W. Groos, former wire chief, has accepted a similar position with the American Telephone and Telegraph Company. He is superseded by Mr. W. C. Rogge, wire chief of the Indianapolis, Ind., office.

Mr. C. W. Frey, formerly district wire chief, has been transferred to be assistant general wire chief at New York, and is succeeded by Mr. P. D. Herron, of Kansas City, Mo.

Mr. E. A. McKnight, formerly assistant wire chief, has been transferred to the Chicago office. He has been succeeded by N. T. Petty, transferred from duty as Associated Press rider, Mr. A. E. Van Tyne relieving Mr. Petty.

Mr. O. R. Carson, night wire chief, has been transferred to day duty as assistant wire chief, Mr. Geo. A. Littel, late-night wire chief, being advanced to the position of night wire chief.

Mr. G. W. Thompson, assistant night wire chief, has been appointed late-night wire chief.

During the two weeks' absence of Mr. C. L. Rayborn, assistant wire chief, his duties were looked after by Mr. Henry Crane, assistant quad. chief, Mr. O. M. Thomas, of the traffic department, filling Mr. Crane's position during that time.

PITTSBURGH DISTRICT WESTERN UNION.

Mr. J. P. Hogan has been appointed manager at Hornell, N. Y., succeeding Mr. D. D. Norton, resigned.

Mr. R. H. Christian has been promoted to be chief operator at Bluefield, W. Va.

Mr. P. L. Ward, has been promoted to be chief operator at Cumberland, Md.

Philadelphia Engineering Discussion Club.

The Engineering Discussion Club, composed of members of the 1912-1913 class of Drexel Institute Electrical School, Philadelphia, held its annual banquet and regular meeting for the installation of officers for 1913-1914, September 24. Covers were laid for twenty-five.

The following officers were installed: President, H. S. Ayres, of the Philadelphia Electric Company; vice-president, Harry W. Moser, of the Electrical Bureau; secretary-treasurer, F. P. McElroy, of the Postal Telegraph-Cable Company.

Papers were read by members upon the Walker railway generator, engineering in the Panama Canal and wireless telegraphy.

Telegraph and Telephone Age

No. 20 NEW YORK, OCTOBER 16, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Ground Wires in Central Offices.

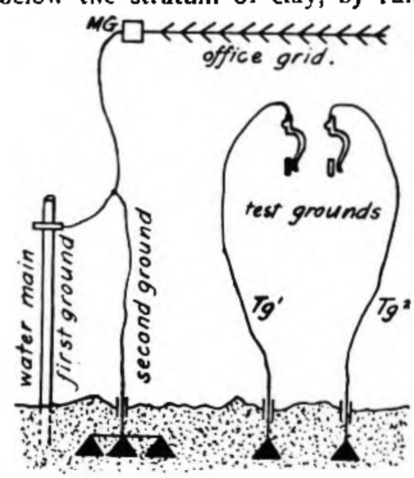
One of the many important things in a central telegraph office is the ground wire, yet, aside from the engineers, and the linemen who install ground wires, there are probably but few who realize how much consideration is given this subject.

Every telegraph man knows that a good ground wire must possess negligible resistance, but what most of them do not know is what a main ground really consists of, and the manner in which it is usually constructed. The resistance of a ground wire cannot be measured as readily as that of a line conductor, unless special arrangements are made therefor, hence the method employed for testing grounds, which will be explained later, is, in itself, an interesting item of information.

The principal requirement of a low-resistance ground terminal is soil that is permanently moist, and the ideal location of such soil is at the outlets and leaks of water mains. Hence, wherever available, the water main should invariably be used for the principal ground-wire connection. In addition to the moist soil, the great amount of superficial area of metal in contact with the earth insures exceptionally low resistance in itself, while every leak in the pipe adds additional moist soil to the surface of the metal. Then, for the reason that the joint resistance of two or more grounds is less than that of a single ground, and to guard against losing connection with the earth entirely, through accident, the best plan is to install one or more separate and distinct ground terminals, remote from the water main, and bond them with the latter, as shown in the accompanying illustration. The true resistance of the central ground will then be equal to the joint resistance of the separate ground connections, while, in the event of one set failing, the other will still remain in service.

The second ground is obtained by burying two or more metal cones or plates in the ground a few feet apart, and, after bonding them by means of a strong copper wire, as shown, the group is, in turn, connected by wire to the water main return lead. This combination constitutes the "main ground," which is connected with the switchboards, and all parts of the office, by means of taps from the office grid.

It frequently happens that the earth is too sandy, or contains too much clay, to offer a suitable ground connection. In such a case, if suitable soil can be found by boring deeper, the metal cones can be buried below the stratum of clay, by running the



ARRANGEMENT OF GROUND WIRES.

wire connections through suitable piping. The excavated clay should never be used to refill the hole, but the best soil available substituted therefor.

As the rules of the company require an inspection of the condition of the main ground at frequent intervals, the necessary means for making such tests may be provided as follows: The arrangement requires two additional ground wires, each entirely distinct from the main ground, and with no connection whatever with the latter or with each other, as shown at Tg^1 and Tg^2. For convenience, these grounds may be run to the lips of two separate spring jacks in the switchboard, and, when not in use, stand normally open. Grounds Tg^1 and Tg^2 may consist of a single cone each, buried at any convenient locality, but as far apart as possible. The metal framework of the building might suffice for one of the test grounds, were it not for the fact that the metal probably comes in contact with the water pipes at some points of most large buildings, and for that reason forms part of the main ground. As the measurement is usually made by the three-wire method, it is obviously better to obtain the additional ground circuits from separate sources.

METHOD OF MEASUREMENT.

The operation specified by the Western Union Telegraph Company for measuring ground wires is as follows:

"First measure M G and Tg^1 together by connecting the measuring leads to the posts 2_1 and 2_2 of the Western Union Standard Wheatstone bridge. Repeat the operation by reversing the leads and taking the average of the two measurements for the figure to be used in obtaining final results.

"Second. Measure M G and Tg^2 in the same manner. Also measure Tg^1 and Tg^2 together.

"Then add the three average results and divide their sum by 2. From the quotient subtract the third average measurement (that of Tg^1 and Tg^2 together), which will give the resistance of M G, or the main ground, including that of its leads.

Example.

Resistance of M G and Tg^1 = 4.70 ohms
" " M G and Tg^2 = 6.25 "
" " Tg^1 and Tg_2 = 10.80 "

Adding: 4.70 + 6.25 + 10.80 = 21.75 ohms;
Dividing 21.75 by 2 = 10.875 ohms;
Subtracting 10.80 (the resistance of Tg^1 and Tg^2) from 10.875 = .075 ohms,
which is the resistance of M G, including its leads."

Central office grounds should never be allowed to have more than .1 of an ohm resistance.

Telegraph and Telephone Patents.

ISSUED SEPTEMBER 23.

1,073,589. Telephone-exchange System. To S. H. Browne, Pittsburgh, Pa.

1,073,667. Telephone Transmitter. To H. C. Egerton, Passaic, N. J.

1,073,708. Receiver Holder for Telephones. To H. C. Raiber, Pittsburgh, Pa.

1,073,748. System for Dividing Calls Among Telephone Operators' Positions. To H. J. W. Fay, Westboro, Mass.

1,073,788. Telephone Outfit for the Deaf. To K. M. Turner, Jamaica, N. Y.

1,073,886. Telegraphy. To W. M. Bruce, Jr., Springfield, Ohio.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, October 10:

American Telephone and Telegraph Co.	122¼
Mackay Companies	79½
Mackay Companies, preferred	65
Western Union Telegraph Co.	60

PERSONAL.

Mr. C. O. Mailloux, president of the American Institute of Electrical Engineers, New York, has received from the president of France the decoration of Chevalier of the Legion of Honor.

Mr. Gano Dunn, a former telegrapher and past president of the American Institute of Electrical Engineers, and now president of the J. G. White Engineering Corporation, New York, has been elected a member of the Simplified Spelling Board.

Major J. Orton Kerbey, of Washington, D. C., a well-known old-timer, and formerly in the consular service in Brazil, recently sustained severe injuries to his hip and side by a fall at his home. He is now improving.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

Mr. Edward Reynolds, vice-president and general manager, is spending a few days resting at his home in New Rochelle, N. Y., after which he will spend his vacation driving through the Catskill Mountains and visiting a few of the up State members of the Greene County Society, a society of which he has been secretary for ten years.

Mr. E. B. Pillsbury has been appointed superintendent of the seventh district, Eastern Division, which includes the State of Connecticut and lines and offices in northern New Jersey, southern New York and northeastern Pennsylvania. The office of general superintendent, Eastern Division, was discontinued October 1. All district superintendents will hereafter report direct to the general manager. Mr. Pillsbury's headquarters will remain in New York.

Managers Appointed.—The following appointments of managers are reported: P. S. Durgin, at Newport, R. I., vice L. A. Boone; E. J. Huber, at Racine, Wis.; H. F. Wheeler, at Kenosha, Wis.; H. J. Harnett, at Houghton, Mich.; John Weber, at Joilet, Ill.; H. L. Reynolds, at Salem, Ohio; R. P. Seyfer, at Muskogee, Okla.; H. Dodge, at Brattleboro, Vt.; T. M. Pepper, at Danvers, Mass.; E. J. Anctil, at Greenfield, Mass.; A. A. Lambert, at Lawrence, Mass.; Miss Theresa Fehrman, at Janesville, Wis.; Miss H. S. Dunlop, at Rochester, Minn.

Transfer of Alaska Telegraph System.—It is reported that the Washington-Alaska military cable and telegraph system will be transferred to the Post-office Department. The system has hitherto been controlled by the War Department, and comprises 2,500 miles of submarine cable, 1,200 miles of land lines and five wireless stations, covering 2,000 miles along the Yukon and its tributaries.

Corporation Taxation in Virginia.—In addition to the usual property tax in Virginia, telegraph companies pay a license tax of $2.00 per mile on poles and conduits, and a franchise tax of 2 per cent on their intrastate gross earnings.

Western Union Telegraph Company.
EXECUTIVE OFFICES.

Mr. M. C. Rorty, manager joint telephone arrangements, New York, recently spent a week in Atlanta, Ga., on company business.

Mr. F. E. Clary, former district superintendent at New Haven, Conn., but now engaged in other business in Los Angeles, Cal., was a recent New York visitor.

Mr. A. C. Cronkhite, district commercial superintendent, Indianapolis, Ind., announces the following changes in his district: Mr. C. W. Mason, manager at Terre Haute, Ind., has been appointed manager of the Evansville, Ind., office, vice Mr. A. A. Burr, transferred to Detroit, Mich., as assistant manager. Mr. Mason is succeeded at Terre Haute by Mr. F. B. Bradley, manager at Muncie, Ind. Mr. J. E. Riley, formerly manager at Bloomington, Ind., succeeds Mr. Bradley as manager at Muncie, and Mr. J. H. Jarvis, manager at Greenville, Ohio, has been transferred to the corresponding position at Bloomington. Mr. Jarvis is succeeded at Greenville by Mr. L. H. Garber.

Mr. S. M. English, president and general manager of the Postal Telegraph-Cable Company, of Texas, was a recent New York visitor on company business.

THE CABLE.

Mr. G. G. Ward, vice-president and general manager Commercial Cable Company, New York, arrived from Europe on the steamer "Adriatic," October 3.

Mr. Duncan H. Cameron, of the Western Union Cable station at North Sydney, C. B., is the inventor of an automatic telegraph and cable relay.

New Cable Wharf and Warehouse.—The Western Union Telegraph Company has under consideration a new cable wharf and warehouse at Halifax, N. S., where its ocean cable repair ship, "Minia," is stationed. The building will be a two-story concrete structure, 98 feet by 138 feet in dimensions, and contain concrete tanks for storage of cables.

Liability for Errors in Cipher Messages.—Justice Seabury, in the Appellate Division of the Supreme Court, New York, on September 30, rendered a decision to the effect that telegraph companies are not liable to heavy damages for errors in transmitting messages written in cipher. He holds that where "a telegraph company receives a cipher message, or one otherwise unintelligible, the nature and purpose of which is known only to the sender and addressee, it is liable only for nominal damages in the event of negligence." The case was that of Bertuch *vs.* the United States and Haiti Telegraph and Cable Company.

Mr. Frank J. Sherry, auditor of the French Telegraph-Cable Company, New York, and Mrs. Sherry, celebrated the twenty-fifth anniversary of their marriage at their home in Brooklyn on September 27, a large number of friends and of business associates of Mr. Sherry being in attendance. Mr. and Mrs. Sherry were presented with many valuable presents in silver by their friends, including Mr. E. C. Sweeney, manager of the company at New York; the staff of the New York office, Mr. George Clapperton, traffic manager of the Commercial Cable Company, New York; Mr. E. Reynolds, vice-president and general manager of the Postal Telegraph-Cable Company, New York; Mr. F. J. Kernan, auditor of the Postal Telegraph-Cable Company, New York; Mr. Fred Payne, manager of the Postal offices in Brooklyn; Mr. R. Montgomery, of the Western Union Telegraph Company, and several others.

James P. Gerrity, Jr., age 38 years, an operator in the cable office at 16 Broad street, New York, died in Jersey City, N. J., Sunday, September 28.

THE TELEPHONE.

Telephone Notes Sold.—An issue of $10,000,000 six months notes, representing financing of several subsidiaries of the American Telephone and Telegraph Company, has been sold on a 5½ per cent. basis. The notes were indorsed by the parent company.

Telephone Mortgage.—The Pacific Telephone and Telegraph Company has awarded $3,000,000 five per cent mortgage and collateral trust bonds to a Boston banking house. The bonds are issued to take up the same amount of Sunset Telephone and Telegraph bonds.

Novel Use for a Telephone.—The steeple of the Calvary Baptist Church, at Washington, D. C., was weakened during a recent storm, and it was decided to replace it with a new structure. A telephone line was run 180 feet, straight up the steeple, to facilitate the work of removing the old material.

Public Telephone Booths in Vienna.—Public telephone booths are found in every part of Vienna, Austria. These stations are placed along the routes of the heaviest traffic, such as near railroad stations, transfer corners and entrances to subway stations. A call costs about four cents.

Increase of Capital.—A special meeting of the stockholders of the Central District Telegraph Company will be held at Pittsburgh, Pa., November 25, for the purpose of voting on a proposed increase in the capital stock from $15,000,000 to $25,000,000, and the creation of an indebtedness of $25,000,000.

The Telephone in the Straits Settlements.—The Colonial government of the Straits Settlements owns the telephone system in Penang and Malacca, where 495 and 57 telephones, respectively, were in operation at the close of 1912. The profit of the business was $10,834. The sum of $27,250 is to be expended in making the circuits metallic.

Eagle Crosses Telephone Wires.—An eagle recently deranged the wires of the Interstate Telephone Company, between Spokane and Cœur d'Alene, Wash. The bird, which was found at the top of a pole by the trouble hunters, had been caught in a steel trap, to which about ten feet of chain dangled. The loose chain crossed the wires.

Annual Report of the Western Union Telegraph Company.

The report of the Western Union Telegraph Company for the year ending June 30 was submitted by President Theo. N. Vail at the stockholders' meeting on October 8. It shows the following results:

INCOME ACCOUNT.

Gross Telegraph and Cable Earnings			$45,321,451.36
Miscellaneous Earnings			1,064,541.90
Total Earnings			$46,385,993.26
Deduct:			
Operating Expenses, including rent of Leased Lines, Reconstruction, Repairs, Miscellaneous Interest, etc.		$41,939,933.90	
Taxes		1,020,000.00	
			42,959,933.90
Balance			$ 3,426,059.36
Add:			
Income from Loans and Investments, including Rentals from Real Estate			1,037,449.54
Net Profits			$ 4,463,508.90
Deduct:			
Interest on Bonds of the Western Union Telegraph Company		$ 1,337,229.12	
Dividends:			
Paid October 15, 1912	$748,022.25		
January 15, 1913	748,034.25		
April 15, 1913	748,050.75		
July 15, 1913	748,059.00	2,992,166.25	
			4,329,395.37
Balance transferred to Surplus Account			$ 134,113.53

The property account was increased during the year by $1,819,393, representing the following additions:

New land line construction and equipment	$ 1,114,715.00
Real Estate	713,660.00
	$ 1,828,375.00
Less: Reduction in value of patents	8,982.00
	$ 1,819,393.00

The company's land line plant has been extended by 26,020 miles of wire and 2,174 miles of poles.

Other securities owned by the company show a reduction, compared with the total of June 30, 1912, of $1,327,829.

The company owns 18,418 shares of stock of the American Telegraph and Cable Company, which is leased to the Western Union Company until 1932. On January 2, 1913, a reserve of $364,353 was authorized out of surplus to provide for the probable depreciation in the value of these shares at the expiration of the lease. Interest will be compounded at 5 per cent per annum and credited to the reserve, thus reducing the book value of the company's holdings to $644,630 at the expiration of the lease.

The addition to Sinking Fund represents the principal and accumulated interest for the annual contribution of $32,604 set aside on the first of July of each year to meet on maturity in 1981 that portion of the deferred non-interest bearing liabilities consisting of realized assets of certain leased companies.

Accounts receivable have been increased $734,700, due to increase in gross earnings.

The reserve for reconstruction of land lines has been increased by $776,914, notwithstanding the heavy expenditures for rebuilding portions of the property. The reserve for maintenance of cables has been increased since last year by $127,087. In addition to maintaining the latter reserve, the sum of £20,000 has been charged to operating and transferred to the Anglo-American Telegraph Company in conformity with the terms of the lease, being the annual contribution toward maintaining the cable renewal fund carried on that company's books. The agreement with the Direct United States Cable Company provides that it shall maintain its cable plant without contribution from the Western Union Company.

A plan for the payment of pensions, accident and sickness disability benefits to employes, and of life insurance to their beneficiaries at the time of death, comprehending the interchange of benefits, with similar plans adopted by the American Telephone and Telegraph Company and Associated Companies, the Western Electric Company, and the American District Telegraph Company of New Jersey, became effective January 1, 1913. Pursuant to this plan, the sum of $1,000,000 was charged to surplus and set up as a fund, the Company's obligation being to safeguard the sum so appropriated by (a) periodically crediting the reserve with 4 per cent per annum of the unexpended balance of the fund, (b) maintaining the amount of the original fund by yearly additions provided that such additions shall in no year exceed 4 per cent of the company's payroll.

The increase of $4,700,000 in gross earnings is satisfactory, says Mr. Vail, when due consideration is given to the general business conditions during the period under review. The increase in operating expenses is largely attributable to increases in wages and to expenditures for the betterment of the property and service, by reconstruction of lines, improvement of offices, extending the radii for messenger delivery, and maintaining the relief and pension fund.

As a general convenience in the administration of the company's affairs, the fiscal year has been changed to cover the period from January 1 to December 31 of each year. At the annual meeting in April, 1914, a report will be submitted covering the calendar year of January 1 to December 31, 1913. At that meeting, such general subjects as may appear timely will be presented.

The present board of directors was re-elected.

Proposals for Electrical Supplies for Navy.—Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until November 4, to furnish switchboards and telephones at the naval station, Pearl harbor, Hawaii, and the navy yard at Mare Island, Cal. Applications for proposals should designate schedule number 5872. Blank proposals will be furnished by the Bureau of Supplies and Accounts.

Mr. E. J. Nally, Vice-President and General Manager Marconi Wireless Telegraph Company of America.

As announced in another column, Mr. Edward J. Nally was, on October 1, elected vice-president and general manager, director and member of the Executive Board, of the Marconi Wireless Company of America, with headquarters in New York.

Mr. Nally's many friends will be gratified to learn of his good fortune, and wish him continued success in his new field of endeavor. He has occupied a unique position in telegraph and telephone circles, and is really a pioneer in the telephone industry, having had charge of the first Edison telephone in St. Louis before he had attained his majority. He has been connected with the telegraph service for thirty-eight years and has risen through every grade from messenger boy to the vice-presidency and general managership of one of the great telegraph corporations.

Mr. Nally was born in Philadelphia, April 11, 1859, and is yet in the prime of life. He began September 1, 1875, as a messenger for the Western Union in St. Louis, and his work in that capacity foreshadowed the advancements that were to come to him in after life. Even as a youngster, while other messengers were idling, his moments of leisure were profitably occupied in reading and study, much of his spare time being spent in a little book and print shop where he indulged his taste for old books and prints, and it has continued a hobby with him ever since. One of the traits of character developed early in his career was fidelity to his employer, and he soon showed marked ability to do things thoroughly and well, characteristics that have grown with advancing years.

In 1878 he was appointed to a clerkship in the office of Colonel Robert C. Clowry, then superintendent of the Western Union in St. Louis. Later he followed Mr. I. McMichael, late vice-president and general manager of the Great Northwestern Telegraph Company, to Minneapolis, Minn., when the latter received the appointment of superintendent in charge of the lines that were formerly the property of the Northwestern Telegraph Company. He resigned October 20, 1890, and afterward became general superintendent of the Postal Telegraph-Cable Company in Chicago. His progress toward the highest position in the gift of the company continued until on his birthday, April 11, 1907, he was appointed vice-president and general manager. On July 1, 1913, he retired with a record that is rarely equalled in corporation work. He earned the loyalty and affection of his subordinates, and it is not too much to say that a large measure of the success of the company with which he was identified came from the team play and devotion that he inspired among the employes, and this quality will be of immense value to him and to the new organization which he represents, where his acquaintance and connection is a thing of international, as well as national, character and importance.

He is deeply interested in civic betterments and in everything that tends to improve the condition of those who work. He was instrumental in establishing savings and investment associations, employes' libraries, reading and rest rooms in the various offices of the company he served so long. He is a director of the Telegraph and Telephone Life Insurance Association and the Serial Building Loan and Savings Institution, a member of the National Geographic Society, a vice-president and member of the executive committee of the National Business League of America, member of the Caxton Club, the Pennsylvania Society, the Brothers of the Book, in Chicago, and of the Hardware and Magnetic Clubs in New York.

He married Miss Lee Warren Redd, of Lexington, Kentucky, in 1897, and they, with their two children, have a delightful home at Ossining-on-the-Hudson, where Mr. Nally's love of books, pictures and rare prints and Mrs. Nally's love of flowers unite to form an ideal spot to which to return at the close of a busy day.

Mr. Nally is to be congratulated on the opportunity to consummate his life work by his identification with the development of wireless interests, and the Marconi Company is more than fortunate in securing the services of one of the ablest men in the telegraph field.

A full-page portrait of Mr. Nally forms a supplement of this issue.

Induction of Straight Wires.

Owing to its magnetic action, a current passing through a straight wire will induce currents in another wire running parallel, when the current is varied in strength. The current induced on starting or strengthening the primary one is in the opposite direction, that on stopping or weakening, in the same direction. The reaction of the induced currents weakens and opposes the primary ones, according to Lenz's law. The strength of the induced currents depends upon the rate of variation of the primary current, the distance apart of the wires, the lengths they run together and the insulating substances or dielectric between them.

The induction through dry air is less than when any other substance intervenes between the wires. What is called the inductive capacity of air being unity, that of resin equals 1.7; glass, 1.9; paraffin, 1.98; india-rubber, 2.8, and gutta-percha, 4.2.

It is important to consider these values in connection with cables for telegraph and telephone wires, and, if otherwise possible, to choose a substance which has the least inductive capacity, and so keep down the inducing action between the wires.

TELEGRAPHS IN THE STRAITS SETTLEMENTS.—The telegraph lines in the Straits Settlements are owned by the government, and, during the year 1912, 244,301 telegrams were transmitted. The revenue received was $27,256, and expenditures $26,178, a very small amount of which was applied to extensions.

CANADIAN NOTES.

Mr. F. T. Jennings, superintendent of telegraphs, Canadian Pacific Railway, Sudbury, Ont., was married on September 1 to Mrs. May Dreany, of North Bay, Ont. Mr. Jennings has resigned from the telegraph service and will live at Brampton, Ont. Mr. D. H. Bowen, heretofore assistant superintendent of the Ontario Division, has succeeded Mr. Jennings as superintendent of telegraph for the Lake Superior Division, with headquarters at Sudbury.

Telephones in Canada.—According to government statistics, there are now in use in Canada about 400,000 telephones, compared with 200,000 reported a year ago. This averages one telephone for every nineteen persons in the Dominion. The total length of telephone wires in use is nearly one million miles, an increase of about 200,000 miles.

Mr. D. A. MacNeill, operator for the Canadian Pacific Railway Company's Telegraph at Schreiber, Ont., has accepted a position with the Grand Trunk Railway System at St. Thomas, Ont.

RADIO TELEGRAPHY.

Mr. E. J. Nally, formerly vice-president and general manager Postal Telegraph-Cable Company, New York, has been appointed vice-president and general manager of the Marconi Wireless Telegraph Company of America, with headquarters in New York. Mr. Nally sailed for London September 30, on the steamer "Mauretania." He will be in consultation with the officials of the parent Marconi Company, in London, and will be absent about a month.

To Prevent Unauthorized Use of Wireless.—The English Postmaster-general has requested the police authorities of Great Britain to assist in the prevention of unofficial and unauthorized wireless telegraphy, especially with portable wireless apparatus.

Proposals for Radio Sets for the Navy.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive proposals for radio-receiving sets until October 21. Application for proposals should designate schedule number 5,890.

Institute of Radio Engineers.—The regular meeting of the Institute of Radio Engineers was held at Columbia University, New York, Wednesday evening, October 1, after a well-attended informal dinner. A paper entitled "Some Recent Radio Sets of the Marconi Company," illustrated by lantern slides, was given by Mr. Roy A. Weagant. Mr. Weagant has been engaged in the design of the apparatus he described, and his comments were therefore of especial interest. The paper was followed by a brief discussion. The next meeting will be held on November 5.

Heroic Wireless Operator.

A few issues ago reference was made to the death of Donald C. Perkins, chief wireless operator on the steamer "State of California," which sank in Alaska waters last August. *The Wireless Age* gives some details of the disaster and says:

"Faithful to his duty, even as he faced death, Donald C. Perkins, chief wireless operator on the steamer 'State of California,' lost his life when the vessel crashed onto a reef in Gambier Bay, Alaska, on August 18, and sank, carrying with her, according to newspaper reports, thirty-two persons.

"Before he went to his grave, Perkins succeeded in sending the S. O. S. signal, which brought another steamship to the aid of the survivors. "Jack" Irwin, of the American Marconi Company, declares that Perkins was entrapped in his cabin and drowned, while newspaper stories are to the effect that he was struck by a falling mast and killed.

"The ill-fated vessel was going at full speed when she struck the rock, which was uncharted. A large portion of her bottom was torn off, letting in a mountainous deluge. Three minutes afterward she sank. The disaster came without warning at half-past eight o'clock in the morning, and many of the passengers who perished met death in their staterooms.

"In the three minutes before the 'State of California' went to the bottom, Perkins, by sticking to his post, was able to send out his distress call, which was picked up by the Jefferson, of the Alaska Steamship Company, only a short distance away. When the rescue ship arrived on the scene, the survivors were in lifeboats and liferafts. It was broad daylight, and it was easy to pick them up. It was seen at once that there was no possibility that any of the missing reached shore."

Wireless Signals and Atmospheric Influences.

In a paper presented by Prof. E. W. Marchant at the recent meeting of the British Association at Birmingham, England, some interesting facts regarding wireless signals and atmospheric influences thereon were given.

Measurements on the strength of signals received at Liverpool from Paris and some other places have been made over a considerable period of time, he said, but those described in the paper dealt mainly with observations during the month of July. The most accurate observations have been obtained with signals sent out by the observatory at the Eiffel Tower of 10.45 a. m. and 11.45 p. m. The method adopted in the earlier tests was to use a "Perikon" detector in series with galvanometer and telephones, the measurement of strength being made by the cumulative deflection due to a series of known signals. This method was not found satisfactory with the Paris signals for which the antenna current used was known, and in the later tests an Einthoven string galvanometer has been employed by which the strength of signal for each individual spark at Paris could be observed to within + five per cent. The results obtained show that there is a maximum variation from 0.6 to 1.3 in the strength of the signals received on different days in the same month; the average strength of signal being assumed to be 1.1, and that the current received on a fine, clear night is about 1.7 times as strong as that received in the daytime.

Although no certain relationship can yet be regarded as established between the strength of a signal and the weather conditions at the sending and receiving stations, so far observation has shown that rain in Paris always corresponds with a diminution in strength of received signal. In one case, with a wind of twenty feet per second velocity, blowing in a northwest direction, the signal strength fell to half its normal value. The most favorable condition for signaling appears to be a cloudy sky at both sending and receiving stations, the signals being weaker when the sky is clear or covered with light clouds. Rain at the receiving station appears to have a comparatively small influence on the strength of the received signals.

The result of a set of special signals sent from the Eiffel Tower on the evening of Saturday, July 26, 1913, at intervals of thirty minutes, between 7 and 10 p. m. (which includes the time of sunset), shows that the increase in strength of night signals occurs just after sunset, there being a sudden increase in strength of about seventy per cent. This change is quite sudden, there being comparatively little alteration in signal strength until the sun has set and no perceptible increase in strength afterward. There appears to be some evidence that signals are slightly stronger just after sunset than during normal night conditions.

Confusion in Nomenclature.

The committee on nomenclature of the British Association for the Advancement of Science is a distinguished body, says the *Electrical World*, and its suggestions are therefore worthy of serious consideration, but we shudder in contemplation of the results that would follow if every national scientific body should do as it has done recently. It is really a pity that with a carefully organized international body striving to bring order out of chaos and to secure uniformity in at least a few simple matters any national body whatever should think it expedient to introduce conventions of its own. The system of symbols proposed by the British association is not greatly different from that adopted by the International Electrotechnical Commission. It merely varies enough to be confusing at times without thereby gaining in any material particular. The British proposals for symbols are based on the fiction that total quantities and their differentials should be designated by the same letters but in different type, while the International Electrotechnical Commission scheme makes this same distinction between correlated electric and magnetic quantities. Now, in this whole matter of units and symbols the one thing practically important is that fundamentals all over the world should be expressed in exactly the same terms. It does not make the least difference whether a consistent theory or any theory at all lies behind the international conventions. In fact, as a rule, the same general theory of construction would not hold in different countries taking different viewpoints and with mnemonic values never coinciding. It was an immense stride forward when I became the symbol for current and R that for resistance, thus breaking through the international wall. But two Phœnician characters would have done as well, if not better, once they were really put into use.

The trouble at the root of the whole matter lies in a certain selfish indolence that impels those who write or lecture on technical topics to avoid writing or speaking a few plain words at the cost to the world of forcing tens of thousands to think about and learn a new word and a new notation, for which there is no real use whatever. In fact, the British association committee frankly notes that there are several derelict names which could advantageously be dropped. Even with the elimination of freaks the number of things to be named or noted in allied sciences rises to a figure inconveniently great. The fact is that there is genuine need for fully twice the number of letters available for symbols, even in two fonts of type, when one eliminates the letters already pre-empted for the connotation of general conventions.

The remedy for the present confusion, it seems to us, is twofold. First, avoid special names and symbols unless they are really necessary to large branches of science or technology. It is not sufficient that they should save the lecturer's fingers from wielding the chalk ten extra minutes per year. Second, use not only the Roman characters in two fonts well distinguished, but use the Greek letters, and, if necessary, others more freely than at present. Besides, we have subscripts to fall back upon in case of need, and these are especially useful in noting correlated ideas. The chief thing, however, is to stop making futile efforts at a correct theory of notation in favor of establishing international practice. We hope that the British association report wil be for all practical purposes laid on the table until the next International Electrotechnical Commission meeting and will then be amended to agree therewith, so that it may not further confuse scientific literature. A few books printed in an unusual or experimental notation constitute an international nuisance until they are out of date and forgotten.

Magnetic Permeability.

This characteristic may be best defined as a numerical co-efficient which expresses the ratio between the number of magnetic lines formed in a space containing nothing but air and the number formed in a space filled with a given quality of iron. This ratio differs for different qualities of iron, and hence we say that the permeability of the iron differs accordingly.

The higher the co-efficient of permeability, the less, so to speak, is the magnetic resistance, and the more suitable is the iron for the purposes of an electromagnet. On the other hand, the permeability of air and of most substances other than iron is comparatively very small.

Converted by Telegraph.

"I suppose you know that the operators at the telegraph offices along any line of road do a great deal of talking back and forth over the wire," said an old-timer. "You take it at night, when only a few of the offices are open and the wires are clear most of the time, and the operators will joke back and forth, just to keep themselves awake.

"I used to be a night operator at a good-sized town in Illinois. There was a junction about twenty miles away, and the night man there was named Tom Jones. I never saw him, but I was well acquainted with him, that is, we talked over the wire a good deal, and he used to send some clever things. Whenever I would be sitting in the office at night and some funny crack would come clicking over the instrument, I'd know it came from Tom down at the junction. Besides, after you listen to a man's sending, you soon know his style.

"Well, it seems they had a big revival or protracted meeting down at the junction. Tom would attend these meetings early in the evening, before going on duty, and about the third time he went they had him up to the mourner's bench, and he professed religion. I suppose you have heard the saying that the toughest man on earth is a New England man gone wrong, and by a similar rule, a telegraph operator, who is not ordinarily regarded as a pillar of the church, becomes a fanatic if he ever does join the church. From the minute Tom joined the church he became a missionary. No more frivolous jokes went over the line. I should say not! I would be sitting in the office at one o'clock in the morning—and you know the deathly stillness of one o'clock in the morning in a country town. You can hear yourself breathe. As I say, I would be sitting at the table, and there would be ten minutes of silence, and then the sounder would begin to click: 'F-l-e-e f-r-o-m t-h-e w-r-a-t-h t-o c-o-m-e.'

"It would come very slowly, so as to make it more solemn and impressive. Then in a little while I would hear, 'Young man, be sure thy sins will find thee out,' or else, 'The wages of sin is death.' Then perhaps a half hour later I would get this query: 'Where will you spend eternity?' Do you know that is an embarrassing question to ask a man at one or two o'clock in the morning, when he is sitting up all alone? It makes him think of his past life. He imagines that the ghosts of all his good resolutions are looking in the windows at him. I used to get up and get a drink of water, shake down the fire and rattle the stove, so as to relieve the tension. I dare say Tom had calculated the effect on men along the line. They used to ask him to 'Let up,' 'Don't roast us this way,' and some of them were even more emphatic in their messages, but Tom simply came back with 'Now is the accepted time,' or 'What if you should die to-night?' He was determined to convert all of us. I stood it for a week, but the nervous strain was too much for me. I demanded a day job. I understand that Tom did convert two or three of the boys. Think of that! Converted by Telegraph!"

Telephone Pioneers of America.

FRANK B. KNIGHT.

Mr. Frank B. Knight, special agent of The Southwestern Telegraph and Telephone Company, Dallas, Tex., is one of the best known telephone pioneers, and is an efficient official. Mr. Knight is also widely known among the telegraph fraternity, having been a telegrapher before he entered the telephone service. He was born in Canandaigua, N. Y., December 23, 1848, and learned telegraphy at the age of fourteen years, on the line of the old New York, Albany and Buffalo Telegraph Company, at Geneva, N. Y. He was later employed on the New York Central Railroad, in the Syracuse office, and, on the breaking out of the Rebellion, joined the United States Military Telegraph Corps. At the

FRANK B. KNIGHT, DALLAS, TEX. (1880)

close of the war, Mr. Knight entered the service of the Western Union Telegraph Company at Rochester, N. Y., and, in 1870, he was appointed chief operator of telegraphs of the Union Pacific Railroad at Omaha. He was afterward manager of the Western Union office in Omaha, and, in May, 1880, resigned that position to enter the service of the American Bell Telephone Company as special agent, the territory to which he was assigned and to which he devoted his attention for four years comprising all that part of the United States lying west of the Mississippi River. Mr. Knight retained his connection with the Bell Company as special agent until 1905, when he was transferred to the Southwestern Telegraph and Telephone Company as special agent, with headquarters at Dallas, where he is still located.

Mr. Knight has a large number of friends both in the telegraph and telephone service.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, OCTOBER 16, 1913.

The Annual Government-Ownership Scare.

For the past few weeks the daily press has been in a high state of excitement, bordering on hysterics, over the question of government ownership of the telegraph and telephone lines in this country. Wall Street, of course, felt the influence of these reports, and, if the truth were known, perhaps Wall Street has more to do with the disturbance than appears on the surface.

The whole thing started from a Washington dispatch in one of the New York daily papers to the effect that an administration measure would be introduced in Congress looking to the purchase of the telegraph and telephone lines. The postmasters-general in late years have acquired the habit of suggesting in their annual reports the advisability of the Government owning the telegraph and telephone lines and it is possible that the present Postmaster-general will have something to say on the subject in his forthcoming annual report. In the meantime, all the newspapers throughout the country have taken the subject up on speculation and become greatly excited over it. The suggestion has been so magnified that the people are led to believe that it is a "sure thing" that the government will be in possession of these services within a very short time.

As the original story has passed through many editorial brains, it has become greatly exaggerated by the addition of imaginary facts, originating in the minds of country editors who know nothing about the matter, but think that government ownership of everything would be a good thing, on general principles. It is gratifying, however, to note that there is at least one daily newspaper editor who has not lost his head in the excitement. He says, "Government ownership and operation of telegraph and telephone lines would be a venture for which no special justification could anywhere be found. Government control of these utilities in foreign countries, particularly in France, has not been a success. We do not need to repeat foreign experiences and foreign failures here."

The whole thing is an excellent illustration of the rapid spread of a village rumor. It starts innocently enough, but as it passes from mouth to mouth, it gathers around it a lot of fancy and fiction and in time becomes a terrific thing to behold.

Fitness for Positions.

The question of fitness for positions in the telegraph service is always carefully considered by those in authority, no matter who the applicants may be or for what places they may aspire. Before an operator receives an appointment at a stated salary to work a certain wire, his ability for the special duties he will be called upon to perform must be first satisfactorily ascertained. So, too, for the higher positions of manager and of superintendent, skill not only as operators, but the possession of the necessary executive faculty, must first be clearly known and demonstrated. The same care also governs the selection of the general superintendent. Thus it will be seen that throughout all grades in the service the constant aim is to secure only men who are fully competent to fill their respective positions.

Naturally, there is a large measure of responsibility attached to the making of all such appointments, so that those upon whom this important duty falls realize the necessity of guarding against mistakes and errors of judgment in the selection of an appointee. Therefore, from the directors of a company down to all in whom is lodged the power of appointment, vigilant scrutiny of fitness is demanded.

All this is a consistent and proper method of procedure, and especially so where such large, peculiar and wide-extending interests are involved as distinctively belong to a telegraph company. This being the case, how important it is, then, for every person in the service who is ambitious for promotion to prepare himself for advancement, for from the up-coming ranks choice must of necessity be made. In controversion of this it is sometimes said, and we are aware to what an extent the opinion is shared in by operators, that "pull" or favoritism, rather than merit, secures advancement, that genuine worth is apt to count for but little, and generally goes unrewarded. Whether or not there be any truth in this assertion, on general principles it cannot be accepted, for its admission would be to negative an efficient administration of the company itself. Therefore, in considering the matter, it should be on broad and generous grounds, rather than from a narrow point of view, hence the insistence with which we have urged that the individual should qualify himself to fill a position higher than the one he already occupies. Valuable services are always in requisition, and intelligence of a practical order is bound to secure recognition.

Your Personal Inventory.*

Did you ever "take stock" of yourself? You have a pretty fair idea what sort of a fellow you are and how much you are worth to yourself, your company and the business world in general. If not, you have an interesting half hour before you, and maybe a surprise or two if the inventory is conscientiously made.

Take pencil and paper and draw two columns, heading one "assets" and the other "liabilities," for want of better terms. Then forget all your pride, all your egotism—"swell-head" most people call it —and jot down in these columns your strong points and your weak ones.

First, your health; is it good or bad? Then, ambition; are you really ambitious or simply covetous of success? How about your intelligence; have you brains or just a brain, and are you mentally alert or mentally lazy? So on and so on—your faculties, your manners, your habits, and all the other attributes that go to make up your real measure.

And suppose, just for example, you find that your "asset" column includes good health, ambition, brains, good manners and ten or a dozen other requisites of the real man. Good, you say; and maybe you are prompted to let it go at that, content that you have an advantage over the great majority of your fellows. But hold on! What does the other column show? Just suppose you are afflicted with occasional mental laziness; have you had gumption enough to say so? Have you frankly put yourself down as a "grouch" if, when things do not go to suit you, the title fits? It is just possible that you do not talk well or write well. Perhaps you are overburdened with pride or you are thin-skinned; perhaps diffident and perhaps a bit of a know-it-all. Then what?

Now, this is not a preachment; it is only a suggestion that you make a very simple and thoroughly interesting experiment. If the results show satisfactory, well and good. If they are not to your entire liking, you have something handy "to work on" in your everyday building-up process.

Earth Currents.

Two similar metallic plates immersed in two different electrolytes, separated by a porous partition, will form a voltaic couple, and therefore generate a current. There is no doubt that a slight current is produced by the two earth plates at the ends of a telegraph circuit, but this current is of so minute a character that its effect upon the circuit may be ignored. There are also stray currents which are produced by leakage from the uninsulated return conductor (the bonded rails) of electric railway systems. As the current due to a given difference of potential is inversely proportional to the resistance, it will be obvious that the disturbing current may be reduced to negligible dimensions. It may be added that the leakage current varies from time to time, and that therefore an opposing battery cannot be inserted in the line so as to balance it.

It is found that different parts of the earth are frequently at different potentials, and that consequently "earth currents," as they are termed, flow over the circuits between the various points. In the case of very long submarine cables these currents are of sufficient magnitude to make direct working quite impracticable. For this, and other important reasons, condensers are inserted at either end of the circuit, thus preventing the passage of a steady current through the cable. Long land lines and short submarine cables are normally unaffected by earth currents and provision against them is unnecessary.

The precise cause of earth currents has yet to be discovered. There is, however, no doubt that they are always in evidence during periods of "magnetic" storm. When the aurora, observed chiefly in the Arctic regions, is of a rapidly varying character, magnetic storms and earth currents are invariably observed. The association of sun-spots with periods of magnetic storm has been suggested, but evidence shows that several specially large sun-spots have been unaccompanied by magnetic storms. Again, there is no evidence of any connection with earthquakes or other internal troubles of the earth itself.

As none of the theories which have been given altogether fit the observed phenomena, the true cause is, at present, quite an open question.

Generally speaking, lines running northeast and southwest are most frequently affected, whilst those running northwest and southeast are seldom disturbed.

Early Telegraph Lines in New York State.

The first telegraph line into New York from the north crossed the drawbridge at Third Avenue on the Harlem River. This was in 1846. Whenever the bridge was opened for the passage of vessels the wires were disconnected, and such interruptions sometimes lasted an hour or more, in the midst of business and without warning.

Newspaper service was soon started, and even while Albany and Utica were the only offices on the line, items from the New York papers and from the legislature were transmitted to Utica, and after the line reached Buffalo, the papers were allowed a stated time for the exclusive use of the wire, from 2 to 3 p. m. for the evening editions, and from 6 to 7 for the morning editions. In case the Harlem Bridge opened during these periods the papers received an abridged report, or none at all, as the order to give "30" at three and seven o'clock, respectively, was imperative. Frequently the inland papers made the announcement: "No report to-day; bridge opened."

* *The Telephone News.*

Course of Instruction in the Elements of Technical Telegraphy—XLIX.

(Copyrighted.)

(Continued from page 587, October 1.)

[The Course of Instruction in the Elements of Technical Telegraphy, which has been running regularly in this journal since October 16, 1911, has met with wide-spread favor and is being studied diligently by thousands of telegraphers and others throughout the world. It is being translated into Spanish, and printed in South American electrical journals, and has attracted universal attention for its clearness of expression and its practicability. It has been endorsed by the officials of telegraph, telephone, cable and railroad companies, many of whom have acknowledged the improvement in the technical standing of their progressive employes, and they commend the course as being of the most practical kind of instruction.

This course was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, and is being published now for the benefit of those of our readers who desire to fit themselves for higher positions in the engineering branch of telegraphy, and it has been a valuable aid in this direction. It is elementary, and devoid of higher mathematics, yet it is fundamental in character and extremely easy to learn.

Each chapter is complete in itself, and the chapters are arranged in natural order so that the student acquires the knowledge step by step in logical sequence. Each chapter is followed by test questions on the subject of the chapter, thus enabling the student to review his progress from time to time.

Back numbers containing these valuable lessons can be obtained at 10 cents per copy.]

Stearns' Differential Duplex (*Continued*).

So long as the resistance of the artificial line equals the resistance of the main line the current from B will divide equally at R, and the magnetic effect on the cores will be neutralized, since the currents in the coils, being in opposite directions, tend to establish opposite poles at the same ends of the core. To maintain this resistance equality, or balance, a compensation resistance, equal to that of battery, B, is inserted between the back stop of the key and earth, otherwise the distant station's balance would be affected by the working of the home key.

The magnetic effects of the current from battery, B, are not counteracted in the distant relay, for there the current from the line traverses the line coil only, going to earth by the direct path afforded by the key and battery, or key and compensating resistance, as the case may be, and the distant relay thus responds to every depression of the home key.

When both home and distant stations depress their keys, the forces of the two batteries are added, one to the other, as far as the *line* circuit is concerned, but the artificial line is, in each case, traversed by the current from the battery of its own station alone. The current is, therefore, stronger in the main line coils than in those connected with the rheostats, and, consequently, both relays respond.

In actual working, a key, such as shown in Fig. 64, could not be used, because of momentary breaks which would occur in the line circuit while the key lever was moving from one stop to the other. The current from the distant station during these breaks would be forced to circulate through both coils of the relay and through the artificial line before reaching ground, thereby disturbing the distant station's balance and causing false kicks. By using a transmitter, such as shown in Fig. 65, this is avoided, and the continuity of the main line during key reversals is maintained by means of the contact spring with which the transmitter is furnished.

Fig. 65 shows the arrangement of apparatus in a Stearns duplex at one station. M B is the main battery, T the transmitter, P the transmitter spring, by which the continuity of the line is maintained. S C is the battery compensation resistance, which is in circuit when T is open. R is a differentially wound relay, in four sections, the lower right hand and upper left hand divisions being joined together to form one coil, and the bottom left hand and top right hand sections making up the other. One series of coils is connected to line, and the other to ground through rheostat, Rh, and condenser, C, which, together, form the artificial line. The apparatus at the distant station is exactly similar.

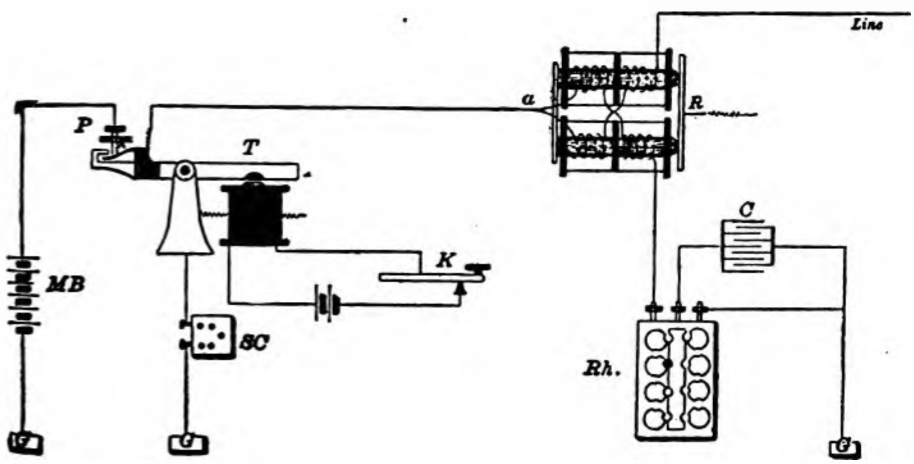


FIG. 65—DIAGRAM OF STEARNS' DUPLEX AT ONE STATION.

The statement that the current from the home battery only flows through the line series of coils in the distant relay is hardly correct, for it will be observed that there are really two paths by which the current can reach ground; one, the shorter, via the transmitter, the other, the longer, via the artificial line. The distant relay is energized by the full strength of the current, however, for the small fractional part going via Rh passes round the core of the relay in the same direction as the line current and adds its magnetic effect to that produced by the stronger current in the main-line coils.

Thus far we have only considered the resistance required in the artificial line to obtain a balance, but the static capacity of the main line must not be neglected. The effects of charging a wire of measurable static capacity have already been described, and as the German silver wire of which the coils in the rheostat are composed, has no appreciable static capacity, it follows that at each moment of charge and discharge there is a momentary excess of current in the main-line coils which is sufficient, on a long line, to cause a momentary attraction of the relay armature.

It is to counteract these static effects that the condenser is used in the artificial line, for, by making the resistence in the rheostat and the capacity of the condenser equal to the resistance and static capacity of the main line, the current going to earth via the artificial line induces a charge in the condenser corresponding to the static charge induced upon the line by the outgoing current, and, both being discharged through the relay coils in opposite directions, and at the same moment, the discharge of the line is neutralized by that of the condenser.

The time occupied by the condenser in charging and discharging should be exactly the same as that taken by the main line, otherwise a true static balance will not be obtained. On long lines, or lines which include a length of cable in their circuit, the action of the condensers may be too rapid to balance the static effects of the line, and a resistance coil may have to be inserted between the condenser and the artificial line to retard the condenser's action; or it may even be found necessary to use small portions of condensers, arranged in parallel, with resistance coils inserted between each, so as to distribute the induction as equally as possible over the resistance, and thus more closely imitate the line itself.

The charge and discharge of condenser, C may be made to equal the static charge and discharge of the line by either adjusting the capacity of the condenser itself or by varying the E M F between the condenser terminals until the required charge is obtained. The potential difference between the terminals of C depends upon the point along the resistance of Rh at which the connection is made; for, since the E M F between two points that are near together is less than that between two points that are farther apart, it is only necessary to connect one side of the condenser to different coils in Rh to procure different potentials, and the nearer to earth the connection is made, the smaller, of course, the E M F will be. To obtain a static balance, therefore, adjust the capacity of the condenser by varying the number of leaves in circuit, or adjust the E M F by connecting the condenser to different coils in Rh, until the static effects on the relay are eliminated. If the static disturbances cannot be wholly counteracted by the former, a slight variation of the latter will probably give the desired result.

HOW TO BALANCE.

First request the distant station to open his key, which will ground the main line through the battery compensation resistance. Now lower the adjustment of the home relay and work the key; if the armature responds, the rheostat resistance either exceeds, or is less than that of the main line, and must be adjusted until the relay remains unaffected by the outgoing current, except, perhaps, by a momentary kick, due to the static capacity of the line. Keep working the key and adjust the capacity of the condenser by inserting or removing plugs, until the kick disappears, when a working balance will be established.

COMMON FAULTS.

Should the home balance be upset when the distant station opens his key but be O. K. when it is closed, the fault will probably be due to a disconnection between the battery compensating resistance and the transmitter at the distant station, which causes the resistance of the artificial line to be added to that of the main line.

Should the home balance be upset when the distant station closes his key, but be O. K. when it is open, the fault will probably be a disconnection of the distant battery, either in the battery itself or at a dirty transmitter contact.

QUESTION PAPER.

(1) How would you adjust the charge in a non-adjustable condenser in use on a differential duplex?

(2) Why is a condenser placed in the artificial line?

(3) State, in detail, the steps you would take to obtain a balance on a differential duplex.

(4) (*a*) What is the circuit of the home battery with the home key closed?

(*b*) With the home key open?

(5) Why does the distant relay respond to the movements of the home transmitter?

(6) Could a true balance be obtained by requesting the distant station to ground at the switchboard?

(7) The distant transmitter is open, but, owing to a dirty contact point, the line makes imperfect connection with ground. How would this affect the home station?

(8) Why are the rheostat spools wound with German silver wire?

(9) Why is the top of a rheostat covered with ebonite?

(10) (*a*) How would you ascertain the total number of ohms contained in a rheostat?

(*b*) The number of ohms in use?

(*c*) What is the resistance with all the plugs inserted?

(11) Explain how the differential relay in a Stearns duplex is energized by the *full* current from the distant battery.

New Office of the Canadian Pacific Railway's Telegraph at Toronto, Ont.

In our issue, dated January 1, 1912, we published a brief description and an illustration of the new building of the Canadian Pacific Railway Company, which was then in the course of completion at Toronto, Ont. We are now able to give further details of the telegraph office and plant, through the courtesy of Mr. William Marshall, superintendent of the Canadian Pacific Railway Company's Telegraphs at that point.

On Saturday evening, July 26, the commercial telegraph office was transferred from the old stand in the Board of Trade building, where it had been located for twenty-two years, to the new building at the corner of Yonge and King streets. The new building is sixteen stories high, and of fireproof construction. It is the tallest building in Canada, having a height of 240 feet.

The public office occupies the entire ground floor, and is a magnificently appointed room, with a twenty-five-foot ceiling, the walls being finished with polished Tennessee marble and the counters of polished onyx. The various departments of the railway company have spaces allotted to them on this floor.

The fourteenth and fifteenth floors are occupied by the telegraph department, and, with the exception of the second floor, the intervening floors are rented to the public.

The operating room is situated on the fifteenth floor. It has a floor space of 4,500 square feet, and is a light, airy apartment, with an eighteen-foot ceiling, large windows extending from within two feet of the floor to within two feet of the ceiling, thus admitting an abundant supply of air and light. The room is further ventilated by a complete ventilation system, which draws in fresh air from the outside by means of power fans. The heating apparatus in connection with the ventilating system is arranged to take the chill out of the air before delivery during the winter season. The room is lighted at night by the indirect system of illumination.

The switchboard and terminal frames occupy some fifteen by twenty feet floor space. The main switchboard is of three fifty-wire sections, and faces the north, while the loop, or local board, and the multiplex battery switch sections face the west. The main lines are brought into the building in lead-covered, paper-insulated, thirty-pair cables, which make connection with the pole line at the corner of Yonge and Front streets. The cables run in tile duct to the basement of the building, thence up the elevator shaft to the loft above the operating room. The cables are supported in the elevator shaft on channel irons, to which they are fastened by a specially devised clamp. Trenches moulded in the concrete floor provide a route for the cables which connect the tables with the terminal frame. Pneumatic tubes connect the operating room with all the various departments. In the basement is the

FIG. 1—GENERAL VIEW OF OPERATING ROOM IN CANADIAN PACIFIC RAILWAY'S NEW BUILDING, TORONTO, ONT.

delivery department, also the district circuit switchboard, on which terminate twenty or more circuits. On these, there are about 1,800 call boxes.

Current for operating the wires and instruments is generated by nine motor-generators, located on a bench near the switchboard, the initial power being obtained from the house plant in the basement, which also furnishes current for lighting the building. The voltages at the switchboard discs are 110 positive and negative, and 225 positive and negative, of which the 110 potential is taken direct from the mains and the 225 from the motor-generators. The negative 110 potential is also used to supply the local circuits, being also extended to such branch offices that are located in the business sections of the city.

Adjacent to the switchboards are the motor-generators and repeater tables, convenient to the wire chiefs. On these tables are eight sets of Weiny-

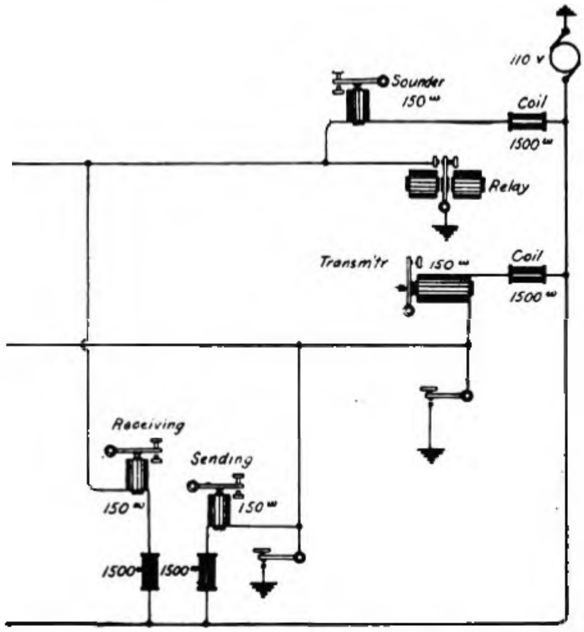


FIG. 2—MULTIPLE ARRANGEMENT FOR DUPLEX LOCAL CIRCUITS, SHOWING BRANCH OFFICE CONNECTED TO A DUPLEX SET.

Phillips repeaters, arranged in half sets, with local circuits extended to the loop board, where they can be combined as circumstances may require. There are also four sets of duplexes located on these tables, arranged so that they can be used as repeaters, or legged over to the operating tables. Four of the quartette operating tables are assigned to the city department. A number of the tables arranged for single wires are equipped with suitable switches and connections with the loop board, so that the keys and sounders thereon can be used for duplex leg downs when required, instead of single. The tables on which the neutral sides of the quadruplex are located are also arranged so that they can be used for single sets when required, which adds considerably to the table capacity of the office.

A notable feature is the arrangement of the quadruplex and duplex local circuits, which might be called an open circuit, multiple arrangement, and which has proved to be a great convenience in making up circuits. With this arrangement, a number of duplex circuits can be grouped together. A number of branch offices can be connected to a duplex, and each branch office connected can hear any of the others send. The only thing necessary to ensure the successful operation of the device is that keys must be kept in the open position when not in use.

A theoretical diagram, showing the general arrangement, omitting jacks and switches, is shown herewith. It will be seen that sounders and transmitters are permanently connected with the source of current through a 1,500-ohm resistance coil, located between the instrument and power, thus preventing the current rising to a higher value than that required to work the instrument. When a number of sounders, or transmitters, are thus connected, and a ground applied to the connecting wire (which is virtually the case when one of the keys or armature of a relay is closed), all sounders close simultaneously.

In the illustration only one branch office is shown connected to the leads. Other branch offices can be connected in a similar manner.

Open-circuit jacks are used on the loop board entirely, and combinations made with double cords. In order to facilitate the grouping of circuits, a row of jacks extend across the board, arranged in multiple groups of five each, and, when necessary to combine a number of branch office loops to work them on a duplex, the wedges of the loop cords are placed in one of the jack groups and connections with the jack group and duplex jack are made by means of a double wedge cord.

The Morkrum printer duplexes, of which there are two, are worked between Toronto and Montreal, and a Morsegraph, with a capacity of twenty-four circuits, is installed in the space behind the switchboard, and connected with the principal circuits. There is also installed a composite telephone apparatus in connection with two Montreal duplexes, which apparatus is used by the ticket offices in Toronto and Montreal for conversation regarding sleepers, reservations, etc.

To facilitate the correct timing of all messages, self-winding clocks have been installed in the various departments.

Following is the personnel of the office: William Marshall, superintendent Ontario Division; D. H. Bowen, assistant superintendent; E. A. Speer, superintendent of construction; F. C. Robertson, inspector of telegraphs; P. G. Galbraith, chief clerk; H. A. Shambrook, local manager; G. Patton, assistant local manager; A. J. Mason, accountant; H. J. Lillie, chief operator; M. J. Bayley, wire chief; C. T. Barber, night chief; J. R. Christie, late night chief; J. D. Smith, traffic chief; W. Smith, W. Carlton, L. Van Every, C. R. Galbraith, assistant chiefs. There are about ninety-five operators, fifty clerks and sixty-five messengers on the staff.

The entire work of the equipping of the new office was done by the local staff, and under the direct charge of Mr. F. C. Robertson, to whom great credit is due. It is also worthy of mention that the multiple arrangement for duplex local circuits is Mr. Robertson's idea.

How Submarine Cables Are Made and Laid.

A submarine telegraph cable consists of a copper conductor, covered with an insulation of gutta-percha. This is all that is required for the exchange of signals, although it may be through thousands of miles. In order to protect the cable from injury, however, it must also be armored to guard it against the many dangers to which it may be exposed. This armor, or sheathing, as it is technically termed, consists of iron or steel wires and sundry coverings of hemp laid up helically, each layer being well coated with a bituminous compound. The cable, as completed, is coiled into large iron tanks, and kept under water, where it remains ready for shipment.

The size and weight of cables vary according to the conditions and locality for which the cable is destined, so that, while some shore ends weigh as much as twenty tons per mile, the modern type of deep-sea cable weighs only about two tons per mile. The earlier deep-water cables were much lighter.

During the whole process of manufacture, the strictest supervision is exercised, and a continuous watch kept on the electrical tests, so as to guard against or detect the slightest fault, should any occur in the insulation.

After the completion of the cable, it is transferred from the factory to the ship, and coiled into her tanks, which are then filled with water. This is done in order to keep a perfect check on its electrical condition. The ship then proceeds to the place where the shore end is to be landed. This landing is effected either by raft, a number of boats, or floated on buoys through the surf to the beach. The end being landed, it is taken into the cable house; the usual test is applied, and if the cable is in sound electrical condition the ship proceeds, laying the main cable on a route previously plotted on her charts.

The paying-out machinery consists of sundry small guiding wheels and a large drum, usually six feet in diameter, around which the cable runs, with brake pulleys attached, and fitted in such a manner that weights can be easily adjusted and the speed of the cable running out kept under control. A dynamometer also stands between the paying-out drum and stern of the ship to show the strain on the cable as it passes into the sea. The speed of its running out should be a certain percentage greater than the speed of the ship, so that it may conform to any undulations in the bed of the ocean, on which the cable is intended to rest. Some skill and a great deal of attention is required in order that too much slack, on the one hand, and, on the other, the greater danger of laying it too tight, and thereby suspending it from peak to peak of submarine mountains, may be prevented. This is one of the results of laying cables by mathematical formula, rather than by practical common sense.

The records of the laying the early Atlantic cables show that the maximum speed was six knots, and that a percentage of from eleven to thirteen was allowed for slack. Notwithstanding this precaution, the repair of certain fractures in them has proved, beyond doubt, that they were broken through having been suspended over inequalities on the bottom.

There are many causes of interruptions and faults in cables in the North Atlantic, some of which are abrasion on rocks and crushing by ice where lying in shallow water, or when landed in exposed places. Occasionally, also, there are faults made in the insulation by the ravages of marine borers; but the greatest number of breaks are caused by the fishing schooners dragging their anchors in gales. Generally, they know when they hook a cable, and some of them will then cut away their hawsers to avoid further damage, knowing that they will be compensated for their loss by the cable companies; while others do their utmost to heave them to the surface, and, in some few cases, have hacked them through with an axe. The law is very severe in such cases. It is a state prison offence; a heavy fine can also be inflicted, but that would be no bar to a suit for damages.

Breaks become more frequent as age advances, or oxidation eats away the iron or steel wires, thereby weakening the cables so that they can no longer sustain their own weight in the suspended parts. There is also the natural decay and corrosion which takes place in all depths of water; and, as the nature of the bottom is continually changing, so also is this corrosion and decay ever varying. In places, on good bottom, cables are sometimes found, after twenty or more years' immersion, practically equal to new, yet, there are other places where the bottom is bad, where the cables may have been suspended, that the iron or steel wires are completely eaten away only a few years after having been laid.

The practice of laying cables between those already laid is a dangerous one. When it is taken into account that the different ships employed laying cables may have run for several consecutive days without obtaining a single observation, there is a great risk of grappling and breaking a wrong cable, when repairing operations commence. Besides lying parallel to one another, there are also many places where they cross. This condition increases the danger in grappling and repair work.

Breaking Strain of Wires.

The breaking strain of a line wire is the limit of strain which the wire can withstand. Any further increase in strain will cause the wire to break.

The tension between the two points of support depends upon the degree of tightness to which the wire is drawn up. The stress in any span, in pounds, can be calculated by dividing the product of the square of the length of the span in feet, and the weight in pounds, of one foot of the wire by eight times the dip in feet.

In practice, wires are erected so that the tension in the spans at the time of maximum stress, *viz.*, at low winter temperature, will not exceed one-fourth of the breaking strain of the wire.

Causes of Wire Interruptions.—Interruptions on telegraph lines are caused by any one of the three faults—ground, contact, or disconnection.

The Telegraph Operator.

The following interesting article appeared in a recent issue of the *Philadelphia Telegraph*:

Telegraphy is a form of labor which is light and pleasant, as compared with many other vocations, and leads to avenues for successful business. Many of the executive positions in the big offices to-day are being filled by men who were at one time messenger boys. A gentleman who had risen from that position said: "A good, common school education is necessary to start with; the better the education, the better the student will get along. A quick, receptive mind is an important requisite as well as patience and application. Usually a student must have at least a year's practice before he or she can become an operator sufficiently good to be intrusted with business or to receive compensation."

Telegraphy offers steady employment the year round, and no operator of push and energy, good moral character and with industrious business habits need be out of work. The supply of good operators does not equal the demand.

The pay ranges from $40 to $90 a month, and more if the operator is especially gifted, and it is possible for an operator to make considerable additional money by working overtime. Brains and deft fingers are two mighty good assets.

It is a fascinating business, and many operators say that the very act of communicating with another person, maybe hundreds of miles away, never loses its interest.

Telegraphy has developed a class of men whose characteristics are acuteness, progressiveness and superior business ability. Opportunities are offered for the cultivation of the mind, and many successful men in other occupations can trace their success to the training which they have received in the service of a telegraph company.

A notable instance is that of Andrew Carnegie, who started his career as a messenger boy, and he was but fifteen years of age when installed in his first office.

The railroads also offer openings for operators, and they maintain schools for the instruction of those who desire to take up the work. There are also private schools of telegraphy, where pupils can pursue that study either in the daytime or in the evening.

Country school teachers are said to make good operators and, as the pay of the latter is much higher than the former, many teachers of both sexes can be found at the telegraph key. The companies need bright men and women and do all in their power to throw opportunity in the way of their young employes to better themselves.

How Iron Telegraph Wire Came Into Use.

The adoption of iron telegraph wire came about through a force of circumstances. The story of the application of iron wire is told in an interesting manner in Mr. James D. Reid's book on the "Telegraph in America."

In the early days of the telegraph, copper wire was employed altogether for line purposes, but, on account of its being soft and unannealed, it gave much trouble by reason of stretching and breaking easily.

Soon after the line was opened between New York and Philadelphia, in 1846, the copper wire was broken in Philadelphia, by a cart bumping against a pole. There were no repairers in those days, and there was no wire available for repair purposes. Mr. Reid tried to procure some copper wire to match that of the line, but could only get some No. 14 iron wire from a tinsmith. "We supposed that would never do," says Mr. Reid. "We consulted, with lengthened faces, what should be done, and, finally, concluded to put in the iron wire and note the results. We did so, making the joints with great care, and hastened back to the office. Arriving there we were overjoyed to find the line at work." This, Mr. Reid states, was probably the first iron wire employed on a telegraph line, and such wire soon came into common use.

In 1850, two new iron wires were erected from Washington to New York. The insulation used for these wires was formed of a mixture of brimstone, gum shellac and resin. A heated mass of the mixture was used to confine a piece of iron into each end of a piece of wood, about three feet in length, which was placed across the poles, and the wires attached to the pieces of iron by a washer held fast by a screw and nut. During hot weather the insulating composition melted and the irons dropped out. "The brimstone insulator," Mr. Reid continues, "was one of the most unfortunate scientific devices ever conceived. It was, indeed, the "brimstone age," for it was being tried by various lines and seemed epidemic."

The Western Union New Quadruplex Apparatus.

BY L. C. MCINTOSH, LOS ANGELES, CAL.

A careful study of the action of the quadruplex instruments in use at Western Union terminal and repeater stations suggests some minor changes that might be advantageously made.

The polar relay might be much improved by placing the permanent magnets so that they could be brought closer together, thereby reducing the air-gap, instead of fixing them at about a quarter of an inch from the armature, as is now the practice.

The double-coil pole-changer, while quick acting and very desirable for machine sending, is, on account of its delicate adjustment, likely to shatter signals as a result of the vibration of the tables by typewriters or of the building itself by passing trolley cars and trains. This kind of disturbance is more noticeable when the instrument is being used as a transmitter on the second side. The earlier type of pole-changer without the back coils and with a heavy spring would make a better transmitter.

The neutral relay appears to be as good as any of its predecessors, but might be improved by adding a third coil, as in the Smith relay, to act in conjunction with the upper holding coils, thus doubling the capacity.

Hints to Beginners.*

BY I. N. MILLER, DISTRICT COMMERCIAL SUPERINTENDENT, WESTERN UNION TELEGRAPH COMPANY, CINCINNATI, OHIO.

Much of the interruption to the working of wires would be obviated if the managers and operators would familiarize themselves with the rudimentary principles upon which our telegraphic system is based. This article is written for the purpose of stimulating a desire among beginners to investigate and study the system.

THE WIRE.

In starting a telegraphic system, we first provide a circuit reaching a considerable number of offices, each office being able to send signals over the entire circuit; they can all communicate with each other. In a telegraph system one-half the circuit is formed by stringing one wire connecting the desired offices or cities. This wire is then connected securely with the earth at each end, the earth being a good conductor of electricity. The earth provides the other half of the circuit.

The wire is attached to insulators, the object being to compel the current of electricity supplied by the battery to pass over the wire to the earth terminals, so that each office connected with the wire can control the entire current by opening and closing the circuit. If the insulation is defective, a portion of the battery current escapes at every insulator during rains and passes down the pole to the earth, and, as there are about 4,000 poles to every 100 miles of wire, the total "escape" often amounts to a large part of the battery current. The various offices lose control of that part of the current which escapes. For example, if one-half the current escapes to the ground before it reaches an office fifty miles from the battery, then this office loses control of over one-half the current, and, by opening the circuit (opening the key), one-half the battery current still flows out over the wire and escapes. This current is often sufficient to operate the relays if adjustments are turned down a little. Under such a condition, offices nearest the battery can often work with each other when some other office has the key open. The escaping of the battery current is what generally causes the changes in the adjustment.

The best working results are obtained when the current is not escaping to the ground, and each office has control of practically all of it. The office at the point where the battery is located always has complete control of the main battery, as there is no escape between this office and the battery; but offices some distance from the main battery have not control of the entire current, and their writing is not as clear and steady as that of the office where the battery is. For example, the sending of the operator working a circuit at the Cincinnati office may reach an office fifty miles distant clear and distinct, but the sending of the operator at the latter point might be very indistinct when it reaches Cincinnati.

THE KEY.

The key is simply an arrangement for opening and closing the circuit, and has the same effect when "open" as to cut the line wire and separate the two ends.

THE RELAY.

If a bar of hardened steel is magnetized, it retains the charge for long periods. When a piece of iron or steel becomes magnetic it attracts pieces of iron when brought in close proximity to it. It is found, in practice, that the best way to magnetize a piece of iron is by winding fine insulated wire around it, and then passing a current of electricity through the wire. In order to make use of these principles, we take a round piece of soft iron (which loses its magnetism whenever the electric current is broken), wind a considerable amount of insulated wire around it, and suspend or hinge a flat piece of soft iron close to the ends of the first piece of iron, so that when the former is magnetized it will pull the latter toward it. The arrangement is such that the adjustments will not permit the two pieces of iron to come into contact with each other. By attaching a spring to the movable piece of iron (the armature), the latter is pulled in one direction by the magnetism, and in the other by the spring; then, by sending a current of electricity through the fine wire wound around the soft iron bar, and arranging to open and close the circuit with a key, we are able to move the armature back and forth, and thus send signals.

SOUNDER.

If there were no escapes on telegraph circuits there would be no use for sounders, as relays could be, and are, made, to give all the sound necessary for reading the signals, but when there are numerous escapes of the current from the wire to the earth, the working margin (the portion of current that does not escape) is very small, and the relay armature is only slightly attracted, and cannot be made to give out a loud sound. To overcome these conditions, a second, or local circuit, is arranged, with battery and sounder in circuit, the battery being of sufficient strength to develop the required sound in the sounder. To operate the sounder, the armature of the relay is arranged to act as a key placed in this sounder circuit. There being no escape on this circuit, the sounder works uniformly, as long as the battery is in proper order. The sounder, or secondary, circuit has no connection with the main circuit, and opening the secondary circuit does not affect the main circuit. The operation is as follows:

The main circuit is opened with the key. This removes the magnetism in the soft iron cores of the relay, and, as the attraction between the cores and the armature is destroyed at the same time, the spring pulls the armature back, and the movement of the armature breaks, or opens, the local, or secondary circuit, causing the sounder cores to lose their magnetic attraction and the armature is drawn back by the spring. In this way, every opening of the main circuit results in the opening of the local circuit, and the relay and sounder move in unison.

*From the *Seventh District Blue Book.*

CONNECTING INSTRUMENTS.

Run a wire from the switchboard to one leg of the key in the main circuit, another wire from the other leg of the key to one of the right-hand posts of the relay, and a third wire from the other right-hand relay post to the switchboard. For the secondary, or local circuit, run the wires as follows: From one pole of the battery to one post of the sounder, from the other post of the sounder to one of the left-hand posts of the relay, from the other left-hand post of the relay to the other pole of battery.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What is the effect of fine, dry weather upon the resistance of a line and what is the effect of wet and foggy weather?

What is meant by balancing a duplex and how is the balancing effected?

What is the name of the instrument used for increasing and decreasing the resistance of the artificial line?

What metal is used for resistance coils?

Is the resistance of the line the only factor to balance against?

What causes electrostatic electricity and in what respect does it differ from current or dynamic electricity?

What causes electricity to accumulate upon the surface of the conductor?

Does static electricity penetrate the substance of the wire, or does it reside on the surface?

Upon what does the quantity of electricity accumulated depend?

Does the earth have any influence on the accumulation of static electricity?

Does the character of the insulating medium between the wire and the earth affect the accumulation of static electricity?

In closing the key on a circuit, does all of the battery current reach the farther end? If not, give the reasons.

What portion of the current does the static charge absorb?

What is the "current of charge" and what are its momentary effects?

What is the cause of the effect known as a "kick," and how does the kick vary?

Is a kick more pronounced on a highly insulated or on a poorly insulated line?

After obtaining the resistance balance, what is the cause of the false signal upon the home relay when the main line is charged initially, and what is the cause of the kick when the home battery is detached from the line and the line connected with the earth?

Are false signals also produced by the current from the distant battery?

What is the effect upon the true signals of the false signals or kicks?

How are the false signals eliminated, and what is the name of the instrument used for the purpose?

How is a condenser constructed, and what is its use in connection with telegraph apparatus?

How does a condenser accumulate an electric charge, and in what way does its discharge counteract the effect of the electrostatic discharge from the line?

What is meant by the capacity of a condenser, and how is the capacity varied?

Study Fig. 149 of the text-book in order to understand the manner in which the condenser is connected to the artificial line of the duplex and to the earth.

In balancing a duplex, what are the two effects to be balanced?

What is the purpose of the rheostat?

How is the resistance of the main line balanced on the rheostat?

Does the resistance of the rheostat control the static discharge from the line?

What is the essential condition of the apparatus at the home station in its relation to the current coming from the distant station?

What is the ground coil, and what is the spark coil?

What are the relative resistances of the two coils?

What is a polar, or double-current, duplex?

What is the name of the instrument which reverses the polarity of the battery?

In reversing the polarity, is the main line current interrupted?

How is the transmitter of a duplex operated, and is there any essential difference between it and the ordinary Morse key?

(To be Continued.)

The Kilovolt-Ampere.

The term kilovolt-ampere (abbreviated kva.) is frequently met in modern electrical literature, and there are many people who do not know the meaning of it.

The kilovolt-ampere is the product of volts times 1,000, times amperes, the word kilovolt meaning 1,000 volts. The term kilowatt, abbreviated kw., in alternating-current practice is understood to mean volts times 1,000, times amperes, times power-factor. The advantage of rating a dynamo-electric machine in kva., instead of kw., lies in the fact that a kva. rating tells what load the machine will carry under all conditions, whereas if a kw. rating is given, other facts must be stated before it will be known what the machine will be able to do under all conditions of load and power-factor.

Resistance of Duplex and Quadruplex Sets.

BY C. G. ALLEN, BOISE, IDAHO.

The article on resistance of bridge duplex and quadruplex sets, by Mr. H. W. Drake, which appeared in the July 16 issue of TELEPHONE AND TELEGRAPH AGE, was, no doubt, read with much interest by many. The complicated circuits of multiplex telegraph apparatus has been a topic of conversation and correspondence between myself and associates for a number of years. We have found in these circuits some very elaborate material for thought and investigation.

The formulas offered and curves plotted by Mr. Drake fulfill their purpose very nicely in relation to the circuits presented and conditions bearing on them, but they do not cover all the conditions met with in working multiplex circuits of this kind. Unless there is something I have been unable to understand, the curves give the minimum set resistance to incoming currents under one phase of the working condition only. I present herewith my version of the matter to be compared with Mr. Drake's.

Fig. 1 is a diagram of a bridge duplex circuit, similar to the one presented in Mr. Drake's article, in which S is the artificial line branch, C the pole-changer and resistance lamp branch, A and B the bridge arms and R' the polar relay branch. The joint resistance between M and N of this arrangement of branches is given in formula 1, which is deducted from Kirchoff's laws. It will be noted

$$R = \frac{B(A+C)(R'+S) + AR'(C+S) + CS(A+R')}{B(A+C+R'+S) + (A+R')(C+S)} \qquad (1)$$

this formula differs slightly from the one offered in Mr. Drake's article. This discrepancy is probably due to an error in transcribing, because the formula given herewith was also taken from Kemp's handbook of electrical testing also. [The error referred to was discovered after the publication of the issue

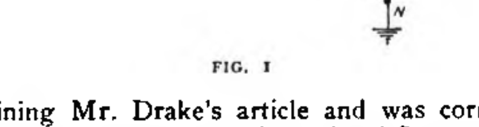


FIG. 1

containing Mr. Drake's article and was corrected by him on page 541 of our issue dated September 1. The error was of a clerical nature and was made in transcribing from notes.—EDITOR.]

If we substitute the values given in curve 10, Fig. 2, of Mr. Drake's chart, in which the artificial line equals 5,000, relay 400, lamp 300 and the bridge arms 500 each, it gives us slightly over 585 ohms joint resistance between M and N, as shown by the chart. This offers resistance to incoming currents when the pole-changer remains on either side, which resistance, it will be shown later, is the minimum with the given values. In actual operation, however, the pole-changer, in moving from one pole to the other, opens the circuit C.

During the time branch C is open we find an arrangement of branches as shown in Fig. 2. For this network of branches formula 2 is used. If

$$R = \frac{R'(A+B)}{R'+A+B} + S \qquad (2)$$

we substitute in the formula the values given in formula 1, we get 5,286 ohms. This gives us the

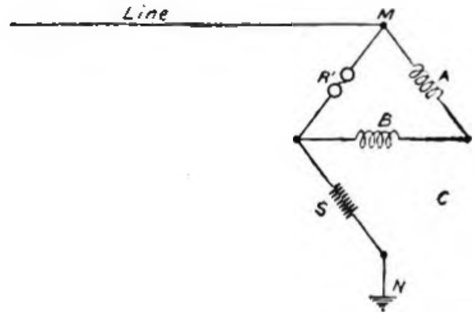


FIG. 2

maximum resistance under working conditions. If we assume branch C to be open one-eighth of the time necessary to complete a cycle of the pole-changer, then the minimum resistance is presented seven-eighths and maximum resistance one-eighth of the cycle. The resistance during the complete cycle would then be expressed in formula 3, which

$$R = \frac{\left(\frac{R'(A+B)}{R+A+B} + S - \frac{B(A+C)(R'+S)+AR'(C+S)+CS(A+R')}{B(A+C+R'+S)+(A+R')(C+S)}\right)}{8} + \frac{B(A+C)(R'+S) + AR'(C+S) + CS(A+R)}{B(A+C+R'S) + (A+R')(C+S)} \qquad (3)$$

gives 1,172 ohms resistance presented to the incoming currents when the ratio of the open to the closed time of the circuit C is seven to one.

From this it can be seen that the resistance offered to the incoming currents depends largely upon the ratio of the open to the closed period of the branch C and as this open period depends upon the rapidity with which the pole-changer is actuated, the resistance to the incoming currents can have no constant value.

In Morse duplex working the ratio of the open to the closed period is very small and consequently not very noticeable, but in automatic working, such as Wheatstone and printers, it becomes very marked and is a large factor in causing what is known as the "lengthening of the artificial line," *i. e.*, the difference between a balance taken with the distant pole-changer idle and when the pole-changer is operating at a rapid rate. It is also very marked in quadruplex working and is a factor of no small magnitude in causing what is commonly called a "breakover," *i. e.*, when the distance pole-changer is open too wide it throws the distant artificial line in series with the main line at each reversal, thus upsetting the balance of the home neutral relay.

By examining Fig. 3, it will be noted that branch C takes a different form in a quadruplex. When the pole-changer stands on either side F is the added resistance in series with the lamp C and forms a joint circuit with the leak resistance L. The resistance of the branch C with this arrangement is given by formula 4. By substituting in formula 1 the value of C we get the minimum set

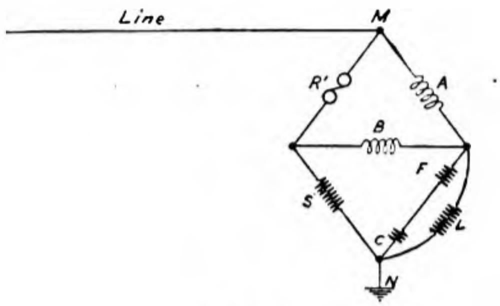


FIG. 3

$$C = \frac{L(C + F)}{L + C + F} \qquad (4)$$

resistance for a quadruplex. It is well known, however, that the resistances of the branches C, F, L, are so arranged that all conditions of the circuit when C is closed give a single or joint resistance equal to the lamp, therefore formula 1 also gives the minimum set resistance for a quadruplex. When the transmitter is open, which closes branch L, and the pole-changer is not resting on either side, which opens the circuit C F, if we substitute L for C, formula 1 gives the resistance for such a condition. When the transmitter is closed, which opens the branch L and the pole-changer is not resting on either contact, which opens the branch C, formula 2 then gives the maximum resistance for a quadruplex also.

Experiments made to determine the relations of the open to the closed periods of the branch C seem to indicate that in ordinary Morse duplex working the ratios are about one to seven, and in automatic work about two to seven. I arrived at this conclusion in the following manner: I arranged a dummy main line circuit as shown in Fig. 4, and placed a battery and direct current millammeter as shown. With the generators dead and short circuited, I took a reading with the circuit C

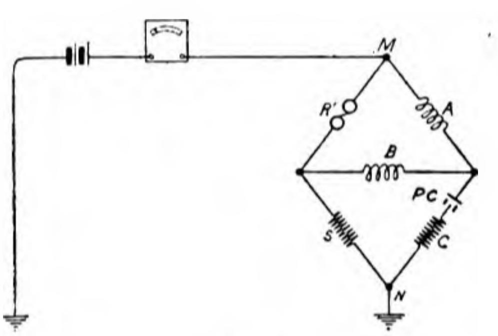


FIG. 4

closed, which I called D, and a reading with the circuit C open, which I called D'. Then with the pole-changer vibrating I took another reading, which I called D''. Any decrease in the reading D must be due to the open period of the branch C. From this we get formula 5, in which O equals the open and C the closed time.

$$D - D' - D'' ; D - D' :: O : C \qquad (5)$$

This article, of course, does not take into consideration the effect the discharge of the condenser in the artificial lines, or the choking effect the bridge arms may have on the incoming currents.

Welding of Platinum Points.

Ever since the telephone and telegraph came into existence the use of platinum as a contact point has increased until at present this metal is demanded so much as to make its cost high.

The old method of making a platinum point on a contact spring or armature, says Mr. H. E. Weightman in the *Electrical Review and Western Electrician*, was to drill or pierce a hole in the piece and press a small piece of platinum into the hole by means of a foot press.

This method was good as far as labor was concerned, but the amount of platinum in the hole of the spring was considerable, even making the hole as shallow as permissible. A new method was started to obviate this trouble, that of welding a thin disk of the metal to the surface of the spring. In welding platinum sheet it was found that a thin coat of copper plate on the platinum next to the spring aided in welding the disk to the spring and reduced the amount of current necessary to effect a weld. A modern welding machine, which is automatic in its action, takes a strip of platinum sheet 0.005 inches thick and 0.115 inches wide, or a coil of platinum wire, depending upon whether a flat contact is to be made or a pointed form. This strip is fed to the clamping device, which cuts off the proper sized piece and deposits it upon the spring where it is clamped and a current of electricity sent through it, causing the platinum to weld to the spring. The point is then flattened or pointed, as the case may be, by a die, as it leaves the machine. The labor saved by this method and the increased output per unit of floor space occupied is considerable, but is offset somewhat by the increased cost of power and depreciation of the machine. The principal saving is made in the amount of platinum used per contact.

Mr. J. W. McMahon, telegraph supervisor, joint office Western Union Telegraph and American Telephone and Telegraph Companies, Newark, N. J., writes: "I thank you very much for your courtesy in renewing my subscription, and hasten to reward your kindness by my little donation. I can truthfully say I enjoy the paper more now than ever since I became engaged in joint office management. The educational and news items are always interesting and really essential to the telegraph and telephone fraternity."

Principles and Discoveries Relative to Telegraphy.

In no other department of physical science have such remarkable developments occurred during the past century as in electricity and magnetism, for in no other department have the practical applications of scientific discovery been so numerous and so far-reaching in their effect upon social conditions.

Two Italian philosophers, Galvani and Volta, toward the close of the eighteenth century, contributed to the invention of what is known as the galvanic or voltaic battery, the output of which was not at first distinctly recognized as the electricity of the older schools. By this beautiful discovery electricity was, for the first time, enslaved to man, who was now able to generate and control it at times, and in such quantities as he desired. Although the voltaic battery is now nearly obsolete as a source of electricity, its invention must always be regarded as one of the three epoch-making events in the history of the science during the past 130 years. For three-quarters of a century it was practically the only source of electricity, and, during this time, and by its use, nearly all of the most important discoveries were made. Even in the first decade of the century many brilliant results were reached. Among the most notable were the researches of Sir Humphrey Davy, who, by the use of the most powerful battery then constructed, resolved the hitherto unyielding alkalies, discovering sodium and potassium, and at the same time, exhibited, in his lectures in the Royal Institution in London, the first electric arc light, the ancestor of the millions that now turn night into day.

The cost of generating electricity by means of a voltaic battery is relatively very great, and this fact stood in the way of the early development of its applications, although their feasibility was perfectly well understood. Without any other important invention or discovery than that of the voltaic battery, much would have been possible, including both electric lighting and the electric telegraph. Indeed, electric telegraphy had long been a possibility, even before the time of Galvani and Volta, but its actual construction and use was almost necessarily postponed until a second capital discovery came to remove most of the difficulties.

This was the discovery of a relation between electricity and magnetism, the existence of which had long been suspected and earnestly sought. A Danish professor, Hans Christian Oersted, was fortunate in hitting upon an experiment, which demonstrated this relation and opened up an entirely new field of investigation and invention. What Oersted found was that when a conductor, as a copper wire, carrying an electric current, was brought near a freely suspended magnet, like a compass needle, the latter would take up a definite position with reference to the current. Thus an electric current moved a magnet, acted like a magnet in producing a "magnetic field." The subject was quickly taken up by almost every physicist in Europe and America. Arago found that iron filings would cling to a wire through which a current was passing, and he was able to magnetize steel needles by means of the current. Ampère, another French physicist, studied Oersted's wonderful discovery, both experimentally and mathematically, and, in an incredibly short time, so developed it as to deserve the title of creator of the science of electro-dynamics.

The first to make what is known as an electromagnet was an Englishman named Sturgeon, who used a bar of soft iron, bent in a horseshoe form, and after varnishing the iron for insulation, wrapped a single coil of copper wire about it, through which the current from a battery was passed. There was thus two ways of producing visible motion by means of an electric current; that of Oersted's simple experiment, in which a suspended magnetic needle was deflected by a current; and that made possible by the production, at will, of an electromagnet. The application of both of these ideas to the construction of an electric telegraph was quickly attempted, and two different systems of telegraphy grew out of them. One, depending on Oersted's experiment, was developed in England first, and afterward in Europe; the other, that involving the use of signals produced by an electric magnet, was developed in America, and was generally known as the American method. It has long ago superseded the first method in actual practice. Its possibility depended on perfecting the electromagnet, and especially on an understanding of the principles on which that perfecting depended. For the complete and satisfactory solution of this problem we are indebted to the most famous student of electricity America has produced during the century, Joseph Henry.

In 1829, while a teacher in the academy at Albany, N. Y., Henry exhibited an electromagnet of enormously greater power than any before made, involving all of the essential features of the magnet of to-day. The wire was insulated by silk wrapping, and many coils were placed upon the iron core, the intensity of magnetization being thus multiplied. Henry studied also the best form and arrangement of the battery under varying conditions of the conductor. An electromagnetic telegraph had been declared impossible, in 1825, by Barlow, an Englishman, who pointed out the apparently fatal fact that the resistance offered to the current was proportional to the length of the conducting wire, and that the strength of the current would be thus so much reduced, for even short distances, as to become too feeble to be detected. Henry showed that what is known as an "intensity battery" would overcome this difficulty, discovering experimentally and independently the beautifully simple law showing the relation of current to electromotive force, which Ohm had announced in 1827. He also invented the principle of the relay, by which the action of a very feeble current controls the operation of a more powerful local system. It will thus be seen that the essential features of the so-called American system of telegraphy are to be credited to Henry, who had a working line in his laboratory as early as 1832.

Morse made use of the scientific discoveries and inventions of Henry, and, by his indefatiguable labors and persistent faith, the commercial value of the enterprise was really established. In the meantime, considerable progress was made in Europe, Baron Schilling, a Russian counsellor of state, devised and exhibited a needle telegraph. The two illustrious German physicists, Gauss and Weber, established a successfully working line, two or three miles long, in 1833, and this system was commercially developed by Steinheill in 1837. In England, Sir Charles Wheatstone made many important contributions, although using the needle system, which was afterward abandoned. Before the middle of the nineteenth century the commercial success of the electromagnetic telegraph was assured, and in the matter of transmission of messages distance was practically annihilated.

Telegraphing Cinema Films.

According to the *Lokal-anzeiger*, a new type of telautograph has lately been used successfully to transmit cinematograph pictures by wire. If a practicable system could be designed for reproducing cinema films telegraphically at a distance and at moderate cost, says *Electricity* of London, there would be a considerable field for the application of the process for reproducing topical films. The present experiments, however, which it is proposed to repeat at a forthcoming German scientific congress at Vienna have shown that, by the means so far available, it is only possible to reproduce about twenty pictures per hour. Even a short topical film occupies anything from one-half to two minutes or more, *i. e.*, contains 480 to 2,000 pictures, so that the process mentioned has yet to be quickened enormously before it can claim practical importance. Ordinary photographs have been telegraphically transmitted from Paris to London for newspaper illustration purposes for some time past, and presumably the process which has been tested in connection with cinematograph films does not differ essentially in its *modus operandi*, but whereas thirty square inches of photograph have to be transmitted in the case of newspaper illustration, 100 feet of cinematograph film represents an area of about 1,200 square inches to be reproduced, and yet will provide less than two minutes' entertainment when projected. One of the most successful systems of telegraphing pictures builds up the "secondary" picture by a number of parallel lines of varying density according to the density of the original corresponding "lines of analysis," but whereas comparatively few lines will yield a reproduction sufficiently good for newspaper work, many more lines per inch width are required to produce a picture which will bear inspection when magnified, say, 200 times on the cinema screen. Another point of interest is the question as to whether the inevitable "staggering" of the lines in successive film pictures will blend away and be unnoticeable on the screen or whether it will lead to annoying patterns, such as those which appear when a half-tone illustration is viewed through a gauze of incorrect mesh and adjustment.

Wireless on Canadian Inland Waters.

Brief reference was made in a recent issue to the new radio law passed by the Canadian parliament regarding radio service on Canadian vessels plying on inland waters. Section 4 of the act, taken from *Canadian Railway and Marine World*, reads as follows:

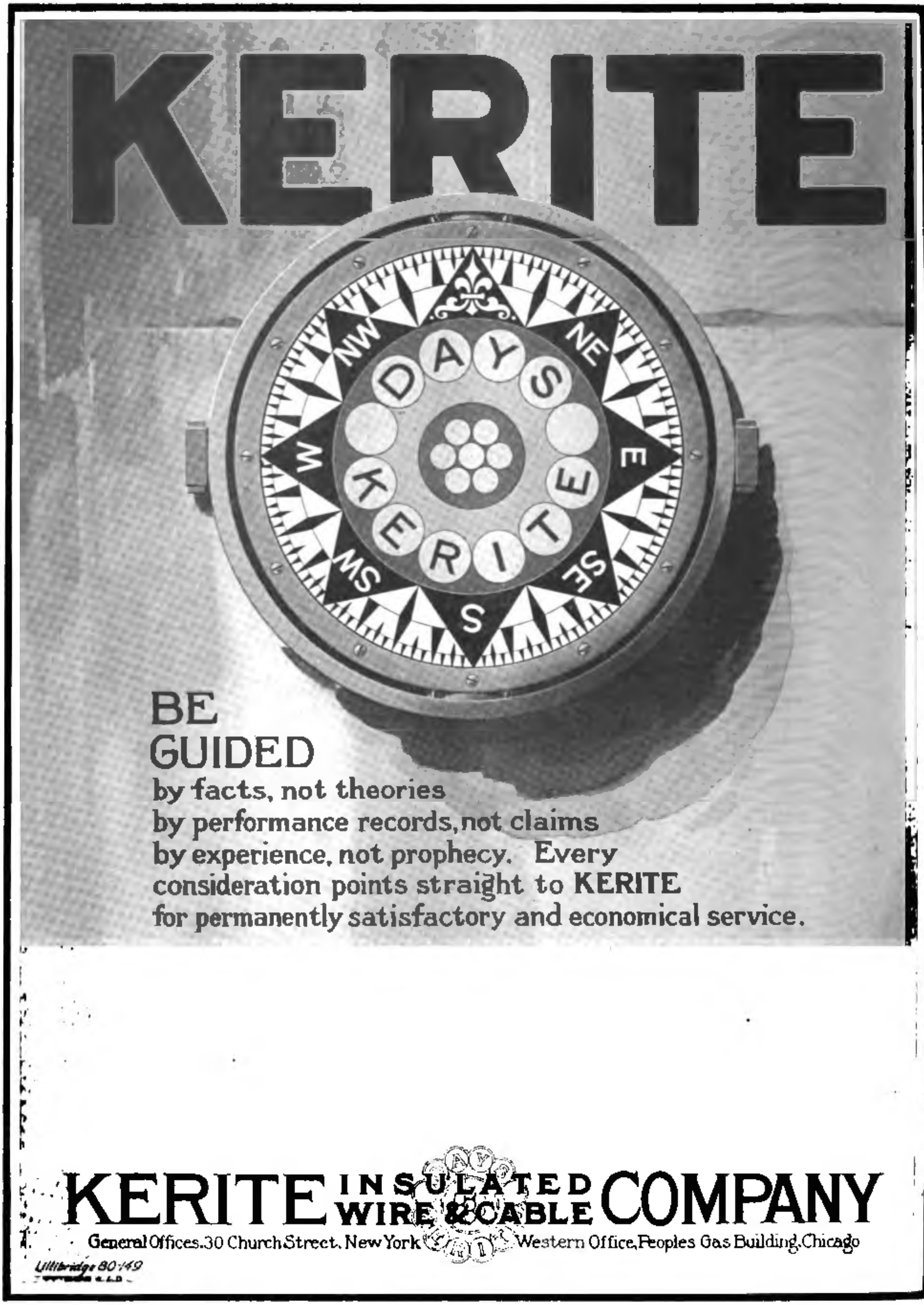
"From and after January 1, 1914, no passenger steamer, whether registered in Canada or not—(a) licensed to carry fifty or more persons, including passengers and crew, and going on any voyage which is or which includes a voyage of more than 200 nautical miles from one port or place to another port or place; or, (b) licensed to carry 250 or more persons, including passengers and crew, and going on any voyage which is or which includes a voyage of more than ninety nautical miles from one port or place to another port or place; or, (c) licensed to carry 500 or more persons, including passengers and crew, and going on any voyage which is or which includes a voyage of more than twenty nautical miles from one port or place to another port or place shall leave or attempt to leave any Canadian port unless such steamer is equipped with an efficient radio-telegraph apparatus, in good working order, capable of transmitting and receiving messages over a distance of at least 100 nautical miles by night and by day, and in charge of a person fully qualified to take charge of and operate such apparatus.

"2. The owner, master or other person in charge of any passenger steamer which leaves or attempts to leave any Canadian port contrary to the provisions of this section shall, on summary conviction, be liable to a fine not exceeding $1,000 and costs, and such fine and costs shall constitute a lien upon such passenger steamer.

"3. This section shall not apply to passenger steamers plying on the rivers of Canada, including the River St. Lawrence as far seaward as a line drawn from Father Point to Point Orient, or on the Northumberland Straits, or on the Georgian Bay, or on the lakes of Canada other than Lakes Ontario, Erie, Huron and Superior, and the provisions of paragraph (c) of subsection 1 of this section shall not apply to steamers making voyages on Lakes Ontario, Erie, Huron and Superior. the regular route for which is not at any point more than seven miles from the shore.

"4. This section shall not apply to steamers calling at Canadian ports solely for the purpose of obtaining bunker coal or provisions for the use of such steamer, or through stress of weather, or for repairs."

TELEGRAPHERS IN THE ARMY.—It is stated that there are over 1200 telegraphers in the ranks of the United States Army.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General Offices, 30 Church Street, New York
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THE RAILROAD.

Mr. George A. Cellar, superintendent of telegraph, Pennsylvania Lines West of Pittsburgh, was in New York October 9 on business.

Mr. C. S. Rhoads, superintendent of telegraph, Cleveland, Cincinnati, Chicago and St. Louis Railway, was a recent New York visitor.

Wireless Train Control.—A wireless train control system, invented by Prof. C. Wirth, of Nuremberg, Germany, has, it is stated, been successfully tested on the Bavarian State railway lines.

Meeting of Telegraph Superintendents of New York Central Lines.

A meeting of joint superintendents of the New York Central Lines was held at Statler's Hotel, Buffalo, N. Y., October 8, at which matters pertaining to the service were discussed.

Those present were: Mr. E. C. Keenan, general superintendent of telegraph, Chicago, Ill., and the following superintendents: C. F. Rhoads, Cleveland, Cincinnati, Chicago and St. Louis, Indianapolis, Ind.; F. F. Riefel, Lake Shore and Michigan Southern, Cleveland, Ohio; J. J. Ross, Michigan Central, Detroit, Mich.; A. B. Taylor, New York Central and Hudson River, New York; L. A. Lee, Pittsburgh and Lake Erie, Pittsburgh, Pa., and W. L. Connelly, Chicago, Indiana and Southern, Gibson, Ind.

Recent Improvements in the Railophone.*

BY FRED W. SCHOLZ.

The Railophone, first used on the London-Brighton Railway line in England, was invented by a German engineer, Von Kramer, and is used to transmit signals between a railway station and a moving train. This effect is obtained through the use of alternating currents, which are produced in a circuit lying parallel to the rails, and which currents are duplicated inductively in the train on a frame containing a large coil of wire. At the time when the first trial was made, Kramer used a large coil of wire which he wound around a railway car and which was connected to a microphone, a telephone receiver and a switch on the car. The switch was used either to send the telephone circuits into the large coil, or to receive the electric signals by means of the receiver. Simultaneous speaking and listening was not possible. The permanent current circuit was placed between the rails and consisted of a loop of insulated copper wire which was fastened to the ties by means of insulators. The one side of the loop, the outgoing line was placed between the tracks of the outgoing trains, and the return circuit was placed between the tracks of the incoming trains. The two circuits were crossed several times along the railway line in order to avoid interference with the other telephone and telegraph lines. The end of the loop was also connected to a microphone and a receiving instrument, which could be connected to the loop by means of a switch. The space between the lower part of the large coil, which was wound around the car, and the loop was about twelve inches. This air space was sufficiently small to make telephone conversations audible.

In 1911 Kramer carried out some improvements on the Stratford-on-Avon line, in which conversations could take place between station agent and conductor on the train, as is the case with the ordinary telephone. The speed of the train, which was about fifty miles an hour, had no influence on the test. In this latter trial two horizontal frames were fastened to the railway car, the one below the lowest car step, the other below the second step, both at a distance of about 2.3 feet. The upper frame was used to send out telephone currents, the lower one was connected to a receiver. The ground line here consisted of an insulated cable, which was laid parallel to the tracks about two feet below the surface. The distance between the cable and the upper car frame was about seven feet. This arrangement worked well from the start and is still in use.

Kramer now tried to improve his system, so that the trainmen could call up any station from the moving train, and vice versa. The completion of this latter attempt was not reached till the early part of this year. For signal service he used a very sensitive resonance relay. This relay is used to receive the exceedingly weak signals, and then to use these by means of other relays for currents to operate electric bells, optical signals, or else to operate switches or brakes by means of electromagnets. In this way he hoped to use the railophone system for railway signal service, in which he also succeeded. Such a line was built on the mentioned railway. Its purpose is the following: 1. The train receives an induction current every time it enters a block. This current operates the instruments on the train. The switch tower man or track walker also receives a signal, usually a bell, which rings as long as the train is in the block. 2. While the train is on this line, the signal lever is automatically locked, and is released only when the train has left the block. This prevents another train from entering the block while the track is not clear. 3. The switch tower man can stop the train at any point in the block in case of danger. 4. If the train should enter the block, which is held by another train, it will be stopped automatically by the electric system. 5. If the train runs into an open block, and if the tower man forgets to set the signal in the block to danger, the train sets the signal automatically into that position. The automatic signal system works automatically and does not interfere in any way with the locomotive engineer or the switch tower man, except when they forget to follow rules, when the signal system begins to work and calls their attention to their errors. This system has been equipped with switches so that the railway people can either telephone or use the system for signals.

* *Telephone Engineer.*

Telephone Head Receivers and Advantages of Telephone Train Dispatching.

It has been pointed out that the continuous use of telephone head receivers by railway train dispatchers and others has some objections, and many attempts have been made to relieve these employes of the physical strain imposed upon them by the weight of the instruments.

Mr. J. C. Johnson, superintendent of telegraph of the Pennsylvania Railroad, Philadelphia, Pa., referred to this matter in his paper on the use of telephones in train dispatching, read at the St. Louis convention of the Association of Railway Telegraph Superintendents, last May.

The constant wearing of the head receiver for eight hours is not always desirable, he said, as this additional pressure upon the ear produces painful sensations after a time, and it is also stated that it causes the ear to be more sensitive to weather conditions than otherwise. This has been overcome, to a certain extent, by the use of lighter equipment and by the dispatcher so developing his sense of hearing that he may change the receiver from one ear to the other and thereby obtain relief for the tired member. On the divisions where the traffic is light, a signal circuit is provided, which enables the way stations to signal the dispatcher by means of a push-button and buzzer. The dispatcher can then remove the head receiver for a considerable portion of the time. The use of the rubber ear cushion is considered favorably by some dispatchers, but does not meet with general approval, as this is apt to cause excessive perspiration, and, after a while, it becomes foul. The loud-speaking receiver for use as an auxiliary in such cases and during thunder storms would seem to be the solution of some of these troubles reported by the dispatchers. Many of our oldest dispatchers have stated that they have worn the head receiver through all kinds of storms, and have never received any injury from this source, although there is a snapping and crackling sensation, which, to the more timid, might be considered dangerous.

Referring to the benefits derived by the use of the telephone system of train dispatching, he said:

"In train dispatching, the calling of the offices is much faster than by Morse, as one office can be called while the dispatcher is talking to another. It has also been our experience that the bell is a positive signal that the operators will immediately answer, no matter how they may be engaged at the time. Orders can be repeated back much quicker than by the telegraph. Greater details are obtained relative to any emergency than are ordinarily given through a third person, who is necessary in case of Morse. The feature of personal contact by the use of the telephone results in a more cordial feeling between the dispatchers and the different way-station operators than could possibly be obtained by previous methods. The use of the breast transmitter enables the dispatcher to use both hands. Reduction in delays to train movements. The fact that an employe does not have to have a certain length of experience in learning any operating code, but can qualify for such positions in from one to two months instead of six months to a year, results in a very much better supply of more efficient operators. It is estimated that a saving of about forty per cent in time is effected over that required for similar operation by telegraph, which greatly relieves the lines and does away with the congested condition of wires, and the contentions between operators for the use of the circuit. The train wire may be cut into the more important yard offices on the division, thus enabling the dispatcher to communicate directly and promptly with the yardmaster or assistant trainmaster, when conditions demand. No chance for the operator to open the train wire and place it out of service when leaving the instrument to attend to other business. Wet and foggy weather has no detrimental effect upon transmission, in fact, it usually improves it. As a general thing, those telegraph operators who have been opposed to the use of this means of dispatching and handling train orders before experimenting with it, have become very warm friends of this means of communication, after having tried it for some time, and have expressed a wonderment that they were able to do without it for so long a period. In many cases, they consider it a hardship to go back to the key in case of trouble on the telephone selector system. Many inefficient telegraphers, and others suffering from telegraphers' paralysis, have thus been enabled to maintain their positions."

The Buzzoplex.

Messrs. J. H. Bunnell & Company, Inc., New York, are introducing a wireless telegraph learner's instrument, which, no doubt, will be a great help to those who are learning to send and receive wireless signals. The instrument consists of a high-frequency double-wound vibrator mounted on a polished hard-wood base, with one of the firm's wireless keys, a double-pole, double-throw switch and three sets of terminals making an attractive as well as useful apparatus. The signals heard in the telephone are precisely the same as those heard in a regular wireless station. A cell or dry battery is connected so as to operate the buzzer, which is controlled by the key in the usual manner.

For class-room work several head telephones may be connected in series so that a number of students can listen at the same time. With condensers, the Buzzoplex can be used to give a phantom circuit on a single telegraph line without interfering with the regular Morse signals.

The instrument can also be used for testing detector crystals.

The Cost of the Western Floods.—The total loss of property caused by the floods in the Ohio Valley last March is estimated at $163,000,000. This includes damage to railroads, telegraph and telephone lines, which was very great.

Mr. L. D. Gagen, manager Western Union Telegraph Company, Akron, Ohio, writes: "I do not know of anything I enjoy more than the perusal of the Age. The report of the Old-Timers' Convention was a dandy, I thought."

PHILLIPS CODE.

The popularity of Phillips' Code, by Walter P. Phillips, was never more apparent than at the present time. Its acceptance by the telegraphic fraternity, as a standard work of the kind, dates from its first publication, and the constantly increasing demand for this unique and thoroughly tested method of shorthand arranged for telegraphic purposes has necessitated from time to time the issuance of several editions. The present edition was carefully gone over, a few revisions made, and a number of contractions added, until now this "staunch friend of the telegrapher" is strictly up-to-date in every particular. It has been declared that an essential qualification of a "first-class operator" is a thorough understanding of Phillips' Code.

The use of this system promotes rapid transmission, and for press reports especially was long since declared to be the best ever devised. By common consent it is recognized as standard, and everywhere is regarded in the profession as indispensable in contributing to the operator's fund of practical knowledge. In fact, not to understand Phillips' Code acts as a distinct embarrassment to the operator.

The price of the book is $1 per copy. Address J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

One-Day Postponement of Telephone Pioneers' Convention.

The third annual convention of the Telephone Pioneers of America, which was to have taken place at the Congress Hotel, Chicago, October 16 and 17, has been postponed one day, and will therefore be held October 17 and 18. This change was made necessary because the president, Mr. Theo. N. Vail, found it impossible, on account of previous engagements, to reach Chicago in time to preside at the meeting on the sixteenth. He, however, has been able to make arrangements to be there the following day and the plans have been changed accordingly. The programme, as already announced, will be fully carried out except as to the matter of dates.

The business meeting will be called to order at ten o'clock, Friday morning, October 17, and the telephone play will be given on Friday evening at a location to be announced. The addresses of Messrs. N. C. Kingsbury, vice-president of the American Telephone and Telegraph Company, New York; Thomas A. Watson, Thomas B. Doolittle and Martin J. Carney will be made on the afternoon of Friday, October 17. The visits of inspection will take place on the day following—Saturday.

The annual banquet will be given by the American Telephone and Telegraph Company at the Congress Hotel at seven o'clock in the evening of October 18.

A special train from New York will be run over the Pennsylvania Railroad. The Committee on Transportation consists of Messrs. R. H. Starrett and W. E. Huntington, both of New York.

Fifty-six new members were admitted to the association by the Executive Committee on October 2.

HISTORICAL.

The Telephone Pioneers of America was organized in Boston, November 2, 1911, at the Hotel Somerset. The meeting was called to order by Mr. Thomas B. Doolittle. General Thomas Sherwin, chairman of the Board of Directors of the New England Telephone and Telegraph Company, Boston, was appointed temporary chairman, and Mr. Henry W. Pope, of New York, temporary secretary. The association was formed "for the purpose of recalling and perpetuating the facts, traditions and memories attaching to the early history of the telephone and telegraph system; preserving the names and records of the participants in the establishment and extension of this great system of electrical communication; the promotion, renewal and continuance of the friendships and fellowships made during the progress of the telephone industry between those interested therein, and the encouragement of such other meritorious objects, consistent with the foregoing as may be desirable." The following named gentlemen were elected officers for the first year: President, Theo. N. Vail; vice-presidents, F. N. Bethell, W. T. Gentry, E. B. Field and B. E. Sunny; secretary and treasurer, Henry W. Pope; Executive committee, T. D. Lockwood, J. J. Carty and F. A. Houston. In the afternoon Dr. Alexander Graham Bell, Mr. Frederick P. Fish, former president, and Mr. T. D. Lockwood, general patent counsel of the American Telephone and Telegraph Company, made interesting addresses. November 3 was spent in visiting the main exchange in Boston, and an automobile trip to Lexington, Concord and other historic points in the vicinity of Boston. In the evening there was a banquet at the Hotel Somerset.

The second annual convention was held at the Hotel Astor, New York, November 14, 15 and 16, 1912, and was a highly successful meeting in every particular. The officers and members of the executive committee for the first year were re-elected and Messrs. Thomas B. Doolittle and Charles R. Truex were added to the executive committee. In the afternoon, Mr. Thomas A. Watson, who was prominently associated with Dr. Bell for many years in the development and public introduction of the telephone, made a very interesting address. He was followed by Messrs. J. J. Carty, chief engineer of the American Telephone and Telegraph Company; Union N. Bethell, president of the New York Telephone Company; Emile Berliner, of Washington, D. C., inventor of the Berliner transmitter; Samuel B. McMeen, of Chicago, and J. E. Kingsbury, director of the Western Electric Company, London, England. In the evening there was a theatrical entertainment at the hotel. On November 15, a variety of entertainment was provided for the members, including a thirty-five mile automobile ride to Briarcliff Manor, and, in the evening, there was a banquet at the Hotel Astor, at which there was an attendance of 600 persons. November 16 was spent in sightseeing.

An Important Book on Testing.

Every student-telegrapher should have in his library of electrical literature a copy of "Electrical Instruments and Testing," by Norman H. Schneider. The importance of electrical testing cannot be over-estimated, and a practical knowledge of this branch of technical telegraphy is indispensable to those who would progress. This book is the latest on the subject of testing and is clearly written and well illustrated. It is as useful to the telephone man as to the telegrapher, as it contains a good deal of information on testing in telephone exchanges. The work is designed for the practical man and contains only the simpler mathematics. The chapters on the testing of telegraph wires and cables, and the location of faults were written by Mr. Jesse Hargrave, a well known telegraph engineer.

The price of this book is $1.15, postpaid, to any part of the world and orders will be filled by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, on receipt of price.

LINEMAN FAINTS AT SIGHT OF MONEY.—A lineman in a western city received $4,500 damages from a telegraph company for injuries sustained as a result of falling from a pole. The sight of so much money caused him to faint away. This particular occurrence, however, should not be taken to indicate that linemen are not used to riches.

MUNICIPAL ELECTRICIANS.

To Rebuild Long Branch Fire Alarm System.—It is proposed to rebuild the fire alarm telegraph and police telephone systems at Long Branch, N. J., and place the wires underground.

The First Underground Fire-Alarm Telegraph Circuit.

In 1877 it was necessary to protect a certain district of Chicago with fire and police alarm boxes, and in order to make the proper locations for apparatus, Mr. J. P. Barrett, then superintendent of fire alarm, was compelled to run a line of poles through a part of what was, at that time, the most fashionable district of the city. He did this on Saturday night and Sunday morning, to avoid an injunction. On Monday morning a delegation of gentlemen from the fashionable district called on his Honor the Mayor and demanded the removal of the poles and also the scalp of the superintendent. Mr. Barrett was ordered to appear before his Honor and the committee to explain the situation and the necessity for protection, and where the appropriation for that particular extension came from.

After quite a lively discussion, he was asked by the mayor what could be done to relieve the pressure. Mr. Barrett said that if he had sufficient funds at his disposal he would put the wires underground. One of the committee asked how much that would cost. After a short mental calculation, Mr. Barrett said he thought about $900 would do the work. The next morning at ten o'clock, one of the committee called and laid $900 in currency on Mr. Barrett's desk, with the remark: "There! Now take down your —— poles!" Mr. Barrett reported to the mayor the receipt of the money, and the latter replied: "I guess, John, you are up against it now."

The first move was to secure the wire, which was obtained from Mr. Day—Kerite insulation it was. Mr. Barrett next secured the necessary length of two-inch wrought-iron pipe, reamed it out free of burrs, and then treated it to a bath of linseed oil and coal tar and dried it in the sunshine. The joints were red-leaded and the wires drawn in and connected.

Committees and delegations visited and tested the work, the press discussed it and finally the common council passed a general ordinance covering the city lines.

The attorney for the Western Union Telegraph Company said to some one at the time that "that piece of wire had caused more trouble than anything since the discovery of the telegraph."

OBITUARY.

Joseph Donahue, of Philadelphia, Pa., a well-known press operator, died in Pittsburgh, September 30.

Robert Barclay, aged seventy-two years, an old-time telegrapher, retired ten years ago, died at Iron Mountain, Mich., September 22.

Melvin T. Deetz, aged twenty years, son of Mr. George Deetz, manager of the Western Union Telegraph Company, Atlantic City, N. J., died at his home in that place, September 29.

Miss Mae Gertrude Ekblom, manager of a Western Union branch office in Los Angeles, Cal., died in that city of tuberculosis, September 17. Miss Ekblom was one of the most widely known employes of the Western Union Telegraph Company on the Pacific coast and was endeared to all who knew her.

Future Meetings of Associations, Societies, etc.

Telephone Pioneers of America, at Chicago, Ill., October 16 and 17. Secretary, Henry W. Pope, 15 Dey street, New York.

Association of Railway Telegraph Superintendents, at New Orleans, La., May 19, 1914. Secretary, P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill.

Old-Time Telegraphers' and Historical Association and Society of the United States Military Telegraph Corps, at Kansas City, Mo., September 15, 16 and 17, 1914. Secretary of Old-Timers, F. J. Scherrer, 30 Church street, New York. Secretary Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

LETTERS FROM OUR AGENTS.

PITTSBURGH WESTERN UNION.

On Thursday, September 25, the Pittsburgh Sons of Jove, of which District Commercial Superintendent A. C. Terry is a member, entertained at luncheon at the Hotel Schenley, the Illuminating Engineering Society, which was in annual session here. Mr. M. F. Knapp, local stateman, presided at the luncheon. Many interesting addresses were made. The music was furnished by seven members of the Commercial Orchestra of the Western Union Telegraph Company.

Miss M. G. Lessig has been appointed manager at Grove City, Pa., succeeding Mr. J. Starsky, resigned.

ST. LOUIS WESTERN UNION.

Mr. W. C. Rogge, wire chief of this office, returned to Indianapolis, Ind., on September 8, to resume his former position as wire chief at that point. He made many friends while in St. Louis. He is succeeded by Mr. Earl L. Morgan, chief of the Barclay printing department

Mr. F. E. Patrick, a former chief in the Barclay Printing Department, who is now located in Arkansas, recently visited this office.

Mr. C. W. Frey, assistant supervisor of wire service, New York, and formerly district wire chief in this office, was in St. Louis on October 3 and 4 on company business.

Mr. E. H. Moore, former assistant wire and quad. chief, has been promoted to be first assistant, and will have direct supervision of the quadruplex and switchboard force. He is succeeded by Mr. O. C. Dale, formerly night printer chief. Mr. Oscar Boehme has been appointed night printer chief, to fill the position formerly occupied by Mr. Dale.

Mr. A. J. Mau, former plant chief, has been appointed district equipment supervisor of the second and sixth districts, with headquarters at St. Louis.

Mr. W. C. Norby has been appointed plant chief of the St. Louis territory, vice A. J. Mau, promoted.

On the evening of September 25 a large number of the employes of the plant department attended the first meeting of the season of the Bell Telephone Society. An interesting lecture was delivered by Mr. W. C. Steinhauer, wire chief of the Western Division, Chicago, Ill., on "The Application of the Morse Telegraph by the Western Union Telegraph Company." The lecture was illustrated by stereopticon views of the different instruments in use. Mr. H. J. Pettengill, president of the Southwestern Telegraph and Telephone Company, St. Louis, related his experiences in the early days before the introduction of the present methods of testing for trouble in relay coils. In order to locate defects of this nature, Mr. Pettengill said it was the custom to unwind the coil until the fault was revealed. Mr. Pettengill's address was followed by remarks from the president of the society and others on matters of interest concerning telephone and telegraph relations.

MILITARY TELEGRAPH CORPS.—President William Bender Wilson, of the Society of the United States Military Telegraph Corps, Holmesburg, Pa., is sending out circular letters to the members, urging them to take action in the campaign for the passage by Congress, at its next session, of the bills looking to the pensioning of the members of the corps.

Telegraph and Telephone Age

No. 21 NEW YORK, NOVEMBER 1, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Primary Batteries.

Students cannot obtain a better idea of what an electric current is and what factors regulate and govern it than by studying the actions that take place in a voltaic cell, which is usually called a primary battery.

Those who begin by following this course do not have to accept some of the statements found in text-books, merely because these statements are supposedly authoritative, for the reason that the cell itself offers indisputable evidence, some of which is visible evidence, to support such statements.

It is a well-known fact that if two insulated metallic bodies are charged with electricity, no matter how, and one has a greater charge than the other, the moment they are connected together by a conductor the two unequal charges will be equalized. Yet, there has been no loss in the amount of the two charges. Evidently, then, there has been a passage of electricity from the body more highly charged to that with the lower charge. The effect manifested in the connecting wire is called an electric current. Under the conditions stated, the flow of electricity between the two insulated bodies would cease almost instantly, since the transfer, or equalization of potentials, would take place in a fraction of a second. Hence, in order to maintain a current in the conductor, the bodies must be recharged as rapidly as they are discharged. In an electric generator, this difference of potential between two points is maintained by the expenditure of mechanical power in driving the machine; in a primary battery it is maintained by chemical action.

The elements of a primary battery, therefore, consist, essentially, of two separate bodies, an external wire for connecting the two together, and an acid solution to act upon such bodies. In order that the two bodies may accumulate two charges of different strength when acted upon simultaneously by the same solution, it is necessary that one shall consist of a metal different to that composing the other. This is because different metals offer different resistances to the action of the acid. The voltage of any cell depends only upon the nature of the metals used as electrodes and the kind of solution in which they are immersed.

The ideal combination of metals used for this purpose, when a constant current is desired, is zinc and copper, because they produce a greater difference between the strength of their respective charges than do any other materials, except zinc and carbon. When zinc and copper are coupled each cell of battery will have an electromotive force of approximately one volt, if the solution consists of sulphuric acid, diluted, regardless of the size of its plates.

The total quantity of current that a cell of this kind can furnish at any one time depends principally upon the superficial area of the plates, or, in other words, upon the total area of surface exposed to the action of the acid. If zinc is coupled in the cell with any other metal than copper the voltage will be less; if coupled with carbon it will be greater. Other combinations produce different values of electromotive force.

If the student can obtain the use of a volt- and a mil-ammeter he will be able to readily verify the accuracy of most of the foregoing statements in the following manner:

First, connect the voltmeter across the binding-posts or other terminals of a zinc-copper cell of battery, containing a solution of dilute sulphuric acid, and make a note of the voltage, as indicated by the needle. Then remove the two plates and substitute a much smaller pair of the same metals. It will then be observed that the voltage has not changed in the least, thus proving that the size of the plates has nothing to do with the electromotive force.

Next connect the ammeter alone across the terminals, in the same manner, and after noting the amount of current that flows through the coils, substitute different sizes of coupled plates and take a reading in each case. The readings should differ —the larger the plates the greater the volume of current. If part of the surface of the plate is not exposed to the action of the solution, the effective size of such plate will only be equivalent to a plate having the dimensions of the remaining exposed surface. The student may verify this fact by taking readings when the copper plate is partly covered with bubbles of hydrogen gas which settle on that plate, because of the lack of a "depolarizer" or other preventive. When these bubbles accumulate, the effect is to weaken the current by decreasing the active surface of the plate.

The usual means employed to prevent this harmful action is to introduce into the solution some chemical substance that will unite with the objectionable gas before it reaches the copper plate. This is best done by using two different solutions separated by the walls of a porous cup, such as in the case in the Daniell cell, the porous cup containing one solution and the zinc plate is set bodily in a larger jar containing the other solution and the copper plate. When wet, the walls of the porous cup allows the current to pass through it, but prevents the mixing of the two fluids, one of which contains the chemical ingredients that unite with the escaping hydrogen, and thus prevent further harm.

The gravity battery represents a later form of the two-fluid battery. In this type the heavier fluid settles on the bottom of the jar and the lighter on top, while the zinc is immersed in the latter fluid, near the surface, and the copper at the bottom, in the heavier fluid.

So called "dry batteries" become exhausted quickly while in use, because, owing to their being sealed, and other reasons, the hydrogen bubbles cannot be prevented from accumulating, but the E. M. F. is usually high because the electrodes are zinc and copper.

Telegraph and Telephone Patents.

ISSUED OCTOBER 7.

1,074,170. Telegraphic System. To J. Gell, London, England.

1,074,171. Receiver for Automatic Telegraphic Systems. To J. Gell, London, England.

1,074,286. Microtelephone. To W. B. Oliver, Collingswood, N. J.

1,074,298. Telephone Repeater System. To H. E. Shreeve, Milburn, N. J.

1,074,677. Enumeration of Telephone Calls. To S. D. Williams, Newport, Wales.

1,074,831. Telegraph Key. To R. L. Boulter, Los Angeles, Cal.

1,075,007. Telephone System. To J. G. Blessing, Chicago, Ill.

1,075,257, 1,075,258, 1,075,259, and 1,075,260. Telephony. To M. L. Johnson, Chicago, Ill.

1,075,315. Automatic Transmitter for Telegraphic Systems. To J. Gell, London, Eng.

ISSUED OCTOBER 14.

1,075,423. Telephone Hand Set. To R. R. Ireland and A. F. F. Gilson, East Orange, N. J. and Closter, N. J.

1,075,430. Telephone Exchange System. To F. R. McBerty, New Rochelle, N. Y.

1,075,485. Telephone Pay Station. To G. A. Long, Hartford, Conn.

1,075,503 and 1,075,504. Telegraph Transmitter. To C. E. Scribner, Jericho, Vt.

1,075,614. Image-Transmitting Telegraph. To L. Tshörner, Vienna, Austria-Hungary.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, October 27.

American Telephone and Telegraph Co.	121¾
Mackay Companies	78
Mackay Companies, preferred	64
Western Union Telegraph Co.	63½

PERSONAL.

MR. FRANK JAYNES, former superintendent of the Western Union Telegraph Company, at San Francisco, Cal., accompanied by Mrs. Jaynes, was a recent New York visitor.

MR. E. E. HUDSON has been elected fourth vice-president of the Thomas A. Edison, Inc., Orange, N. J. He will continue, as heretofore, in charge of the sales of the primary battery department.

MR. T. C. MARTIN, an old-time cable telegrapher and now secretary of the National Electric Light Association, New York, sailed on the Cunard steamer "Lusitania," October 14, for a month's visit to England and Europe.

MR. HARRY E. DUNHAM, former editor of TELEGRAPH AND TELEPHONE AGE and now a patent attorney for the General Electric Company, Schenectady, N. Y., was in New York, October 15, on his way home from Washington, where he was admitted to the bar.

MRS. L. W. WORTSMAN, wife of Mr. L. W. Wortsman, of Savannah, Ga,, a well-known member of the United States Military Telegraph Corps and an old-time telegrapher, was a recent New York visitor. Mrs. Wortsman called on many friends while in the city.

MR. THEODORE E. MORELAND, the well-known old-time and military telegrapher, with the Western Union Telegraph Company at Pittsburgh, Pa., has retired from active service. Mr. Moreland is seventy-two years of age, and has been identified with the telegraph for nearly fifty years. He took a prominent part in the telegraph service of the Civil War.

MR. FERNANDO GIL has been appointed director of the Federal Telegraphs of Mexico, succeeding Mr. Camilo A. Gonzalez. Mr. Gil was appointed to this position July 1, by the Executive of the Union. Mr. Gil was born in the City of Mexico, August 24, 1869, and, at the age of seven years, went with his family to San Francisco, Cal., where he received his school education. He returned to Mexico in 1890, and in 1892 entered the services of the Mexican Telephone and Telegraph Company as clerk, and gradually advanced to the position of superintendent. On July 1 of this year, he was appointed director general of Federal Telegraphs, as noted. Mr. Gil has travelled considerably in the United States.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. EDWARD REYNOLDS, vice-president and general manager of this company, is again at his desk after a vacation spent in driving through the Catskill Mountains and visiting friends.

MR. J. J. CARDONA has been appointed assistant treasurer of this company to succeed Mr. Theo L. Cuyler, jr., who has resigned on account of ill health. Mr. Cuyler has, for the past twenty-eight years, filled the position of assistant treasurer. For some time, his health has been impaired, and on the advice of his physicians he voluntarily retired from active service, in order to be relieved from the strain of office work. He will spend his time out of doors as much as possible, and engage in some lighter occupation in order that his recovery may be assured. His many friends express regret at his leaving the service and wish him speedy recovery of health. His successor, Mr. Cardona, was his assistant prior to his retirement.

MR. G. W. RIBBLE, district superintendent, Atlanta, Ga., was a recent New York visitor.

MR. LOUIS L. HOWELL, supervisor of traffic, New York, has resigned to enter the service of the New England Telephone and Telegraph Company. He has been assigned to special duties in the traffic department in Boston.

MR. JOHN NEHRING, manager of the Chicago office of this company, was in New York recently. He came to meet Mrs. Nehring on her arrival from Europe, where she has been studying music.

MR. R. J. HALL has been transferred from the auditor's department, New York, to the office of the assistant treasurer.

MISS E. M. ALLEN, librarian of this company, is making an extended trip through the West.

OPENING OF NEW OFFICE IN ALBANY, N. Y.—The new office of this company, at 98 State street, Albany, N. Y., was opened on October 12. It is up-to-date in its equipment and furnishings. The offices occupy the main floor and the basement, the latter being used for the messenger force, tool rooms, storage battery and generators. The floors are of tile and the furniture of birch-mahogany finish throughout. There are accommodations for twenty operators, and the repeater tables are arranged in groups of six units, each unit having twelve sections. There are seventy-two sections for multiplex sets. The repeater tables are fireproof, as is also the switchboard; the latter is constructed of slate with angle iron frame. Mr. W. M. Pruyn is manager of the office, Mr. H. S. Mason, chief operator, assisted by Q. A. Andrews, wire chief, and G. Champion, repeater chief. Mr. W. A. Andrews is night chief and Mr. W. A. Crawford, all-night chief.

NEW LINES IN OKLAHOMA.—The new lines of the Mackay Telegraph and Cable Company reached Tulsa, Okla., October 24.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

MR. THEO. N. VAIL, president of this company, left New York October 23 for a few weeks' rest. He is now at White Sulphur Springs, Va., where he will spend a portion of the time.

MRS. NANCY WHITE BROOKS, aged eighty-seven years, mother of Mr. Belvidere Brooks, vice-president of this company, died in New York, at the home of Mr. Brooks, October 19. The remains were buried in New York.

MR. T. W. CARROLL, division traffic superintendent, Chicago, and Mr. T. P. Cummings, district commercial superintendent, New Orleans, La., were recent executive office visitors.

MR. J. P. EDWARDS, division traffic superintendent, Atlanta, Ga., was a recent executive office visitor.

MR. A. C. CRONKHITE, district commercial superintendent, Indianapolis, Ind., announces the following appointments: Mr. R. E. Eckler, manager at Muncie, Ind., to succeed J. E. Riley, resigned; Miss A. D. Harris, acting manager at Greencastle, Ind., vice Mr. W. H. Janes, who has been absent for some time on account of illness.

OFFICERS ELECTED.—At the meeting of the directors of this company on October 22, the present officers were re-elected for the ensuing year.

THE CABLE.

MR. S. FENN, traffic manager at London, Eng., is on a business trip to the United States. Before coming to New York he is visiting the Newfoundland stations.

CABLE SERVICE RESTORED.—The Commercial Cable Company announces that the Bissao-Bolama cable has been restored.

CABLE RATES REDUCED.—It is stated that arrangements have been concluded for the reduction of cable rates to the West Indies by one-half. In order to do this, the British and Candian governments will make an annual contribution of approximately $40,000 each, and the West Indies will continue their present subsidies.

BASEBALL NEWS IN HAVANA.—"*La Lucha,*" which is one of the leading papers of Havana, praises the cable service rendered during the World's Series baseball games. The result of each inning was known in Havana in less than two minutes. Six operators covered the Havana end of the three direct duplex wires to New York and Philadelphia. The paper congratulates Mr. Eugenio Fortun y Varona, manager of the International Ocean Telegraph Company at Havana for the excellent manner in which the service was handled.

SUBMARINE CABLES AND TRAWLERS.—A report to the British Board of Agriculture and Fisheries, recently issued, details the proceedings of the Board with regard to the complaints of damage to submarine cables by trawlers, and the steps taken to diminish the trouble by warning the owners, improving the otter-boards, etc. It is stated that a very marked decrease took place in the number of cases of interruption to cables reported after 1909, when the Board first took action in the matter. A conference with the states of Western Europe was held on June 13, with a view to international co-operation in the matter.

THE PACIFIC CABLE.—The accounts for the year ending March 31 last show net traffic receipts, $830,-135, and total receipts, $839,500, exceeding the expenditure by $226,375. Interest and sinking fund on the loan capital required, $387,725; the difference, $161,350, being contributed by the Imperial and Dominion Governments. The net traffic receipts exceeded those of 1911-1912 by $55,675, while expenditure was up by $2,600 only, on the surface, but actually by $14,356. The Australian and New Zealand extensions were completed during the year. During the year rates have been lowered, week-end cable letters at eighteen cents a word being accepted, and press messages at fifteen cents. The cost to the public increased by 16 per cent. The total number of words dealt with in 1912-1913 was 2,670,-575, as compared with 2,131,376 in the previous year.

THE TELEPHONE.

MR. GERARD SWOPE, vice-president of the Western Electric Company, New York, made an address before the meeting of the Telephone Society of New York, on Tuesday, October 21. His subject was, "The Western Electric Company's Place in the Bell System."

MR. WILLIAM H. O'BRIEN, of the telegraph department of the New England Telephone and Telegraph Company, Boston, Mass., on October 12 made an address before the Knights and Ladies of St. Rose, in Boston, on "Reminiscences of the Telegraph." Mr. O'Brien covered the period from the days of Prof. Morse up to the present time.

TELEPHONES IN SOUTH AMERICA.—The number of telephones in use in South America in 1912 was Argentina, 62,547; Brazil, 21,264; Bolivia, 2,000; Chile, 24,482; Colombia, 1,700; Ecuador, 2,550; the Guianas 1,220; Paraguay, 350; Peru, 3,800; Uruguay, 9,210; Venezuela, 4,568.

TELEPHONE CONFERENCE.—A conference of the executive officers of the American Telephone and Telegraph Company and associated companies was held at 15 Dey street, New York, October 7, 8, 9 and 10. There were thirty officials present. A theatre party was given on the evening of October 8 and the next night, October 9, President Theo. N. Vail entertained the party at a dinner at the Metropolitan Club.

TELEPHONE RATES BETWEEN ENGLAND AND FRANCE.—The modified telephone rates between England and France will not come into operation for some weeks. Three-minute calls between Paris and London, Rouen and Birmingham, will cost 96 cents; between Lyons and London, $1.44; between London and Bordeaux, and Liverpool and Nantes, $1.92. It is anticipated that there will be a considerable reduction for night calls.—London *Electrical Review.*

TELEPHONE RATES.—The State Railroad Commission of California has ordered the Pacific Telephone and Telegraph Company to reduce its rates. It is stated that the reduction will amount to $15,000 a year. The Southwestern Telegraph and Telephone Company, St. Louis, Mo., has applied to the State Public Service Commission for permission to increase its rates. The Public Service Commission of St. Louis recently reported that the present rates are too low to earn a fair profit on the company's investment.

TELEPHONE CASE DISMISSED.—The New Jersey Board of Public Utility Commissioners has dismissed the complaint of James Chittick against the New York Telephone Company, claiming that his telephone service had been temporarily discontinued for failure to promptly pay bills rendered, and that upon willingness to settle the account the company demurred to a pro rata reduction for the period of curtailed service. In dismissing the case, the Board refuses to disturb the contract requirements of the company providing that service may be stopped between the tenth and fifteenth of that month in which payment is due, if bill is not paid when due, and holds that with such agreement the company has the right to curtail service to a patron under conditions stated.

TELEPHONE EARNINGS.—The report of earnings of the American Telephone and Telegraph Company for the nine months ending September 30 show a total of $34,199,981.57, and expenses $3,850,-359.64. After deducting interest $5,706,357.80, a balance remains of $24,643,264.13. Dividends paid, $20,561,971.69, leaving a balance of $4,081,292.44. The gross earnings of the Bell Telephone System in the United States for the eight months ending August 31 were $141,963,035, as compared with $129,615,075 during the same period of 1912. The expenses were $102,854,840, against $92,235,237 last year. After deducting the interest from the net earnings there is a balance of $28,114,185, from which dividends amounting to $20,189,628 are deducted, leaving a surplus of $7,924,557, as compared with a surplus of $8,877,346 in the same period last year.

CANADIAN NOTES.

MR. A. BRUCE SMITH, manager of telegraphs, Grand Trunk Railway System, Montreal, Que., Canada, was a recent New York visitor.

ELECTRIC CLOCKS IN MONTREAL.—Electric clocks are to be placed in the new Montreal City Hall Annex. An appropriation of $2,715 is recommended for the purchase of sixty-eight timepieces.

CANADIAN PACIFIC PRINTER CIRCUITS.—The Canadian Pacific Railway Company's telegraph has been operating two duplex Morkrum printer circuits between Montreal and Toronto for over a year. On October 25, a duplex Morkrum printer circuit was started between Montreal and Ottawa, and another circuit is about to be put into operation between Montreal and Quebec. Mr. W. J. Camp is assistant manager of the company's telegraph and has general charge of this work.

LETTER TO THE EDITOR.

The Canadian Pacific Railway Company's Toronto Telegraph Office.

Editor TELEGRAPH AND TELEPHONE AGE:—

SIR:—Referring to the article on page 619, of your issue of October 16, I wish to call attention particularly to the arrangement for branch office legs on duplex or other multiple circuits. There are a great many places where 110-volt direct current is used for lighting service, and, in all such places, this arrangement can be easily worked out. Some of the advantages are that the legs to the branch offices may vary considerably in their resistances without appreciably affecting the amount of current going to each branch office. It will be noticed that the artificial resistance runs up to 1,650 ohms; the number of wires to branch offices is considerably reduced, it only being necessary to have one wire for the sending side and one wire for the receiving side, instead of looping one or both back to the main office, and providing adjustable resistance to take care of the addition or subtraction of extra branch offices.

Since the installation of this plant, it has worked out very satisfactorily, indeed, and, I think, it is really the best system of any that has ever come to my notice.

Mr. F. C. Robertson is the inventor of the arrangement, and a great deal of credit is due to him, not only for this, but for the large number of other appliances he has installed. This office, I think, is now one of the best equipped on this continent.

W. J. CAMP,
Assistant manager Canadian Pacific
Railway Company's Telegraph.

MONTREAL, QUE.

APPRAISING TELEGRAPH PROPERTY.—The engineering board of the Interstate Commerce Commission, on October 16, in Washington, D. C., met the engineers representing all the telegraph interests in this country for the purpose of discussing means of making appraisal of the property of the telegraph companies, as provided for by the recent act of Congress. The engineers present were: Messrs. J. J. Carty, chief engineer, F. L. Rhoades, outside plant engineer, and F. A. Stevenson, general superintendent of plant of the American Telephone and Telegraph Company; J. A. Stewart, general manager New York Telephone Company; G. M. Yorke, general superintendent of plant, R. E. Chetwood, plant engineer, and J. C. Hubbard, general supervisor of lines, Western Union Telegraph Company, New York; John F. Skirrow, associate electrical engineer Postal Telegraph-Cable Company, New York.

MR. L. H. DINKELDEIN, night chief operator of the Postal Telegraph-Cable Company, New Orleans, La., writes: "I thank you for renewing my subscription to the AGE. The electrical knowledge contained therein is too good to be passed."

Magnetic Club Fall Dinner.

The regular autumn meeting of the Magnetic Club will be held at the St. Denis Hotel, Broadway and Eleventh street, New York, at 6:30 p. m., Wednesday, November 12.

Mr. E. Reynolds, vice-president and general manager of the Postal Telegraph-Cable Company, New York, and Mr. J. B. Taltavall, publisher of TELEGRAPH AND TELEPHONE AGE, who has just returned from a trip to Europe, will be guests of the club.

The menu will be an old-fashioned Thanksgiving dinner with turkey, plain vegetables, pies, etc., such as "mother used to make."

The greater part of the evening will be devoted to entertainment by professionals. Dinner tickets will be $2.00 each. All acceptances should be in the hands of Mr. Joseph J. Cardona, treasurer, 253 Broadway, New York, not later than Monday, November 10.

RADIO TELEGRAPHY.

TO HONOR MR. MARCONI.—The *Daily Telegraph* of London, England, in referring to the invaluable service rendered by the wireless telegraph in the "Volturno" disaster, suggests that the time and occasion have arrived for the State to grant to Mr. Marconi some fitting token of England's gratitude for his great achievements in behalf of humanity.

MR. E. J. NALLY, vice-president and general manager of the Marconi Wireless Telegraph Company of America, New York, arrived from Europe on the steamer "Imperator," October 29.

WIRELESS BETWEEN BRUSSELS AND BOMA.—It is stated that wireless messages from Laeken, near Brussels, Belgium, have been received at Boma, in the Congo, a distance of about 4,200 miles.

THE COLTANO STATION.—The new wireless station at Coltano, Italy, will be ready for public service next January. It is stated that the press rate to America will be fixed at five cents per word. Mr. Marconi recently inspected this station and will return to London about November 19. He expects to visit America next January.

"THE WIRELESS AGE" is the new name for the "*Marconigraph,*" which was published in the interests of the Marconi Wireless Telegraph Company in New York. "*The Wireless Age*" is in magazine form and the first number of the new series contains much interesting reading matter. Mr. J. Andrew White is the editor.

Another Wireless Rescue.

The great value of wireless in the marine service was again proved on October 9, when the news of the disaster to the steamer "Volturno," which was destroyed by fire in mid-ocean, while on her way to New York from Rotterdam. Distress signals were sent out and were responded to by twelve steamers. Some of the survivors, several hundred in number, were brought to New York, and others were taken to Europe on other steamers bound in that direction. About 140 of the passengers and crew of the "Volturno" lost their lives.

The survivors were rescued under the most difficult circumstances, a heavy sea running at the time. Mr. William Seddon was the chief wireless operator and Mr. Christopher Pennington his assistant. They stuck to their posts under the trying circumstances and kept in communication with the rescuing ships until the last.

William Seddon, chief operator on the "Volturno," said: "My colleague, Pennington, sent out the first 'S. O. S.' call for aid at 7 o'clock and got an answer at 7:10 from the 'Seydlitz,' which was ninety miles away. I went on duty then, and continued calling, and at 7:15 got a reply from the 'Carmania,' saying that she was fifty-nine miles away. We were busy sending and receiving messages until 10 o'clock at night, when the explosion on the ship carried away the aerial. If it had not been for that, we could have worked the apparatus from the accumulators. All of the electric power in the ship was shut off, so that the generator could be used."

Christopher Pennington, the junior operator, said: "I escaped from the 'Volturno' by jumping from the promenade deck twenty feet into the water at midnight on Thursday, as there was no more work for me to do, and Captain Inch told me to save myself. It seemed as though I was going plumb down to Davy Jones's locker and would never come up again, but I managed to kick out and rise to the surface, and was dragged on board one of the boats belonging to the 'Kroonland.'"

First Conviction for Violation of Radio Law.

The first case of violation of the radio communication act of August 13, 1912, was recorded October 20, in the United States District Court, New York. Herbert Myers, of 94th Street, New York, was charged with violating the law in using wireless apparatus which would affect interstate communication, without having obtained the necessary license. He had been warned by the radio inspector, but he disregarded the admonition. His radiograms were received in Adelphi Street, Brooklyn, and he claimed that he was not interfering with any commercial or government station. The government asserted that it made no difference whether he could or did interfere or not, the effect of the radiograms he sent out went beyond the state lines. He was find $50 by Judge Mayer and ordered to destroy the apparatus. Myers, however, stated that he had already destroyed the instruments.

It is within the discretion of the court to order a destruction of apparatus in unlicensed stations besides imposing a fine for violation.

International Wireless Experiments.

The Provisional International Wireless Committee, at a meeting in Brussels, October 15, decided upon the organization of committees in all the countries adhering to the wireless telegraph treaty, which was signed at London, in July, 1912, to aid the governments in extensive wireless observations and experiments. These will be carried out, with the object, first, of determining a way to insure the constancy and steadiness of wireless waves; second, measuring the variations in signals and atmospheric disturbances at the different stations; third, comparing the intensity of signals.

These experiments will be conducted simultaneously on three days of each week, beginning in January. Special meteorological observations will also be made once a month.

Imperial Wireless Situation.

Mr. Charles Bright, the well-known English electrical engineer and authority on cable matters, in an interview with a representative of the Press Association, London, expressed himself at considerable length on the Imperial wireless situation. He believes that a permanent government board of authority could better control Imperial communications, both cable and wireless. Such a board is especially desirable, he believes, in view of the transitory position of wireless telegraphy.

"I find it difficult, at present, to foresee any really secret method of communication," he said, "other than provided by a cable, the two ends of which you can control. In a word, wireless is a two-headed weapon strategically. It will obviously be of considerable value for ordinary naval purposes as a more immediate method of communication for the fleet than the cable provides," he said in conclusion.

OBITUARY.

L. S. Clark, aged 25 years, an operator for the Postal Telegraph-Cable Company, at Memphis, Tenn., died in that city, August 14.

Willard F. Griffith, aged 63 years, a well-known broker operator, died in Brooklyn, N. Y., October 10.

Frank M. Crittenton, aged 66 years, an old-time Western Union operator, died in Chicago, October 12.

The "Hours of Labor Law" in Arkansas.—Attorney-general W. L. Moose, of Arkansas, has handed down an opinion to the effect that a recent decision of the Supreme Court of the United States, involving the act of Congress intended to govern the hours of work of telegraph operators, renders the Arkansas act ineffective, although the number of hours specified in the law is less than the number specified by the act of Congress.

Joint Rates in Arizona.—The Arizona Corporation Commission has granted the petition of the Mountain States Telephone and Telegraph Company for permission to execute contracts with telegraph companies operated in the State, under which joint telephone and telegraph service may be rendered to localities in which the contracting telegraph companies maintain no office, or where they maintain only day offices, and where telegraph service cannot be had at night.

The Birth and Babyhood of the Telephone.*

Mr. Watson introduced his subject by telling the circumstances that led him to become interested in the telephone. He was an apprentice in the shop of Mr. Charles Williams, at 109 Court street, Boston, Mass. Many inventors came to Williams' shop to have apparatus built for testing out and developing their inventions and Mr. Watson had considerable to do with a number of these men, building a variety of appliances, and also helping in testing the equipment. One of these was Alexander Graham Bell, for whom he constructed a number of coils for experiments, through which Professor Bell was trying to develop the harmonic telegraph. Both transmitter and receiver consisted of an electromagnet, with a flattened piece of steel clock spring clamped to one pole, so that its free end could vibrate over the other pole. The transmitter had, besides this, a make-and-break mechanism, which kept the spring vibrating, in what Mr. Watson called a sort of nasal whine of a pitch corresponding to that of the spring. Professor Bell's idea was that when the signaling key was closed, an electric copy of the whine could be passed through the wire and actuate that one of the distant receivers which was exactly tuned to correspond. Theoretically, this harmonic telegraph seemed to be an extremely simple contrivance, but many experiments were made without any success.

While working with Professor Bell one day (June 2, 1875), Mr. Watson was at the transmitting end, while Professor Bell was in another room, some sixty feet away, retuning the receiver springs; suddenly one of the transmitting springs stopped vibrating because its make-and-break points had become welded together. Presently, Professor Bell rushed into the room, demanding, "What did you do then? Don't change anything! Let me see." It seemed that while the transmitter spring had stopped vibrating for its magnet, it had, nevertheless, been set to slight vibration by the sounds thereabout, and Professor Bell had heard a faint reproduction of those sounds at the receiver near his ear. This gave him a clew for the development of a much simpler form of telephone than he had planned at one time to develop, and he immediately started to work out the idea. That evening he had Mr. Watson mount a small drumhead of gold-beater's skin over one of the receivers, the center of the drumhead being joined to the free end of a receiver spring and a mouthpiece was placed over the drumhead. The next day the two men tried it out. As the two rooms formerly used were too near together for the test, Mr. Watson ran a wire especially for the trial from one of the attic rooms, down two flights of stairs, to the third floor. Over this line, the test was made that evening. Mr. Watson could hear Professor Bell's voice and almost catch his words, but he could not make himself heard to Bell, until they had changed their positions. This showed Bell that he was on the right track, and he immediately set to work, with Mr. Watson's aid, in constructing a variety of forms of telephone. Various shapes of magnets and coils, diaphragms and mouthpieces were tried, until, in the following March, such progress had been attained, that Mr. Watson heard a complete and intelligible sentence transmitted over the wire. Renewed experiments were then conducted and a telephone set was prepared for exhibition at the Philadelphia Centennial Exposition.

Mr. Watson said that on October 9, 1876, "we were ready to take the baby out of doors for the first time." Permission was obtained to use a private wire running from Boston to Cambridge, about two miles long, and that evening Mr. Watson was at Cambridge, with one of the best telephones developed as yet, and Professor Bell signaled from the Boston office on a Morse sounder. At first nothing could be heard, and it was found that a high-resistance telegraph relay was in the circuit; on cutting this out, Mr. Watson clearly heard Bell call, "Ahoy, ahoy." This was the first long-distance telephone conversation. Tests on longer telephone lines soon followed. The fame of the invention rapidly spread, and a great many people made pilgrimages to Bell's laboratory to hear the telephone talk. In April, 1877, the first outdoor telephone line was run between Mr. Williams' office in Court street and his home in Somerville.

Financial problems arose in the development of the invention, which, for the time, were solved by Professor Bell giving a series of public lectures on the telephone. In these, Mr. Watson was almost invariably the actor behind the scenes.

Mr. Watson continued with a narration of the many difficulties that arose with the attempts to develop signaling apparatus and other parts of equipment. He told how he had developed the magneto calling device, and how he had started to work on switchboards. Other inventive minds were turned to the telephone. His own connection with the business ceased in 1881, when he was compelled to take a trip abroad on account of his health.

* Abstract of address by Mr. Thomas A. Watson before the third annual convention of the Telephone Pioneers of America, Chicago, October 17.

Telephone Problems of To-Day.*

These problems are numerous and complex, said Mr. Kingsbury, and one of the most important is the problem of financing the business. In the telephone industry, the plant must be constantly enlarged and extended, and capital must be secured for these extensions from time to time. It is an old saying that capital is timid, but it is also true that, given a legitimate, stable business, with assured earning power, capital readily seeks investment. The telephone business is perhaps one of the most stable of any line of business. Even during dark days of financial stress, when other lines of business have either stopped growing, or are going backward, the telephone business continues to increase in size and importance. Therefore, as long as there is a continuance of net earnings on a basis just to the public, and at the same time safe and satisfactory to the investor, the problem of financing will not be very difficult.

Ever since the invention of the telephone, hun-

* Abstract of paper read by Mr. N. C. Kingsbury at the third annua convention of the Pioneers of America, at Chicago, October 17.

dreds of engineers have been busily engaged in researches and experiments that have resulted in the invention of hundreds of devices now used in the every-day operation of the telephone. The telephone art is continually advancing, and the refinements achieved are creating a demand for further refinements. The success of the past calls for further achievements. But a few years ago it was the cause of great congratulation to be able to talk from New York to Philadelphia, or to Boston. Today, if one cannot talk satisfactorily from New York to Chicago, criticism of the telephone company is immediately heard. Engineering problems involved in achieving universal service are being worked out. The ability to talk from New York to Denver has aroused the desire to bridge the gap between Denver and the Pacific Coast. To permit talking from the Atlantic to the Pacific, clear across the continent, will have cost, said Mr. Kingsbury, more of human effort, ingenuity, determination and money than it has cost to dig the Panama Canal. The time is at hand when aerial construction must be of such character as will withstand not only the usual, but also, to a great extent, the unusual attacks of the elements.

Taking up the relations of the telephone business to the public, Mr. Kingsbury said that no problem at the present time is of greater importance. In his opinion, the telephone business will, in the future, succeed or fail in proportion as the public is educated, satisfied and pleased. Education is the first requisite, because the public really knows little about the business. The public is quick to realize that a great calamity, such as the recent Dayton flood, must seriously interrupt, or, for the time, destroy the service, but the public knows little about the difficulties that cause slight deviation from the present high standard of service, which, to the person not well acquainted with the difficulties connected with giving this service, are likely to cause dissatisfaction and displeasure. The reason for doing things should be carefully explained. The telephone business is not a private business; in the fullest sense of the word, it is a public business and the telephone companies have probably the largest public to serve of any business in the country. The public is a partner in the business, and, as such, is entitled to know exactly what is going on and the reasons for every line of action. There is particular need for developing relations of mutual confidence and respect between telephone companies and the public now, because of the general movement for investigation of every business in which the public is at all interested. The telephone business has nothing to conceal; it is a legitimate enterprise, conducted in accordance with all legal restrictions.

Regarding relations of the older companies with their competitors, Mr. Kingsbury said that the Bell system is not an enemy of any other. Unpleasant relations that at one time may have existed, were the natural outcome of extra competitive effort, but government and state regulations have modified competition to a great extent, and it is no longer necessary or wise to employ methods of warfare. The Bell system has no divine right to run the telephone business exclusively, but it does have some superior rights, because it was the pioneer in the business, and did the discouraging work of the pioneer; it has also developed the field along many lines greatly beyond the possibilities of any other interest, and is in the best position to give the public universal telephone service of the highest grade. Therefore, an attitude of friendliness has been developed in regard to competitors, consistent with the best policies of the public, and with the effort to conserve to all investors as large a proportion of their investment as possible.

As to commission regulation, Mr. Kingsbury said that the creation of commissions to serve as a connecting link between the corporations and the public is a fixed policy to which the companies must adapt themselves. They must convince the commissions that rates, practices and policies are just and equitable, or else change these so as to conform with the desires of the commissions. The Interstate Commerce Commission is, at the present time, making two investigations. One is of a general character to gather data and facts regarding the business of all telephone companies having an income of $50,000 a year or more. Another investigation just begun is the making of a detailed inventory of the physical property owned by all telephone companies in the United States. Although this will take many years, the facts ascertained will be of the utmost value. Despite the establishment of various commissions, the municipalities still desire to maintain some control over public utilities, and, here again, it is necessary to truthfully represent the utility business as it actually exists.

Probably the most important telephone problem at present is that of giving the highest possible grade of service to the public. This is a problem of organization, and involves devotion to duty, not only on the part of operators, but of every employe of the telephone company. They must all be taught that they are servants of the public and that the primary object of the telephone company is to give service.

Damage by the Spring Storms.—The sleet storms of last February and March did great damage to telephone property throughout northern Illinois. After six months, the Chicago Telephone Company has just completed the work of repairing its lines, the damage to which amounted to at least half a million dollars. Over 3,000 miles of wire and 7,000 poles were required to repair the damage within a radius of 100 miles of Chicago. Twenty-seven thousand telephones were put out of commission by the two storms. After the storms the company succeeded in getting about 1,000 repair men to work, and, in most places, service was re-established within twenty-four hours. The cost of these temporary repairs, however, was a total loss to the company, as the work had to be done all over again when the new permanent lines were built and the great quantity of wire used for the temporary work was good only for what it would bring as so much junk.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, ... *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

CHANGES OF ADDRESS.—In ordering a change of address the old as well as the new address must be given.

REMITTANCES to Telegraph and Telephone Age should be made invariably by draft on New York, postal or express money-order, and never by cash loosely enclosed in an envelope. By the latter method money is liable to be lost, and if so remitted is at the risk of the sender.

NEW YORK, NOVEMBER 1, 1913.

STATEMENT.

Statement of the ownership, management, etc., of TELEGRAPH AND TELEPHONE AGE, published 1st and 16th of each month.

Editor—Thomas R. Taltavall, 253 Broadway, New York.

Managing Editor—None.

Business Managers—None.

Publisher—John B. Taltavall, 253 Broadway, New York.

Owners—John B. Taltavall, 253 Broadway, New York; Thomas R. Taltavall, 253 Broadway, New York.

Known bondholders, mortgagees and other security holders, holding 1 per cent or more of total amount of bonds, mortgages or other securities—None.

JOHN B. TALTAVALL,
Publisher.

Sworn to and subscribed before me this 1st day of October, 1913.

THEODORE L. CUYLER, JR.,
Notary Public,
Kings County.

Certificate filed in New York County.
(My commission expires March 30, 1914.)

Another Wireless Rescue at Sea.

Another notable instance of the saving of life at sea through the instrumentality of radiotelegraphy is that of the burning of the steamer "Volturno" in the North Atlantic Ocean on October 13. Fire started in the hold of the vessel, and when it was found that the situation was serious the ominous signal "S O S" was flashed from the unfortunate vessel and caught by no less than a dozen other ships at various distances from the scene of trouble. These vessels at once hastened to the relief of the disabled steamer, and, when the sea permitted, about 500 of the 650 persons on board were rescued, the others being lost by burning, drowning, etc. Had it not been for the wireless, it is safe to say that probably every one of the 650 would have been lost.

Few people realize the incalculable benefit to humanity of radiotelegraphy, especially to the seafaring portion of it, and it is only through such disasters as those that befell the "Republic," the "Titanic" and the "Volturno," that its true worth is revealed.

A wonderful thought in connection with such experiences is that the world is made familiar through the newspapers with the details at the scene of trouble, usually many days before the survivors can be brought to land and safety. Truly, wireless and the press form a combination of forces that can rightly challenge the admiration of the world, and the most wonderful thought of all is that this beneficent agency sprang from a tiny spark detected by Hertz in his laboratory a few years ago.

Use of the Telegraph in Opening the Panama Canal.

One of the most interesting events in the telegraphic world, in recent years, was the exploding of the Gamboa dike, in the Panama Canal, October 10, by an electric spark brought into being by President Wilson closing a key at Washington. The electrical impulse thus dispatched traveled over a composite circuit of land lines and submarine cables 5,172 miles in length, and accomplished its mission in the remarkably short time of one second. The arrangements were well planned and carried out, and there was not the slightest impediment to the progress of the electrical impulse in its travel.

Such a long circuit, of course, could not be practically operated without repeaters. There were several of these devices on the line, repeating from land lines to cables, and vice versa, and from cable to cable. There were no technical difficulties in accomplishing this, however, and the signal reached its destination practically instantaneously.

To the reflecting mind the ability to accomplish such a result is a wonderful thing, but, in these days of big things and rapid changes, such an achievement as the one recorded here passes almost unnoticed. Distance, in a telegraphic sense, is an infinitesimal factor, and can be practically left out of the calculation. The telegraphic signal is, with light, the speediest thing known, and has the great advantage over light, in that it can, with unerring certainty, be conveyed any distance to any point, in all kinds of weather, and produce results at the end of its journey.

The Telephone Pioneers' Convention.

The convention of the Telephone Pioneers of America, in Chicago, October 17 and 18, will pass into the association's history as one of the best so far held. The organization is perhaps the youngest of all bodies of its kind, but strength and vigor have been prominent characteristics since birth. It is only three years of age, and its young life has been one of useful activity. The association is unique in having as its officials and most active members, the heads of the great telephone organization and the spirit of fraternity between the officials and employes evinced at these annual gatherings is a healthy sign.

The central location of the convention city of this year brought together more members than probably would have attended had the meeting been held in a city nearer the coasts. The result of this was that a larger area of the country was represented than would otherwise have been the case.

For the first time since the organization of the association, the convention was presided over by its president. His brief address at the opening was hearty and full of optimism, and he entered into the spirit of the occasion with as much enthusiasm as did the other members.

The secretary's report shows a healthy growth of the association during the past year and the circumstance that each year many employes become eligible to membership by reason of the fact that their period of service in the telephone business brings them within the time requirements provided by the constitution, there should be no particular difficulty in maintaining a steady growth in membership. The fraternal and co-operative spirit pervades the service to such a degree that most all those eligible to membership esteem it an honor to become identified with the organization when they reach the Pioneer age.

The Chicago convention was a success in every respect and will be remembered with pleasure by all who attended. The next annual meeting will be held in a city to be selected later by the executive committee. Atlanta, Ga., has made a vigorous bid for the honor, and if the executive committee selects that city, there is every assurance that the association will meet a royal welcome and genuine Southern hospitality.

Visit of Postmaster-General Samuel, of England, to the United States.

The Right Hon. Herbert L. Samuel, P. C., M. P., postmaster-general of Great Britain, after spending a couple of months in Canada investigating the telegraph, telephone and postal systems of the Dominion, passed a few days in the United States prior to his sailing for home from New York on the steamer "Mauretania," October 22. He spent Sunday, October 19, in Washington, D. C., where he met President Wilson and Postmaster-general Burleson. Returning to New York, he was entertained at luncheon by the Pilgrims of the United States, on Tuesday, October 21.

In his address at the luncheon, Mr. Samuel said, among other things:

"It was my predecessor, Mr. Sydney Buxton, who carried through that great reform of reducing the five-cent postage between our countries to a penny, or two cents. That was done at the cost of the exchequer of the United Kingdom and of the treasury of the United States. I have been instrumental in carrying out another reform in securing reductions of cable rates between the two countries. Not only has that been of the greatest advantage to the public on both sides of the Atlantic, but it has this additional merit, from the point of view of the government: It has been carried out, not at the cost of the exchequer or of the treasury, but at the cost of the cable companies, which I see represented here to-day.

"The reduction of the press rates has been, I think, especially advantageous. The editor of one of your greatest newspapers has told me that the effect of reducing by one-half the press rate across the Atlantic has not been to reduce by one-half his expenditure on cable news, but to double the amount of news he receives from Europe. I have no doubt the same tendency is going on in the eastward direction the same as westward—a largely increased mass of news affecting our countries received from one country and printed in the other country, so expanding the knowledge of each of the other. All this helps to make us realize that the things that unite us are far more important than the things that divide, and the circumstances that make for good-will are of immeasurably more moment than the circumstances which, from time to time, make for misunderstanding."

Mr. G. G. Ward, vice-president and general manager of the Commercial Cable Company, who is a member of the executive committee of the Pilgrims, was present at the luncheon.

Mr. Samuel's visit to the "States" was entirely private.

Radiotelegraphic Investigation.

The committee on radiotelegraphy at the recent meeting of the British Association for the Advancement of Science at Birmingham, England, in reporting its findings, stated that the most urgent and most profitable work it could promote was the investigation of the following large-scale phenomena:—

1. The influence of sunrise and sunset, of daylight and darkness, and of meteorological conditions, on the propagation of electric waves over long distances.

2. The origin and the laws of "strays"—*i. e.*, natural electric waves.

In order to promote the necessary widespread observations, says the *London Electrical Review*, the committee proposes to draw up a simple scheme of instructions which will be circulated to amateurs throughout this country, and also, with the permission of the companies concerned, to operators on ships. These instructions would include directions for simultaneous observations of, for example, the strength of the time-signals from such stations as the Eiffel Tower, and the average strength and frequency of strays. The observations would subsequently be classified and reduced by this committee; and it is felt that this work would open at once an almost unexplored and exceedingly promising branch of research—one which cannot be entered upon in any other way. It is, of course, essential that the work should be carried out over a very large area and by very numerous observers.

Course of Instruction in the Elements of Technical Telegraphy—L.

(Copyrighted.)

(Continued from page 618, October 16.)

[The Course of Instruction in the Elements of Technical Telegraphy, which has been running regularly in this journal since October 16, 1911, has met with wide-spread favor and is being studied diligently by thousands of telegraphers and others throughout the world. It is being translated into Spanish, and printed in South American electrical journals, and has attracted universal attention for its clearness of expression and its practicability. It has been endorsed by the officials of telegraph, telephone, cable and railroad companies, many of whom have acknowledged the improvement in the technical standing of their progressive employes, and they commend the course as being of the most practical kind of instruction.

This course was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, and is being published now for the benefit of those of our readers who desire to fit themselves for higher positions in the engineering branch of telegraphy, and it has been a valuable aid in this direction. It is elementary, and devoid of higher mathematics, yet it is fundamental in character and extremely easy to learn.

Each chapter is complete in itself, and the chapters are arranged in natural order so that the student acquires the knowledge step by step in logical sequence. Each chapter is followed by test questions on the subject of the chapter, thus enabling the student to review his progress from time to time.

Back numbers containing these valuable lessons can be obtained at 10 cents per copy.]

The Polar Duplex.

In the polar duplex, a differentially wound polarized relay (Fig. 62) is used for the receiving instrument, and the battery, instead of being cut in and out by a transmitter, as in Stearns' duplex, is reversed by means of a pole changer, one form of which is shown in Fig. 66.

S and S[1] are tension springs, connected respectively to the + and — poles of the battery. C and

FIG. 66—ONE FORM OF POLE-CHANGING INSTRUMENT.

C[1] are adjustable contact screws in metallic connection with each other and connected to ground. The line is connected with the pole changer lever, L, the movements of which are controlled by a key and local circuit. The continuity of the line is maintained during reversals of the home key by means of the tension springs, S and S[1]. When the key is closed, S[1] is removed from contact screw, C, by L, and one pole of the battery is thus to line, while the other is to ground through contact C[1] and S. When the key is opened, L moves downward, followed by tension spring S[1], until the latter is stopped by C, when, for an instant, all the contact points touch each other and the battery is, for the moment, short

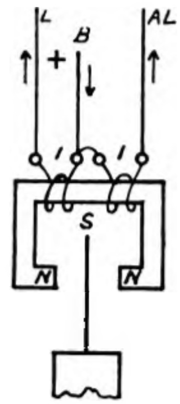

FIG. 67—CONDITION OF NO ELECTROMAGNETISM.

circuited. L then forces S away from C[1], and the battery is reversed.

The successful working of this instrument depends upon its perfect adjustment, which is, therefore, a matter of great importance. The play of the remote end of the lever, L, between its limiting stops, should not exceed 1/32 of an inch.

The contact screws, C and C[1], ought to be adjusted so that all the contact points shall touch each other for the shortest possible period at a point midway in the stroke of the lever during its upward and downward movements. In this form of pole-changer, the contact points are enclosed in a circular glass-encased box, to protect them from dust, etc.

The winding of the polarized, or polar, relay is similar to that of the differential relay used in Stearns' duplex; a preponderance of current in the main line coils produces, as a rule, a movement of the relay tongue to the marking side, thus closing the local circuit, and an excess of current in the artificial line causes a movement to the spacing side, but as these movements depend on the direction of current flow, it may prove beneficial to the student if we consider, in turn, the different kinds of magnetism produced in the cores by reversals of the home and distant batteries.

To find the direction of current flow in an electromagnet, Thompson gives the following rules: Looking at the south pole of an electromagnet, the magnetizing currents are circulating round it in the same cyclic direction as the hands of a clock move; and looking at the north pole of an electromagnet, the magnetizing currents are circulating round it in the opposite cyclic direction to that of the hands of a clock. These rules are true, no matter whether the beginning of the coils is at the end near the observer or at the farther end from him, *i. e.*, whether the spiral be a right-handed screw or a left-handed screw. It will be just the same thing, as far as the magnetizing power is concerned, if the coils begin at one end and run to the other and back to where they began; or they may begin half way along the core and run to one end and then back to the other; the one important thing to know is which way the current flows round the core when you look at it end on. Now look at the cores as they appear in Fig. 67. When there is no current flowing through the coils the two poles on either side of the tongue are north poles, since the coils rest on the north pole of a permanent magnet, and so long as the outgoing current divides equally between the line and artificial line these two poles will remain unchanged, the different magnetisms which one current tends to produce being neutralized by those of the other current.

(*To be Continued.*)

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What causes the armature of a polarized relay to remain in contact with either pole of the electromagnet when no current is passing through the coils?

What is the effect of the differential winding upon current sent out from the home station, and what is the effect of that current upon the relay at the distant station?

How are positive and negative currents sent to the line?

Is a polar relay actuated by one current alone or by both positive and negative?

What currents are necessary for the operation of a quadruplex?

In changing the polarity of the transmitting current, what receiving instrument responds thereto, and what instrument responds to increase and decrease of current strength?

Is the neutral relay of a quadruplex affected by the change in polarity of the current?

Is the polar relay affected by the increase and decrease of current?

Does it require as strong a current to operate a polar relay as is required to operate a neutral relay?

If a current of constant polarity is maintained and signals are transmitted on that current, what instrument responds?

What is a diplex?

In what respect does a diplex correspond to a quadruplex?

Does the diplex require for its operation double currents or single currents?

What is the cause of the break in the signals received on the neutral relay when the polarity of the current is reversed?

How is the "clipping" of signals prevented?

Why are short coils on the neutral relay advantageous in quadruplex work?

Can quadruplexes be operated by electric generating machines?

Why are machine currents preferable to battery currents?

What is the usual proportions of current for the long and short ends of a quadruplex battery?

What part of the quadruplex is operated by the short end of the battery, and what portion by the total strength of the battery?

What is known as the No. 1 side of a quadruplex and what is the No. 2 side? What are the instruments used on the two sides?

What is the tap wire?

What is the "ground coil" used for?

What is the reason for placing a resistance between the condenser and differential relays on long circuits?

In practice, what determines the proportional division of the battery for the long and short ends?

What is the need of balancing a duplex or a quadruplex?

In balancing, why is the distant station requested to "ground"?

When both ends of the circuit are grounded, what is the next step in the operation of balancing?

Study carefully "Instruction for Balancing," as given on page 188 of the text-book.

Do changes of weather affect the balance of a duplex or quadruplex?

What is the effect of wet weather on the line resistance?

Can repeaters be used on duplex and quadruplex circuits?

Can branch offices be connected to a quadruplex and duplex circuit so they can work direct with the terminal stations?

What is Color?

All that we know of color, its causes and effects is in connection with the wave theory of light. Color depends upon the number of light waves reflected from any object impinging upon the retina of the eye. In red there are about 40,000 waves to the inch, and these will strike the eye at the rate of 447 millions of millions of pulsations per second. In violet there are 57,000 waves to the inch and 690 millions of millions of pulsations per second. The other colors have wave light intermediate between these two. Color does not, therefore, exist either in the object, or in the brain, or in the mind of the observer. It is an effect. There can be no appearance of a fire on a desert island where there is no eye within seeing distance. The chemical process called combustion goes on, but there is no appearance of the flames save when its waves strike upon the retina of an eye.

The Other Side of the Telegraph.

BY H. S. PIERCE, EVANSVILLE, IND.

Is it true that the modern telegraph office is commonplace and that the spirit of romance has no place within its noisy interior? To the casual observer, it doubtless presents a most commercial aspect, but to those who handle the enormous volume of telegrams that daily pass to and fro over the wires, there comes the realization that matters of life and death are embodied in each day's business.

Written upon the small blank, affairs of grave moment come to their knowledge. Through the medium of the telegraph this written intelligence is spread throughout the land, and often to foreign shores.

News that will make history is flashed out along the litle metal threads to be read by eager multitudes, thousands of miles away. Perhaps it is a war bulletin. Again, it may be an important act of legislation affecting the welfare of many, or a bulletin announcing the death of a president, or the crowning of a queen. Diplomatic messages go hurrying over the wires, to eventually cross the ocean by cable, and stem the approaching tide of war.

Then there is the common business message, which deals with current matters of trade. There is little of seeming interest in its ten words, yet it may mean a food supply to a stricken city, as in the case of the Dayton disaster.

This naturally calls to mind the telegram, that in times of danger comes to an anxious parent, bringing such relief of mind as only a parent or loving friend may know.

Then quickly following in its wake, comes the dispatch that spreads a mantle of sorrow over a household. One of its members has met death in some distant land. Speeding through the night, an anxious father strives to reach the bedside of his dying little one. The fast express train rushes through the miles, but swifter than steam, a message is speeding along the very wires that run parallel with the track, and at the next stop he is handed the dispatch that tells him his mission has failed. Just a short message on a bit of paper, but surely it is one of deep sorrow for him.

The wireless may perform a like function at sea, for the swiftest ocean greyhound is usually in communication with the distant shore and often with friends on other steamers.

All tiding are not bad tidings. The ocean cable can carry to distant Africa the cheering word from home. The Alaskan miner may hear from his friends in America. The lover uses up the fifty-word limit in the night lettergram, in order that Betty or Dolly may know that his love burns like an oxy-acetylene flame, and that he always remembers her every time he thinks of her. To the bereaved comes the word of comfort. The father opens the little envelope and smiles as he reads of the addition to his family. The Newlyweds are beseiged by messenger boys who bring heaps of missives from foolish and loving friends. The host receives word of the coming guest and is glad. So the little telegram goes straight into the hearts and homes of the nation.

Indeed, who shall say that the telegraph is commonplace? There is possible romance in nearly everything, and as long as electricity conveys the world's intelligence, the telegraph will always claim its share.

Accuracy First.

In a contribution on "Accuracy First," to the *Commercial News*, of Pittsburgh, Mr. A. C. Terry, district commercial superintendent Western Union Telegraph Company, Pittsburgh, Pa., says, in part:

"It may be that the public is more critical and exacting than formerly, and this attitude may bring to light many errors that have, in the past, been overlooked, but whatever the cause, the number of complaints has greatly increased during the past two years.

"Errors made by operators drive patrons to seek other service, and thus the revenues of the company are decreased. Directly and indirectly, the operator's compensation is affected. Directly, because errors charged against him and his record determine his value to his company. Indirectly, because if his company is successful in rendering accurate and reliable service, he will, in turn, be benefited.

"Some of the errors made by operators in messages that come to my desk through our complaint bureau and otherwise are so ridiculous as to cause me to wonder whether the operator of this day and generation is not, after all, trying to make a machine of himself, rather than try to exercise ordinary intelligence. Indeed, I think the machine is maligned by being placed in the same class, for a properly adjusted and lubricated machine makes no mistakes.

"The young and inexperienced telegraph operator, and sometimes those who are not young and inexperienced, have a great ambition to be fast senders and receivers; in other words, they want to be 'stars,' thinking that the greater number of messages they handle, regardless of accuracy, the higher will be their rating in the scale of compensation. They fool themselves, because it is accuracy and not speed that counts. Their motto should be, 'Accuracy first; speed afterward.'

"A study of the complaints filed from month to month shows that the responsibility for errors does not rest entirely on the telegraph or telephone operator, for very many are chargeable to the counter clerk, who carelessly allows illegibly written words to pass without making them plain, so that the operator will not be obliged to guess. The careful, painstaking receiving clerk is a valuable asset to the company, and the careless, 'don't care' clerk at the counter is a menace to the service.

"The commercial department is, more than any other, interested in the work of the operators, because it is that department which has to stand the brunt of the 'slings and arrows' of an outraged customer who feels keenly the loss of almighty dollars occasioned by the telegraph operators' careless work, and so I say to the telegraph and telephone operator—keep ever before you the new slogan of the traffic department, 'Accuracy First.'"

Early Days of the Telegraph in Toledo, Ohio.

The first telegraph office in Toledo, Ohio, was established about 1848 by the Atlantic, Lake and Mississippi Company, otherwise known as the O'Reilly line, said an old-timer. Its staff consisted of one operator, who also acted as manager, and one telegraph boy.

The line was a single wire, beginning at Buffalo and running along the highways through the principal towns along the lake shore and crossing into Michigan, terminating at Detroit. It ran close to the old Government road and crossed the Maumee River over the bridge at Perrysburg, Ohio, then and for a long time after the only bridge over that stream.

A rival line was strung about a year later and established its office on Monroe Street, opposite the office of O'Reilly's company. The tariff in effect in those days would make a twentieth century business man gasp with wonder and indignation, but it went without a murmur. Taking messages by sound was not in vogue then, a register being in use that recorded the dots and dashes on a slip of paper which were afterward deciphered by the operator. But some enterprising characters found that it was just as easy and much quicker to read the signals as they came along than to read the slip afterward, and started to take all messages by sound, as is universally done now. Some of the old-line managers balked at this and issued a stern prohibition against relegating the recording machines to the rear, but, like all others whose ideas are behind the march of events, their dictum had to be withdrawn, and the machines were eventually thrown out entirely.

The Erie and Michigan Company opened an office in Toledo, in 1850, and came over the same route as the other two, but was continued through Michigan to Chicago and ran to Milwaukee, where it terminated. It finally passed into the hands of Ezra Cornell, of New York, a colleague of Professor Morse, and the pioneer telegraph man of that day.

From the very first the line was patronized by the lake transportation people, who realized its utility at once, but the general public were slow to appreciate its opportunities and advantages. In consequence, business was booming in the summer, but came to a practical standstill when navigation closed in the winter.

Lines began to multiply until around 1855, when the Western Union Company appeared in the field, and the older lines were gradually leased or absorbed. Several independent companies appeared later, but the war put an end to a good many of them, though tolls were never as high as then, and it was not until the early 80's that the Postal appeared on the scene.

In spite of the many varied mechanical improvements in the business, not much can be said in favor of the increase in speed of sending messages now against the rapidity with which they were transmitted then. In those days $400 per annum was considered extra good pay for an expert man, and so it was when you consider the lower cost of living prior to the war.

The Anglo-Belgian Submarine Telephone Cable.

The Anglo-Belgian submarine telephone cable, as is well known, is of the Pupin loading-coil type. The tests of this cable have shown that it has a "standard-cable" equivalent of 3.28 miles. Without loading coils, a mile of the same cable has a "standard-cable" equivalent length of 0.435 mile, and, therefore, the actual gain due to the addition of loading coils is equivalent, in its effect on the speech transmitted, to reducing the length of the cable by 70 per cent. The coils increase the diameter of the gutta-percha core from about 1 inch to 3 inches. A gutta-percha cone is inserted at each end as packing, and gutta-percha sheet is wrapped round them and jointed to the gutta-percha of the core at each end. Two double coils are employed. Each double coil consists of two windings on the same iron core, and one winding is connected in series with each conductor. This has an advantage over four distinct coils, as the iron core experiences an aging effect which affects its permeability and may not be precisely the same in two cores. If separate coils on separate iron cores were used for the outgoing and return circuit, the gradual change in permeability might disturb the even balance of the circuit, but by winding them on the same core the variations are automatically compensated. Between the silk-covered wire of the coils and the gutta-percha sheet there is a sheet of metal foil; this was found to be a necessary precaution in the construction of the cable. An annular rubber distance-piece is inserted between the two sets of coils to give greater flexibility.

The method of armoring is very ingenious. At about thirty feet before the position of the coils was reached the stranding machine was stopped and a second armoring was started on the top of the other one. When the bulge in the cable was reached the wires of the second armoring, which was given the same lay as the first, automatically place themselves between the other wires, so that the part of the cable with the increased diameter is covered with a single layer of the armoring wires, and at about thirty feet on the other side of the coils the additional wires are cut and bound up as before.

Magnetic Permeability.—This characteristic may be best defined as a numerical co-efficient which expresses the ratio between the number of magnetic lines formed in a space containing nothing but air and the number formed in a space filled with a given quality of iron. This ratio differs for different qualities of iron, and hence we say that the permeability of the iron differs accordingly.

Mr. T. C. Ashcroft, of Memphis, Tenn., writes: "Thank you very much for renewing my subscription. It is a genuine pleasure to receive and read your instructive journal. In every issue I find something of interest about my old-time friends."

Third Annual Convention of the Telephone Pioneers of America.

The Telephone Pioneers of America held their third annual convention on October 17 and 18, in the Congress Hotel, Chicago, Ill., and the meeting was successful in every respect. The attendance was large, and all parts of the country were represented, largely on account of the central location of the city.

The first session was called to order at 10:30 a. m., Friday, October 17, by President Theo. N. Vail, who was given a rousing welcome by the assembled members, as he mounted the platform.

Mr. Vail made a brief address, in which he expressed his appreciation of the change of dates of the convention in order that he might attend. This gathering, he said, was, in reality, a gathering of a great brotherhood. He referred to the fact that a large proportion of the pioneers that were active in the early development of the telephone industry are still connected with it. The growth of the industry was, he continued, marvelous, and for several years has been consistently working out the policy of establishing universal service. "Whether it be ultimately privately owned or government owned," said Mr. Vail in conclusion, " a completely interconnecting system, furnishing universal intercommunication, must be attained."

Mr. B. E. Sunny, president of the Chicago Telephone Company, and vice-president of the Pioneers, followed Mr. Vail with an address of welcome. He expressed the pleasure of the local telephone men in having as their hosts the pioneers and leaders of the telephone industry. "It is difficult to realize to-day," he said, "when we have standards that have been universally adopted, and the problems of practical telephony have been so largely solved, that in the beginning, in 1876, there were no telephone men, and there was no one who had anything more than a vague idea as to how the business could be started, or, indeed, the extent to which the public would use the telephone.

"The men who were drawn into the new field came from every line of commerce and the professions—from the mail service, the telegraph, the railways, from the banks and mercantile houses, and there were lawyers, physicians, brokers, real estate dealers, and, indeed, representatives from every kind of business.

"The first ideas and appliances for the development of the telephone business," he continued, "were borrowed from the telegraph, but that service was quickly drained of all that it could contribute, and, from that time on, the pioneers had to rely upon their own resources. There was so much to be done, and so little to do with, that almost everyone tried his hand at inventing, and the lack of methods and experience was no bar. * * * The achievement represented in the telephone system of to-day is a tribute to the adaptability of the American business man to unusual demands upon his energy and resources.

"While the new problems and perplexities which crowd in from day to day prove that the telephone millennium is not in sight, we are grateful for all that the pioneers have done for us, and we are grateful, too, for the results that the thousands of loyal and faithful employes are securing every day," said Mr. Sunny, in conclusion.

Mr. Frank H. Bethell, vice-president, then took the chair.

Secretary Henry W. Pope presented his report for the past year.

"The passing year," he said, "has been one of much encouragement as to the future of the association, in that there has been a steady and conservative growth every month; the rolls containing, at this date, 1,164 members, an increase since January 1 of 164, averaging in excess of eighteen members per month.

"The cash balance on hand, September 30, was $1,551.05.

"It is interesting to note that the new members come very largely from the class just reaching the service-limit eligibility, and have, furthermore, a continuous service record."

Referring to the deaths of members during the year, Mr. Pope said: "Your attention is particularly called to the death of one of your two honorary members, Francis Blake, which occurred two months after receiving this mark of respect from the convention assembled at New York in 1912."

Eleven members have died since January 1, 1913, and their deaths will be appropriately recorded in the annual proceedings of this year.

"It has seemed to your secretary," said Mr. Pope in conclusion, "that the question as to the advisability and propriety of placing a suitable tablet at 109 Court street, Boston, Mass., commemorative of the first word heard over the telephone and the first manufactory of telephones, should receive consideration at this meeting of pioneers."

Invitations to hold the next meeting of the pioneers at Atlanta, Ga., were read, from Governor John M. Slaton, of Georgia; W. T. Gentry, president of the Southern Bell Telephone and Telegraph Company, Atlanta; Mayor J. J. Woodward, of Atlanta; Fred Houser, secretary of the Atlanta Convention Bureau, and the Atlanta Hotel Men's Association, W. L. Moore, president of the Atlanta Chamber of Commerce. The matter was referred to the executive committee for action.

Mr. Thomas D. Lockwood, of Boston, referred to the historical museum of telephones and telephonic apparatus, established in New York by the Western Electric Company, and asked members who had early types of telephone instruments in their possession to send them there as exhibits.

He also presented some amendments to the constitution and by-laws, which had been prepared by the committee appointed for the purpose at last year's convention. All of the amendments were adopted, but the proposal to increase the annual dues of members failed.

The following officers were elected: President, Theo. N. Vail; vice-presidents, Thomas D. Lockwood, Charles F. Sise, Thomas B. Doolittle, and George E. McFarland; treasurer, George D. Milne.

Messrs. Charles G. Dubois, Angus S. Hibbard and Charles E. Scribner were elected members of the executive committee, and Messrs. E. F. Sherwood and J. T. Moran were appointed members of the same committee by President Vail.

Mr. Thomas D. Lockwood was then called upon to preside as vice-president elect. He made a brief address, in which he referred to some features in the early history of the telephone, dwelling particularly on the development of the telephone exchange. This, he said, was really an evolution from the telegraphic exchanges, some of which, in a crude form, were in use as early as 1852.

He described one of the earliest telephone exchanges, which was started in Hartford, Conn., by a druggist. On one occasion, this exchange was used for the prompt summoning of physicians and hospital attendants after a railroad wreck. This incident attracted much attention to the telephone at that time.

The afternoon session, which was presided over by vice-president Lockwood, was devoted entirely to addresses, Mr. N. C. Kingsbury, vice-president of the American Telephone and Telegraph Company, New York, being the first speaker. His subject was, "Telephone Problems of To-day." An abstract of Mr. Kingsbury's address will be found on another page of this issue.

Mr. Thomas B. Doolittle was the next speaker. While engaged in the manufacturing business at Bridgeport, Conn., until 1876, he became interested in the telegraph, since many rush orders were received in that manner. With a number of friends he established a small local telegraph system, controlled from a central switchboard, and called it the Bridgeport Social Telegraph Association. It was connected between various residences, business houses, banks, etc. In June, 1877, he saw a number of telephones and brought some of them to Bridgeport, where he connected them to what, until then, had been the telegraph system. By a number of simple changes, this was then converted into a telephone exchange. From this point, his interest in the development of the telephone business became active to the point that he had to neglect other business. Later in that year, he built what was the first private exchange, connecting the various departments and offices of the Ansonia Brass & Copper Company. Having already a knowledge of wire drawing, he used the facilities of this company for the production, for the first time, of hard-drawn copper wire. This wire was used in the private exchange of the company, with very excellent results. Tests were made at various times and the wire was found to show no deterioration in conductivity or tensile strength. Mr. Doolittle made a number of attempts to introduce the wire for telephone lines, but with rather indifferent success for several years. He narrated the changes that were made in the Bridgeport exchange; how he was compelled to give up its management and how, subsequently, he worked on the development of a unit type of switchboard, which was the forerunner of the multiple switchboard of the present day and of the multi-office system. He spoke of the difficulties in securing patents and of further improvements that he had made in the calling system. Subsequently, he became interested in long-distance service, until his retirement from active duty in 1909.

Mr. Thomas A. Watson, who was closely associated with Dr. Bell in the early development of the telephone, was next called upon to address the meeting, and in his easy conversational style related many interesting facts about the birth and babyhood of the telephone. An abstract of Mr. Watson's address appears on another page.

At the conclusion of Mr. Watson's remarks, the convention adjourned.

ENTERTAINMENT.

An interesting entertainment programme was arranged for the pioneers and carried out to their great enjoyment.

On the evening of Friday, October 17, a two-act musical comedy, entitled "Telephonery, Past and Future," was given at Studebaker Theater. The first act dealt with the past in telephony, and represented the pioneers of 1878, or "landing of the first capitalist." Act two showed telephone conditions in the year 2113 A. D. Thought transference had superseded the telephone, but the chaotic service of the American Thought Transference Company led to a public protest and an appeal for the restoration of the peace and privacy of the telephone of 1913. The first act was composed and set upon the boards by Messrs. M. D. Atwater, A. P. Allen and E. H. Bangs; the second act was "de Composed into the form of ozone and wafted through space," by Mr. Angus S. Hibbard. An excellent musical programme was rendered during the play, which was a great success and well performed, all of the actors being telephone people. H. P. Wayman was stage manager; H. H. Hill, jr., and T. J. Hardy, assistant stage managers; W. T. Purdy, musical director.

On Saturday, October 18, the day was devoted to entertainment. An automobile trip of inspection and tour of the park and boulevard system of Chicago was made. The first stop was at the Bell Telephone building, where the visitors were shown through the operating rooms and the various departments. The Pioneers were then conveyed to the Western Electric shops, at Hawthorne, where luncheon was served, while the Western Electric band played popular airs. After luncheon a visit of inspection of the various shops was made, and then a game of baseball was played between the Chicago Telephone and Western Electric teams. A group picture of the party was taken during the afternoon.

The banquet on Saturday evening, October 18, was a very successful and enjoyable function. At each place at the tables was a candlestick made in the shape of a telephone receiver, full size, and on the four sides of the shade was the blue bell. These candlesticks made very appropriate souvenirs. The ice-cream was served in triangular boxes—the Pioneers' badge—and at each seat was a place card, in the shape of the association badge with the name of the guest printed on it. The seating list was made up in the form of a neat booklet and the songs that were rendered during the banquet were distributed on printed sheets. The menu was very elaborately designed and executed, and contained artistic photogravure portraits of Professor Alexander Graham Bell and President Theo. N. Vail, also a country scene showing a telephone line. There were 500 persons seated at the tables.

NOTES.

A special train from New York, consisting of four cars, carried fifty-six delegates from the East. The train left the Pennsylvania station, in New York, at 8 a. m., Friday, October 17, and arrived in Chicago the next morning at 8 o'clock. Mr. R. H. Starrett, of New York, was the chairman of the Committee on Transportation, and was congratulated upon the excellent manner in which he performed the duties of that office.

There was an attendance of 475 pioneers, many of whom were accompanied by their wives Among them were:

Mr. and Mrs. W. R. Abbott, Chicago; E. B. Baker, Minneapolis, Minn.; Mr. and Mrs. E. M. Barton, Chicago; Mr. and Mrs. W. E. Bell, Chicago; F. H. Bethell, New York; Mr. and Mrs. U. N. Bethell, New York; Mr. and Mrs. C. L. Boyce, Detroit, Mich.; Mr. and Mrs. C. H. Brownell, Peru, Ind.; Alonzo Burt, Chicago; Mr. and Mrs. J. E. Culbertson, Cincinnati, Ohio; C. B. Doolittle, New Haven, Conn.; Thos. B. Doolittle, Branford, Conn.; Mr. and Mrs. E. B. Field, Mr. and Mrs. E. B. Field, jr., Denver, Col.; J. J. Ghegan, New York; Mr. and Mrs. Angus S. Hibbard, New York; H. F. Hill, Chicago; W. J. Hiss, St. Louis, Mo.; Mr. and Mrs. Leland Hume, Nashville, Tenn.; Mr. and Mrs. C. A. Janke, Camden, N. J.; Mr. and Mrs. N. C. Kingsbury, New York; Mr. C. J. Leslie, Toronto; A. G. F. Lockwood and Thomas D. Lockwood, Boston; R. T. McComas, Cincinnati, Ohio; Mr. and Mrs. C. W. McDaniel, Kansas City, Mo.; G. T. Manson, New York; F. C. Mason, Grand Rapids, Mich.; Mr. and Mrs. H. J. Pettengill, St. Louis, Mo.; H. W. Pope, New York; Charles W. Price, New York; Mr. and Mrs. A. L. Salt, New York; J. A. Seeley, New York; H. O. Seymour, Milwaukee, Wis.; W. A. Sherwood, Mt. Vernon, N. Y.; Mr. and Mrs. B. E. Sunny, Chicago; Mr. and Mrs. H. B. Thayer, New York; H. F. Thurber, New York; Theodore N. Vail, New York; T. A. Watson, New York; W. T. Westbrook and W. T. Westbrook, jr., Philadelphia, Pa.; C. H. Wilson, New York; Robert Yearsley, Chicago.

Electromagnetic Waves.

In a paper read at the Birmingham, England, meeting of the British Association for the Advancement of Science, Professor G. W. O. Howe said: "A very clear conception of the nature of the electromagnetic waves employed in radiotelegraphy can be obtained by considering those electromagnetic waves which exist in the space between the two conductors of a single-phase transmission line. If the conductors are flat, parallel strips, close together, and connected at the sending end to the terminals of an alternator, there is a certain value of the non-inductive load at the receiving end which will absorb the arriving energy without any reflection. Under these conditions the current and voltage are in phase all along the line, and the same is true if the line is assumed to be of infinite length. Line resistance and leakage are assumed to be negligible. It follows from this that the electric and magnetic fields at any point have their maximum values at the same moment. Instead of two parallel strips transmitting energy in one direction, two parallel discs of infinite extent can be imagined, with the alternating potential difference applied between their centers. Energy would then be transmitted radially in all directions in the plane between the discs. The earth could take the place of the lower disc, while the upper one could be represented by a conducting horizontal plane some distance above the earth. The waves produced would be truly cylindrical, whereas those employed in radiotelegraphy are spherical. If now, the upper disc is replaced by an inverted conducting cone of infinite extent, with its apex almost in contact with the earth, the alternating potential difference being applied between the apex and the earth, the electromagnetic waves will be almost identical with those employed in radiotelegraphy and will vary in the same way with the distance from the sending station. This imaginary multi-directional transmission line, consisting of a lower plane (the earth) and an inverted cone, lends itself to simple calculation, because, like an ordinary transmission line, and unlike the two parallel discs, it has a constant inductance and capacity per mile. It can be shown that if the angle between the cone and the earth is seventy degrees, the relations between the magnetic and electric fields near the earth's surface and the total energy radiated are identical with those existing in the ordinary radiotelegraphic wave. As in the transmission line already considered, the current and potential difference will be in phase at every point, and, therefore, contrary to the usually accepted view, the horizontal magnetic field and the vertical electric field due to a sending antenna are not ninety degrees out of phase, but are approximately in phase, except in the immediate neighborhood of the antenna. This also follows from the fundamental equations of a progressive, as distinct from a stationary, electromagnetic wave."

Society of the United States Military Telegraph Corps.—The report of the proceedings of the thirty-second annual meeting of the Society of the United States Military Telegraph Corps, held at Detroit, Mich., August 26, has been issued in pamphlet form. It is accompanied by a large sheet of photographic reproductions of prominent old-time and military telegraphers, and at the back of the pamphlet is given a list of the surviving members of the corps, so far as known at the present time. Mr. David Homer Bates, secretary of the society, is to be congratulated on the promptness with which he has gotten out the report.

When Prof. Bell Invented the Telephone.

In the letters of Madame de Hegermann-Lindencrone, appearing in *Harper's Magazine* for November, an interesting glimpse is given of the early days of the telephone and other inventions now in current use. Writing from Cambridge, in 1877, she says:

"Johan has just come home from Boston, bringing incredible stories about having talked in a machine called telephone. It was nothing but a wire, one end in Boston and the other end in Cambridge. He said he could hear quite plainly what the person in Cambridge said. Mr. Graham Bell, our neighbor, has invented this. How wonderful it must be! He has put up wires about Boston, but not farther than Cambridge—yet. He was ambitious enough to suggest Providence. 'What!' cried the members of the committee. 'You think you can talk along a wire in the air over that distance?' 'Let me just try it,' said Bell. 'I will bear half the expense of putting up the wire if you will bear the other half.'

"He was ultra-convinced of his success when, on talking to his brother in Cambridge from Boston, in order to invite him to dinner, adding, 'Bring your mother-in-law,' he heard distinctly, but feebly, the old lady's voice: 'Good gracious! Again! What a bore!'

"There is also another invention called phonograph, where the human voice is reproduced, and can go on forever being reproduced. I sang in one through a horn, and they transposed this on a platina roll and wound it off. Then they put it on another disk, and I heard my voice—for the first time in my life. If that is my voice, I don't want to hear it again! I could not believe that it could be so awful! A high, squeaky, nasal sound; I was ashamed of it. And the faster the man turned the crank, the higher and squeakier the voice became. The intonation—the pronunciation—I could recognize as my own, but the *voice!* . . . Dear me!"

Sound That Is Noiseless.

Every day, dozens of people in New York talk with business associates or friends in far-away Chicago. Few know, says Mr. D. C. Shafer, in the *Chicago Record-Herald*, that it is not actually our friend's voice we hear when we use the telephone. It is merely an accurate reproduction of that voice by electricity.

If the telephone was only a medium to transmit sound waves, it would be far indeed from the convenience it is now. Sound travels slowly when compared with electricity or light, as the speed of sound waves through the air is only 1,090 feet a second. It is 970 miles from New York to Chicago; therefore it would take a sound wave 4,700 seconds to travel the distance—supposing, of course, it was possible for sound to travel that far and be audible. This equals seventy-eight minutes, or an hour and eighteen minutes. Therefore, if you said, "Hello!" in this end of a sound-wave line, you would have to wait two hours and thirty-six minutes to get an answer from Chicago. At this rate of speed, if a man had much to say, he might better take a fast train and go to Chicago—not to mention what the tolls would be for ordinary conversation at the usual rates.

Without electricity, it would be impossible to talk from New York City to Chicago or Denver, as we can very easily do to-day. Sound waves would not carry outside the great metropolis. What really happens is as follows: The voice causes a thin metal diaphragm in the telephone to vibrate in sympathy with the voice. This vibrating disk oscillates in front of a small magnet, which sends little currents of electricity along the wires, that are, in turn, repeated to a similar magnet on the other end of the line. This second magnet, influenced by the electricity from the first diaphragm, causes the diaphragm in its receiver to vibrate just as the first one did, and, of course, in vibrating, it repeats in Chicago what was said to it in New York in exactly the same tone.

Electricity travels at a speed of 186,000 miles a second. This is so nearly instantaneous that it can be measured only with most delicate instruments. The time it takes electricity, carrying the human voice, to go from New York to Chicago is so infinitesimally small that it can hardly be recorded in comprehensive figures. Therefore, the modern telephone is nearly instantaneous in its action.

The human voice is produced mechanically. Mr. Edison proved this when he made a machine out of wood, wax, and iron, that would talk. Words are nothing but vibrations in the air produced by similar vibrations of cords in the larynx; therefore a common metal disk can be made to make these same vibrations and actually repeat the human voice.

The speaking tube is the only telephone that actually transmits sound waves in the air. Sound will also travel through metal, water, gases, and mostly any other solid or gaseous substances, and is greatly muffled by soft fibers, such as wool, cotton, sawdust, dirt, etc.

Conception of Potential and Electromotive Force.

When water is pumped to an elevation by the application of power and then allowed to run back to its original level, it is capable of being made to do work in the course of its descent by means of water-wheels, or otherwise, and it is obvious that the amount of work it is capable of doing under these conditions depends upon three things: (1) the height of the fall, (2) the quantity of water, and (3) the length of time the effect continues. We may express the condition of affairs by saying that the water which has been raised has a certain potential energy, which may be defined as capacity to do work, and for brevity we may call it potential. We may, therefore, for illustration, regard electricity as a material fluid to which a certain potential has been given by the action of a battery or of an electric generator, and which is, therefore, capable of doing mechanical work, as is the case with the descending water. That quality of a voltaic cell, or of an electric generator, by virtue of which it confers potential upon electricity, is termed the electromotive force, usually abbreviated e. m. f.—*The Electric Telegraph.*

"Vail, Master of the Wires."

Under this heading, *Business America* for October published an article written by Mr. Elisha Hollingsworth Talbot.

After a general reference to the Bell Telephone stock in the early days, and a personal reference to Mr. Vail, the author goes on to say:

"Inventors are rarely successful in financing or giving practical value to their own inventions, and the telephone did not supply an exception to this rule. Its sponsors, realizing the need of an organizing mind and practical business brain to direct the infant prodigy through its formative years, made a most fortunate discovery in the person of Theodore Newton Vail, then ably serving Uncle Sam at Washington, as general superintendent of the railway mail service, who proved his faith in the telephone, and his possession of the requisite pluck, by surrendering a sure thing and accepting a very uncertain one. But it soon became evident that he had "builded better than he knew," for the stock of the company that could find few investors at forty, when he became general manager, a short time later advanced to more than 900.

"A controlling principle in Mr. Vail's business policy has ever been a conscientious effort to acquaint himself with the needs of the people, on whom the success of any great public utility must depend, and to supply these regardless of the commonplace questions of profit and loss. He believes that it is the duty, alike of the individual and the corporation, to lend a willing ear to the needs and reasonable demands of patrons and employes, and to take both into the inner temple of confidence.

"It was Mr. Vail who brought success to those radical innovations—the night telegraphic letter, the day telegraphic letter, and the lower press rates for cable messages, in the face of more than one Doubting Thomas, who predicted an early failure of the experiment. These were graceful and voluntary concessions to the public, and quickly became popular. The resultant benefits have been satisfactory alike to the telegraph company and its patrons. And, contrary to general expectation, there has been a constant increase of ordinary messages ever since, quite equal to the growth of these new features.

"In most lines of business, there is a constant and merciless weeding out of features that prove unprofitable, regardless of every other consideration than sordid gain. Not so with the Western Union Telegraph Company, under Mr. Vail. Witness the fact that, in 1912, this great corporation maintained 25,000 offices, less than 5,000 of which earned enough to pay expenses; and yet there has been no reduction of the number, notwithstanding the enormous annual loss suffered by this company from operating 20,000 non-supporting offices for the benefit of the public.

"Marvelous, indeed, has been the growth of the telephone, both as a public utility and as a profitable investment. Less than forty years ago the Bell patent, with the magic number of 174465, which has been declared "the most valuable single patent ever issued," made its bow to an incredulous world. As late as 1878, the first switchboard, having as many as twenty circuits, was equipped and used. In 1912, there were 2,576,789 exchange circuits; 7,456,074 separate telephone stations, operating 14,610,813 miles of wire, representing about 9,000,000,000 toll and exchange connections.

" In the first years from 1907, when Mr. Vail returned to the Bell Company, to and including 1912, the assets of the Bell system increased $311,000,000, while "obligations and payables outstanding" increased a little less than $200,000,000, an eloquent testimonial to his efficiency as the directing and developing mind of these two stupendous enterprises, so intimately related to the daily life of very nearly every community in the civilized world.

"There is something really picturesque and inspiring in the career of a man who, beginning the active struggle for fame and fortune at the age of twenty-two on a little farm in Iowa, has before reaching the seventieth milestone, perfected and successfully directed, for a considerable period, the railway mail service of this country; has organized and systematized the telephone industry and lifted it from a position of financial embarrassment in 1880 to a net earning record of almost $57,000,000 and a property value of over $700,000,000 in 1912; has given the country a unified telephone system connecting over 7,500,000 telephones; has reduced the average exchange rate per telephone sixty per cent since 1895; increased the number of stations in the average telephone exchange more than five-fold, and the distance for practical telephone conversation more than 2,000 miles, which twenty-eight years ago had not reached 100 miles; increased the number of shareholders (over one-half of whom are women) from 17,000 to 54,000; has established co-operative and complementary relations between the telephone system and Western Union Telegraph, which has greatly increased the efficiency and usefulness, as well as the revenue of both; has established a munificent benefit fund for employes, from which payments are made in case of accident, sickness, death or retirement from the company's service, varying in amount according to the length of employment and other conditions; and outside of his telephone and telegraph work has bought and electrified important trolley railways, and established electric light and power systems in a far-distant State of South America; has acquired a 5,000-acre tract of Vermont land, transforming it into a thing of beauty and profit—an ideal farm; has founded a successful college of agriculture for Vermont boys, and has, through all these stages of phenomenal advancement, maintained a reputation for business acumen and integrity, for fair dealing and due consideration for his fellow men.

Not a Bull but a Lion.—"Found a lion under bridge very weak," for "foundation under bridge very weak," is one of the latest additions to the telegraphic menagerie.

The Part Played by the Telegraph in Blowing Up Gamboa Dike on the Panama Canal.

An event of the greatest moment and interest to the world's commerce took place on October 10, when the dike at Gamboa, on the Panama Canal, was removed by a huge blast of dynamite, and the waters of the Atlantic and Pacific oceans were practically united through this celebrated waterway.

The officials in charge of the work on the canal, desiring to give the President of the United States the honor of exploding the dike, requested that electrical arrangements be made with that end in view. Consequently, the Western Union Telegraph Company, the Mexican Telegraph Company and the Central and South American Telegraph Company co-operated and made the necessary connections between their respective lines to insure the success of the project. It had been the original intention to set the blast off at 9 a. m., but at the request of the San Francisco Chamber of Commerce, the hour was changed to 2 p. m., in order that the time of the explosion should coincide with the Chamber of Commerce celebration in San Francisco. As the Pacific Coast is intensely interested in the Panama Canal, the request was granted, and at 2 p. m., New York time (11 a. m., San Francisco time), President Wilson closed a key at Washington, and a few seconds later the Gamboa dike was blown up.

To telegraph men the actual operation of setting off the blast at the Gamboa dike and the announcement of the success of the event will be of much interest.

The Western Union Telegraph Company, which, in connection with the Mexican Telegraph Company, daily furnishes correct Washington time to the government officials on the Isthmus of Panama, utilized a circuit from Washington to Galveston, a distance of 1.556 miles. At Galveston, connection was made with the Mexican Telegraph Company's cable to Coatzacoalcos, 792 miles, thence over the land line across the Isthmus of Tehuantepec to Salina Cruz, 163 miles. At Salina Cruz, the circuit continued through the Central and South American Telegraph Company's cable to San Juan del Sur, Nicaragua, 690 miles, thence to the company's station at St. Elena, Ecuador, 1,034 miles. The last stretch of the cable circuit from St. Elena to Panama was 920 miles. At Panama, the cable was connected to a seventeen-mile land line to Gamboa dike, furnished by the Panama Railroad Company.

At all the cable stations Muirhead gold-wire cable relays are used, and the closing of the key at Washington by President Wilson sent the blasting signal direct to the dynamite charge at Gamboa dike without the intervention of human hands. When the relay at Gamboa dike was thus closed, the charge in the dike immediately exploded, thus practically completing the greatest engineering feat in the history of the world.

On the bridge at Gamboa a man was stationed, holding in his hand a telephone connecting with the Central and South American Telegraph Company's office at Panama. The moment the explosion occurred, he telephoned the fact to the operator at Panama, who was ready for the signal with a telephone at his ear and his hand on the key connected to the circuit back to New York. At the instant the signal was received from Gamboa he flashed it to New York, via Colon, and Fisherman's Point, Cuba.

President Wilson closed the key at Washington at 2:01 p. m., and the explosion took place at 2:02, The return signal announcing the success of the event was received at New York at 2:02½. The total length of the circuit from Washington to Gamboa dike was 5,172 miles, and the length of the return circuit via Colon to New York was 2,310 miles.

President James A. Scrymser, of the Central and South American Telegraph and Mexican Telegraph Companies, who was at White Sulphur Springs, W. Va., at the time, received the signals almost simultaneously, and immediately wired his congratulations to the officials of the Western Union Telegraph Company and of his own companies on the successful accomplishment of the interesting event.

The direct cable between San Juan del Sur and Panama was temporarily interrupted, or it would have been used as a link in the circuit, instead of going around by the way of St. Elena, Ecuador.

At the office of the Mexican Telegraph Company, at 64 Broad street, New York, were gathered to witness the interesting ceremonies representatives of practically all of the New Yorks newspapers and many prominent citizens. In addition to three telephone trunk lines, additional public circuits were connected with various organizations throughout Greater New York, to which the news of the event was instantly telephoned.

Mr. B. H. Reynolds, superintendent of the company's New York office, said his company had received many congratulations on the success of the operations.

The event was appropriately celebrated at San Francisco. A direct wire from the White House at Washington was run to a set of instruments at the base of the Dewey monument, Union Square, San Francisco, where a large crowd of people had assembled to witness the attending ceremonies. The San Francisco circuit was closed by President Wilson at the same moment that he closed the circuit to Gamboa dike. When the signal was received, a young lady on the speaker's stand sang the "Star-spangled Banner," and Miss Annette Rolph, daughter of Mayor Rolph, of San Francisco, unfurled the Stars and Stripes, indicating to the assembled people that the Gamboa dike had been blown up.

TELEGRAPH AND TELEPHONE MECHANICS IN AUSTRALIA.—The Australian postal department is experiencing difficulty in securing a sufficient number of postal mechanics to satisfy its needs. This class of mechanics is required for telephone and telegraph work. The lack of help of this nature, it is stated, is embarrassing to the Australian service, and the prime minister at Melbourne states that he will have to import mechanics if Australia cannot supply them.

Safety at Sea.

The committee on radiotelegraphy appointed by the Secretary of Commerce to prepare recommendations for the use of the American delegation to the International Conference on Safety at Sea, to be held in London, November 12, has made its report and recommends:

(1) That efficient apparatus for radio communication be required on all ship in foreign trade which carry fifty persons or more (passengers or crew, or both combined), navigating the ocean between ports more than 200 nautical miles distant from one another.

(2) That apparatus, to be deemed efficient, must transmit messages with sufficient power to be received by day over sea at a distance of at least 100 nautical miles by a ship equipped with apparatus equal to that of the transmitting ship.

(3) That an auxiliary power supply should be provided, independent of the vessel's main electric power plant, which will enable the sending set for at least four hours to send messages over a distance of at least 100 nautical miles by day.

(4) That two first-grade operators should be required on all such ships maintaining a constant service, also on all such ships carrying 100 or more passengers. One first-grade and another first or second-grade operator should be required on all other such passenger ships. One operator (first or second-grade) and one cargo operator or watcher should be required on all such cargo boats.

The recommendations of the committee are based not only on the laws of the United States, but also, in principle, on the London International Convention and the laws of Canada and Australia. The laws of Canada and Australia do not specifically require a constant wireless watch on cargo boats, but authorize those colonies to impose that requirement.

The second operator, or watcher, on a cargo boat will rarely be required for the safety of his ship or the crew of which he is a member. The constant watch is to be maintained almost entirely for the purpose of enabling the master of the cargo boat to be, at all times, in a position to receive radio distress calls and to render the assistance within his power. The proposition, accordingly, is in the interests of the safety of the seafaring world.

The committee comprised E. T. Chamberlain, commissioner of navigation, chairman; W. H. G. Bullard, superintendent Naval Radio Service; C. M. Saltzman, assistant to Chief Signal Officer; J. Q. Walton, constructor in the Revenue-Cutter Service; Frederick A. Kolster, Bureau of Standards.

Cost of Wireless Messages.

Deputy Manager Turnbull, of the Marconi Wireless Telegraph Company, of England, made a statement, in London, on October 15, regarding the cost of wireless messages. He did not consider the ship to shore rates excessive anywhere.

"The radio convention," he said, "specifies that the ship charge shall be equivalent to eight cents a word and the coast charge to twelve cents, but the convention also recognizes the fact that certain outlying stations are worked at very great expense, in which cases the convention provides that each administration can, at its discretion, charge a superior fixed coastal rate. There is one fifty-cent-a-word rate for the transmission of messages from Cape Cod, a high-power station, to distant ships. It is a special case, corresponding to nothing else. The Cape Race and Sable Island rates are only twenty-three cents.

"Again, the capital cost of ship and shore business must not be compared with the transatlantic capital cost without a comparison of the times which each set of stations is working. The transatlantic stations are working always, whereas the Cape Race station, for example, works only when ships happen along, while the expenses continue all the same.

"It is not true that press messages are invariably delayed till others are sent. On the contrary, messages are sent in the order of filing. There is no discrimination against press messages. Preference is given only to government and steamship masters' navigation messages. Press messages would take precedence over captain's private messages if filed first.

"There are no press rates because they were not provided for at the radio convention. The subject never came up. The next convention will be at Washington, in 1917.

"The company is not, at the present moment, convinced that the resultant traffic increase would justify the lowering of rates."

Telegraphy.

Telegraphy is one of mankind's boon blessings, says the *Nashville Tennessean*. Without it, in these stirring times, we should hardly be able to exist. There could be no World Series returns, no stock quotations, and racing results would be of no practical value. Election returns would decrease from old age before the people could learn of the results, and campaign funds would have to be solicited for the next primary before the nominee of the last convention took his seat or realized his fate.

Modern journalism would suffer irreparably, and the latest details of the Civil War would be fresh reading. Baseball is now considered the greatest commercial and amusing business now in existence. Without telegraphy it would be a defunct factor, and the fans would perish. But we are to be thankful that such is not the case.

Telegraphic intelligence is received and dispatched by keen-eared individuals, who can distinguish the drop of a pin from the collision of two microbes in midair. They can receive the election returns in provoking calmness, while two hundred office-seekers are standing at their elbows, yelping for their savior from utter ruin.

When the world has once missed the convenience of telegraphy, then, and not until then, may we expect perpetual and universal harmony among those who complain that we are not advancing.

A Study in Electricity.*

Electricity first attracted attention 2,500 years ago, but scientists have never been able to analyze it and tell us just what it is. We speak of it as a current of electricity, but there is no current, and we use the term as a matter of convenience. Electricity has no weight and can be produced in unlimited quantities without the consumption of any material thing; hence, it cannot be a substance or material.

It is a constituent part of Nature, and, in its natural state cannot be detected, but it is capable of being separated into two parts; one we call positive, the other negative. When separated, the two parts seek to reunite and again form an equilibrium or natural condition. If we constantly separate the two parts and provide a conductor to facilitate the reuniting, then we have what we call a current of electricity, and this current can be utilized to perform work, and, in our business, we make use of it to transmit intelligence. In a battery, there is consumption of zinc and sulphate of copper, but no part of these elements enter into the composition of electricity. They are consumed or physically changed in the effort to separate electricity into two parts.

A wind will disturb a body of water and cause the waves to roll, but water is not composed of wind. Likewise, a battery, or generator, will disturb latent electricity, and, in the process of being restored to its natural condition, brings into action certain forces which can be made use of to advantage.

Electricity passes freely through certain metals in its effort to unite, while a dry piece of glass or porcelain acts as a bar to its passage. In forming a telegraph system, we provide a battery or generator to separate electricity, and then supply a wire through which the two parts can unite. We can cause this wire to extend hundreds of miles, but it must be brought back again to the point where the separation occurs, in order that the reuniting may be continuous. If it is not brought back, the current would only continue for the fraction of a second, while passing from the battery to the end of the wire, and this would not answer the purpose for operating our telegraph machinery.

In actual practice, we do not bring the wire back to the battery, but connect the battery and the distant end of the wire to the earth and the current returns through the earth instead of through a wire.

The fundamental law underlying the operation of the telegraph is that the current in any circuit is equal to the electromotive force of the battery divided by the resistance. Electromotive force, when applied to electricity, is equivalent to the degree of pressure or force in a steam boiler. Some batteries or generators separate electricity more rapidly and to a higher degree than others.

The unit of measurement for electromotive force is the volt. In a local circuit connecting a battery, sounder and key, we have, in the battery, two cells, with an electromotive force of about two volts, or one volt per cell. The resistance of the sounder and battery is about eight ohms. (The ohm being the unit for measuring resistance), the sounder four ohms and the battery cells two ohms each. Dividing the two volts by the resistance of the battery and sounder, eight ohms, we have .25 as the value of the current.

In a telegraph circuit composed of 100 cells of battery, 100 miles of No. 8 iron wire, and ten relays, measuring a resistance of 150 ohms each, we have a total of 100 volts. The resistances are: battery, 200; wire, 1,500; relays, 1,500 ohms (standard relays have a resistance of 150 ohms each), total, 3,200 ohms. Dividing 100 volts by 3,200, we have a current represented by .031. From these figures we find that about eight times as much current is used in operating a sounder as in operating the circuit with fifteen relays and 100 miles of wire, but the electromotive force in the latter is fifty times as great as in the former, in one, two cells of battery are used, in the other, 100 cells. The best results are obtained when the aggregate resistances of the magnets is equal to all other resistances in the circuit.

If this rule were strictly observed, the magnets in different main-line circuits would all be of different resistances. We avoid this by taking an average and adopting it as a standard. A No. 8 gauge iron wire measures about fourteen ohms per mile when new, but after fifteen or twenty years it may measure from twenty to fifty ohms, the increase being largely due to numerous defective joints. With proper instruments, the resistance of any wire can be ascertained readily.

To ascertain the number of cells of gravity battery required to operate a telegraph circuit with standard relays, add together all the resistances of wire, instruments and battery, and divide by thirty; the result will be the number of cells required.

If the terminal grounds are other than gas or water pipes, they probably offer considerable resistance and must be taken into account. The better plan is to measure the resistance of the entire circuit, and divide the result by thirty.

* *From the Seventh District Blue Book.*

An Important Book on Testing.

Every student-telegrapher should have in his library of electrical literature a copy of "Electrical Instruments and Testing," by Norman H. Schneider. The importance of electrical testing cannot be over-estimated, and a practical knowledge of this branch of technical telegraphy is indispensable to those who would progress. This book is the latest on the subject of testing and is clearly written and well illustrated. It is as useful to the telephone man as to the telegrapher, as it contains a good deal of information on testing in telephone exchanges. The work is designed for the practical man and contains only the simpler mathematics. The chapters on the testing of telegraph wires and cables, and the location of faults were written by Mr. Jesse Hargrave, a well known telegraph engineer.


KERITE
1850
1913
DAYS KERITE
1880
1890
1900
1910

THE RAILROAD.

MR. GEORGE F. BAER has been elected president of the Philadelphia, Reading and Pottsville Telegraph Company.

F. S. RAWLINS, aged 58 years, superintendent of telegraph, Southern Pacific Railway, San Francisco, Cal., died of Bright's disease October 17.

MR. JOHN W. KEPHART, formerly a telegraph operator on the Pennsylvania Railroad, at Cambria, Pa., is running for the judgeship of the Superior Court. Mr. Kephart studied law, and is but forty-one years of age.

THE NEW ORLEANS CONVENTION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—Mr. C. A. Stair, division commercial superintendent, Cumberland Telephone and Telegraph Company, New Orleans, La., has been added to the entertainment committee of the Association of Railway Telegraph Superintendents, as a coadjutor of Mr. W. A. Porteous, manager of the Western Union Telegraph Company in that city, whose appointment as a member of that committee was announced recently. Messrs. Porteous and Stair will look after the local arrangements for the next convention of the association, which be held in New Orleans, May 19, 1914.

Wireless in Operation on the Lackawanna Railroad.

Mr. Louis R. Krumm, chief radio inspector of the Bureau of Navigation, Department of Commerce, Washington, D. C., on October 22 and 23, inspected the wireless stations of the Lackawanna Railroad Company at Scranton, Pa., and Binghamton, N. Y., and granted licenses for the operation of these stations, under the government rules and regulations governing radio communications. The wireless service between these points was started on October 23, and messages are now being handled at about the same speed as by Morse telegraph circuits.

The Lackawanna limited train is being equipped with wireless apparatus, and, in a few days, messages will be handled in connection with moving trains.

The company has prepared a special message blank for use in the wireless service. Mr. L. B. Foley is superintendent of telegraph of the Lackawanna Railroad.

Wireless Train Control.

A successful demonstration was recently made of the Prentiss system of automatic "wireless" train control, of which Mr. F. W. Prentiss is the inventor, at the Hampton Court Station of the London and South Western Railway. In this system, says the *Electrical Review and Western Electrician*, the track is divided into a number of insulated sections, in each of which a low-voltage track circuit is arranged, with, in addition, a high-tension wave wire running between the rails. At the end of each section is a box containing the high-frequency plant for the supply of current at 20,000 volts to the wave wire. This plant is controlled by a relay in connection with the track circuit of the section ahead, with the result that if that track circuit be short-circuited, the controlling relay is de-energized, and the supply of high-tension current to the wave wire ceases. The locomotive is fitted underneath with an arrangement of wires equivalent to the antennæ of the ordinary wireless apparatus. These receive the energy transmitted from the wave wire, and by means of a system of coherers and relays in the cab, a green "line-clear" signal is provided for the driver if the section ahead is unoccupied. If, however, the section ahead be short-circuited, the wave discharge ceases, and a red light is shown and a buzzer simultaneously sounded, while the brake is at the same time applied, these operations being effected by power obtained from a battery in the cab. Provision is made to enable the driver to release his brake, but the red light and the buzzer continue until the section ahead is cleared, when the high-frequency supply is re-established and normal working is resumed. The system, therefore, provides for a continuous danger signal on the locomotive, so long as the line is not clear, the automatic application of the brake and a prompt intimation of the restoration of line-clear conditions. In the event of failure of the high-tension, or the track circuit, danger indications would be given. The operation of the cab apparatus naturally depends on uninterrupted battery supply. The demonstration was quite successful, the train being brought up on every trial by the automatically applied brake, although the regulator was untouched.

G. R. S. Selectors on the New York Central.

The New York Central Railroad has awarded the order for telephone selector equipment for the West Shore line, Albany to South Utica, to the General Railway Signal Company of Rochester, N. Y. This circuit comprises forty-two selector stations and is 118 miles in length, the dispatcher's office being located at Albany. The order specifies G. R. S. power equipment, including an alternating-current-direct-current motor-generator set and a power switchboard, with accessories. The installation will be the third circuit on the New York Central Railroad to be equipped with G. R. S. selectors and power equipment.

NEW YORK TELEGRAPHERS' AID SOCIETY ENTERTAINMENT.—The annual entertainment and reception of the New York Telegraphers' Aid Society, for the benefit of the relief fund, will take place at the Lexington Avenue Opera House and Terrace Garden, New York, on Tuesday evening, November 18. A bill of high-class vaudeville will be presented. Mr. R. J. Marrin, chairman of the entertainment committee, promises that this year's event will surpass all previous efforts and an enjoyable evening is assured to all who may attend.

T. & T. L. I. A. ASSESSMENT.—Assessment No. 559 has been levied by the Telegraph and Telephone Life Insurance Association to meet the claims arising from the deaths of Leroy F. Youman, at Dallas, Tex.; Charles F. Gregg, at Vinemont, Ala.; Carl T. Iwers, at Sioux City, Iowa; John W. Brown, at Augusta, Ga.; Eugene E. Hazzard, at Louisville, Ky., and Carl Winkel, at Brooklyn, N. Y.

The Servant's Duty.

As a very large proportion of us must either direct the work of those who serve us, or follow the directions of those whom we serve, the question of the duties which employes owe to employers is indeed vital, says Mr. Walter K. Towers, in *Telephone Engineer.*

The method that an employer usually adopts to enforce his authority is to dismiss from his service the employe who fails to obey his commands, or perform the duties expected of him. The fear of "losing the job" is what holds most employes to their duties. The employe usually enforces his rights by quitting when he is ordered to perform a task which he believes unreasonable. In cases where the employe has been hired for no definite period, and there is no understanding that the employment is to continue for any period, the relation of employer and employe is continued merely at the will of the parties and may be readily dissolved by either. But where there is a definite agreement—a contract—between employer and employe, fixing a term of employment, the employer may not discharge the employe without adequate grounds.

When we speak of "master" in the popular sense we usually think of one who has wide authority over the person of an employe who is in a decidedly inferior position. We are inclined to think of a "servant" as one serving in a somewhat menial capacity. But such is not the meaning of master and servant in legal terminology. The words master and servant are as broad as employer and employe, including all employers and all employes, whatever their rank, whatever the importance or responsibility of their calling. The general manager, with the widest authority, employed at a salary of a hundred thousand dollars a year is, in law, a servant. The simplest employer is master.

The duty of the servant to obey the master is fundamental. It is of the essence of the contract of employment and must always be recognized. "A promise by the servant to obey the lawful and reasonable orders of his master within the scope of his contract is implied by law," said a New York judge. "Submission to the master's will is the law of the contract." An authority on this subject has written, "Where a servant deliberately violates his master's orders, or refuses to obey them when given, he is clearly guilty of the grossest breach of contract. His duty is to obey the master in all things for which he became bound expressly, or in which obedience is implied from the nature of the service undertaken."

The employer's usual redress for a refusal to obey on the part of his servant is a dismissal from his service. This right of a master to dismiss a servant who has violated this duty of obedience is firmly settled. As to just what amounts to such a defiance of proper authority as to justify an employer in dismissing an employe whom it has been agreed is to serve for a definite period is the question that is of most immediate interest and importance to employer and employe.

Not only may a master dismiss a disobedient servant, but he may also sue that servant and secure damages for any injury which may have been caused by reason of the servant's disobedience.

While the general rule is that the disobedience of any order is a breach of the duty which the employe owes to the employer, and so a justification for dismissal, there are certain circumstances which will justify a servant in his disobedience. A servant need not obey an order which is unreasonable, but an employe should be very certain that the instruction would be deemed obviously and certainly unreasonable by a normal person before he disobeys for that reason. Nor need a servant obey instructions which are unlawful. Neither may an employe be dismissed for failure to obey orders instructing him to perform services which are not properly within the duties for which he was employed.

A servant may not be dismissed for the failure to obey an order in regard to a matter of small importance and so trivial that the contract of employment is not affected. If the disobedience was unintentional, and in regard to matters of no importance, and the instructions were in regard to matters of mere detail and not of a character to require, in all circumstances, strict obedience, the law will, generally, insist that there is not sufficient grounds for the severing of the relation of master and servant.

A master may dismiss a servant though the act in question was not actually injurious to him—it is enough that there was a failure to obey in a matter of importance, or a wilful disobedience of any character of a proper order.

The hours at which a servant is required to work are not infrequently fixed by the terms of the agreement between employer and employe. The length of a working day may also be prescribed by law. It may be understood from the nature of the employment, but a servant cannot be required to work at unreasonable times, nor for periods, which considering all circumstances, are excessive.

As to holidays, the laws of the State control. Other days off may be recognized and understood by custom or stated in the contract. Sunday is usually a legal holiday, or understood as a holiday, yet it may not be in exceptional callings, as those of seamen or railroad employe.

Sickness or other urgent necessity is a recognized excuse for an employe's failure to work during periods of required labor. But a servant who absents himself from work, contrary to the instructions of his employer, for no good cause, is guilty of breach of duty and may be dismissed.

Attenuation of Telephone Currents.

Attenuation of telephone currents is due to the gradual loss of amplitude of the current waves or impulses as they pass along the line. When a transmitter is spoken into, the electrical energy produced is transmitted over the wires in the form of current waves. The wave energy is gradually dissipated during its propagation,and the amplitude of the waves diminishes in corresponding degree as they pass along the line.

PHILLIPS CODE.

The popularity of Phillips' Code, by Walter P. Phillips, was never more apparent than at the present time. Its acceptance by the telegraphic fraternity, as a standard work of the kind, dates from its first publication, and the constantly increasing demand for this unique and thoroughly tested method of shorthand arranged for telegraphic purposes has necessitated from time to time the issuance of several editions. The present edition was carefully gone over, a few revisions made, and a number of contractions added, until now this "staunch friend of the telegrapher" is strictly up-to-date in every particular. It has been declared that an essential qualification of a "first-class operator" is a thorough understanding of Phillips' Code.

The use of this system promotes rapid transmission, and for press reports especially was long since declared to be the best ever devised. By common consent it is recognized as standard, and everywhere is regarded in the profession as indispensable in contributing to the operator's fund of practical knowledge. In fact, not to understand Phillips' Code acts as a distinct embarrassment to the operator.

The price of the book is $1 per copy. Address J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Important and Valuable Electrical Books for Study.

"Electrical Instruments and Testing," by Norman H. Schneider, is the latest work on this important subject, and has been brought up to date. It is an extremely practical book, and every telegrapher who is preparing himself to fill positions in the engineering branch of the service should make a copy of this work his text-book in testing. It is thoroughly reliable, and was written by a practical engineer. The section on the testing of telegraph wires and cables was written by Mr. Jesse Hargrave, a well-known telegraph engineer, and the illustrations, of which there are many, are very clear and understandable. The price of this book is $1.15 per copy.

"American Telegraph Practice," by Donald McNicol, is the other book to which we desire to call especial attention. This book contains the latest information and descriptions of telegraph apparatus and systems, and it constitutes a complete course in telegraph engineering. It is well illustrated and a careful study of its contents will give the student an immense advantage in the line of promotion. The more a man knows of it, the more will he be sought when a vacancy occurs. The book deals with every detail of the telegraph engineering and construction services and is written in so clear English that anyone with average intelligence can readily grasp the facts set forth. The telephone in its relation to telegraph operation is also covered to a liberal extent. It is a book that gives one a desire to know it from beginning to end, and, with patient effort, this result can be easily attained. The price of this book is $4.00.

"Handy Electrical Dictionary," by W. L. Weber. This little book, which is of vest-pocket size, is a necessary companion of the two books referred to, as it supplies the key which unlocks the meaning of the technical terms met with in these volumes. To the beginner this little dictionary is really indispensable. It will remove all doubt as to the meaning of technical words and phrases and is a guide post in the study of electricity. Progress in study is much more satisfactory and really enjoyable when one knows that he is on the right road and thoroughly understands what he is reading. This book is a library in itself, and is complete, concise and convenient. The price is 25 cents per copy for cloth binding, and 50 cents for leather binding.

Wireless Telegraphy and Telephony.

Although there are many books on the subject of wireless telegraphy, one of the most comprehensive and practical is Mr. A. Frederick Collins' "Manual of Wireless Telegraphy and Telephony," the third edition of which is now on the market. Mr. Collins is a well-known wireless expert, inventor and author, and has kept ahead of wireless development from its earliest days; he is, therefore, qualified to write intelligently and clearly on this interesting subject.

In his latest book Mr. Collins treats wireless telegraphy and wireless telephony in considerable detail, and by the aid of clearly drawn illustrations and views of apparatus, he has succeeded in treating the subject in so clear a manner that the novice will readily grasp the information and the expert receive new light.

The contents by chapters are: A Simple Wireless Telegraph System; Elementary Theory; Apparatus of a Commercial Station; The Aerial Wire System; Wiring Diagrams for Transmitters; Wiring Diagrams for Receptors; The Apparatus in Action; Adjusting and Operating the Instruments; Different Makes of Equipment; Suggestion to Operators; Wireless Telephony. The appendix gives a list of books on wireless and a glossary of terms, words and phrases. The book covers much ground and will be of great value as a text-book in study and for reference. The price is $1.50 per copy.

Telegraphers of Today.

An excellent opportunity is offered to telegraph people in general to become acquainted with over 600 prominent telegraph officials and others identified with the telegraph, the railroad, the submarine cable and press associations of the past generation, through their portraits and sketches of their careers as published in "Telegraphers of Today."

This work was issued in 1894 and includes photographic engravings and biographical sketches of all the individuals connected with the interests mentioned at that period, many of whom have passed away from their earthly labors. The younger generation, however, will find much of interest in looking upon their portraits and reading of their achievements in life. Many of them are still alive and in harness in the telegraph and other fields of activity.

Mr. J. J. Ghegan, president of J. H. Bunnell & Co., New York, who recently received a copy, expresses his appreciation of the work as follows: "Copy of 'Telegraphers of Today' received. I casually saw a copy of the book when first published, but never had I an idea that it was so beautiful, interesting and historically accurate. It should be of great interest to telegraphers with any sentiment in their make-up. It is magnificent, unique, and I truly pity those of the fraternity who fail to secure a copy before the edition is exhausted. Kindly send me five additional copies. I can use them to good advantage."

This book, which is 11½ x 14 inches in size, was originally published at $5 per copy, but in order to close out the remaining copies we offer them at $1 per copy by express, charges collect.

Address orders to J. B. Taltavall, Publisher, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

FOR SALE.—Bound volumes of TELEGRAPH AND TELEPHONE AGE for 1912. Price $3.50. Sent by express, charges collect. This price covers the bare cost of binding and handling in addition to the regular subscription price of the paper. The binding is of substantial black cloth, with neat gilt lettering.

MUNICIPAL ELECTRICIANS.

FIRE-ALARM APPARATUS FOR SPRINGFIELD, MASS.—The Board of Fire Commissioners of Springfield, Mass., will receive bids until November 18 for the office apparatus for a new fire-alarm telegraph system; also for furnishing underground cable, combination fire-alarm and cable posts and cable boxes.

The Knight Fire-Alarm System.

An illustrated description of the Knight fire-alarm system, as installed in Leicester, England, is published in the *Post Office Electrical Engineers' Journal*, of London. The system is operated on the open-circuit principle, but the patentees state that it can be operated on a closed-circuit, if required.

The fire-alarm boxes transmit a code signal to the fire station and several can be placed on one circuit. A telephone, accessible to the public, is also provided. The external wiring is on the "radial series" system, two wires being used for each circuit. Telephoning is also carried on over the two wires in parallel.

The fire-alarm transmitter consists of a train of wheels driven by a powerful spring, which is held in check by a cam engaged with the pull handle mechanism.

Normally, the brushes on the code signalling or character wheel rest on an insulated strip, the remainder of the wheel being metallic and connected to earth. When the handle is pulled, the trainwork is set in motion and the wheels revolve sufficiently to allow the brushes of one of the wheels to be grounded and those on the other wheel to be disconnected.

The trainwork cannot revolve further until a current has passed through at least one coil of the electromagnet, and by this means confusion of signals at the fire station is prevented, if two or more boxes are pulled at or about the same time.

The pull handle is of the non-interference type; that is, it does not matter if the person giving an alarm hangs on to it or gives a number of separate pulls; the trainwork, having started, is unaffected until it has twice sent the code call to the station.

In addition to driving the chain of wheels and opening the door of the containing box, the spring also rings a loud-sounding mechanical bell. This local alarm is intended to draw the attention of passers-by, or the police, to anyone giving a malicious call.

If, when the handle is pulled, another box on the same circuit, but nearer to the fire station, is signalling, the second call will be held up by the armature of the electromagnet. When the box nearer the fire station has completed its call, its earth connection is automatically taken off and the lines are put through to the boxes beyond. A current can now pass through the electromagnet of the second box pulled, and its call will be transmitted to the fire station. A second call from a box nearer to the fire station cuts out the one already signalling and send in its own call. The first call, however, is not lost. If the character wheel has completed one revolution before the second box is pulled, the code signal has been transmitted to the fire station and the mechanism returns to the normal. If one revolution of the character wheel has not been completed the armature of the electromagnet will hold up the trainwork until a current again passes through its coils; the wheel will then be released and one complete set of signals transmitted.

The handle, when pulled, remains extended, and cannot be restored to normal, except by winding the spring, which should be done by the fireman when renewing the glass front of the box. If this is omitted the projection on the inside of the door, just below the lock, will foul the drum of the driving spring and prevent the door closing. At the same time the glass front is splintered by the pull handle.

Should a fire-call be given on another circuit during a telephone conversation, an indicator shutter will be dropped, and if this is not observed by the attendant the buzzer in the telephone circuit will be operated, due to the increased current sent out by the telephone battery. The telephone speaking-key should be immediately released and the first indicator restored; the fire-call will then be received.

A fire-call from a box on the circuit on which a telephone conversation is proceeding will also operate the buzzer in the telephone circuit. If the fire-call is given at a box nearer to the fire-station, all boxes beyond it will be cut off, and the restoration of the telephone speaking-key at the station is all that is necessary. A fire-call from a box beyond the one being used for telephone purposes will be transmitted to the fire station immediately the telephone receiver at the intermediate box is placed on the hook.

Should the person using the telephone fail to restore the receiver, the second call will be stored until the firemen arrive at the intermediate box in response to the fire-call, which must be given before an unauthorized person can gain access to the telephone.

If more than one box is fitted on a circuit, a self-starting recorder is essential, and in all cases its use is desirable as a record of a call is then obtained.

A coil of high resistance is placed at the distant end of each pair of wires, so that tests for continuity and short circuit may be made by depressing the "line test keys" and taking the readings on a milliampère meter. A disconnection on one wire, or a short circuit, do not affect the working of the system.

LETTERS FROM OUR AGENTS.

PHILADELPHIA POSTAL.

Among recent visitors at this office was Mr. E. H. Brenig, manager of the Allentown, Pa., office.

CLEVELAND POSTAL NOTES.

Mr. E. F. Fahrendorf, formerly assistant clerk to Superintendent F. W. Sprong, has been appointed manager at Dayton, Ohio, vice Fenton Bott, resigned. Mr. C. E. Carter, formerly assistant manager at Cleveland, has been appointed assistant clerk to Superintendent F. W. Sprong, and Mr. George S. Sprong has been appointed assistant manager, vice Mr. Carter.

ST. LOUIS NOTES.

The Western Union Electrical Club of St. Louis met on Thursday evening, September 25, for the purpose of taking up the season's course of lectures and other work of importance, but on account of the storm, nothing was done. At a special meeting on the evening of September 30, the president was authorized to appoint a committee of three to investigate the securing of a club room in which to hold the lectures. It was also decided to hold meetings on the first Tuesday of each month. At the meeting of October 14, Mr. W. L. Rhodes, of the American Telephone and Telegraph Co., delivered an interesting and instructive lecture on "Practical Wire Testing, Including the Bridge Test."

SEATTLE, WASH., WESTERN UNION.

Mr. J. J. O'Brien, night chief operator for several years, has been transferred to the commercial department as manager of a branch office. The change was made on account of failing health and to afford a much-needed rest. Mr. G. B. Elmore, from the late trick, is acting as night chief operator and Mr. J. F. McArthur has been assigned to the late trick.

Mr. F. S. Logan, time-keeper, has resigned and gone to Baltimore to engage in other business. Mr. Fred Thrapp, of the office of district traffic superintendent G. D. Hood, has been appointed time-keeper.

Mr. J. M. Blashfield, of Superintendent Boening's office, has been appointed manager at Victoria, B. C. Mr. Russ Gillette, electrician, was here for a few days recently on business connected with his department.

Telegraph and Telephone Age

No. 22. NEW YORK, NOVEMBER 16, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Theory of Lightning Arresters and Protectors.

A correspondent asks the following question: "How is it that when lightning strikes a telegraph wire the principal portion of the energy is expended through the high-resistance air-gap between the teeth of the grounded arrester and the conductor, instead of taking the path of lower resistance through the conductor to earth?"

To the layman this action of the lightning discharge seems to challenge the accuracy of Ohm's law, which states that electricity seeks the path of least resistance. The contradiction, however, is only apparent, not real.

In order to explain this phenomenan, it is first necessary to acquaint such doubters with some of the characteristics of lightning itself, a study of which discloses the general theory on which lightning arresters are constructed.

Probably every operator has noticed that whenever a charge of lightning came in over the wire his instrument tended to buzz or grind for a brief period of time, instead of subsiding after one click. This will be more readily noticed if the contact points of the relay are very closely adjusted. This indicates that the discharge was not completed at once, but was divided into several discharges following each other successively.

As a matter of fact, it has been demonstrated that the energy of a stroke of lightning is not dissipated all at once, but in many brief discharges following one another in rapid succession. This is due to the fact that a lightning flash is of an oscillatory nature, which causes the discharges to move alternately in opposite direction in the conductor until all of the energy is expended. As these alterations take place at the rate of approximately 300,000 per second, they naturally create an enormous impedance in the conductor. Impedance tends to cause the energy to side-flash under a strain that is capable of breaking down an enormous resistance. Here, then, we see why the greater portion of the energy jumps the air-gap and passes to earth through the ground plate of the arrester, namely, because the greatest strain is sideways. Pointed teeth are usually placed on the arrester to facilitate the discharge. The advantage of points lies in their ability to collect a current of maximum intensity, the energy of which is carried off by minute air particles expelled by the repulsive action of the discharge.

If it were not for the oscillatory action of the lightning flashes there would be little impedance, and the entire charge would then be expended in the conductor, with dangerous results. Ohmic resistance dissipates electrical energy in the form of heat. Impedance merely obstructs the current, but does not dissipate any of the energy. As the amount of heat a given volume of current will develop in a conductor increases in proportion to the time it flows, it is obvious that that portion of the excessive current which unavoidably must flow through the conductor should not be retarded by the impedance any longer than possible. Hence the oscillations in the conductor should be checked as quickly as possible. This is done by inserting electrical resistance in the circuit; the greater the resistance the quicker will the oscillations cease. The air-gap provides one of such resistances, while the impedance developed in the conductor itself provides another. The opposition such resistance offers "damps" or smooths down the waves, causing them to die out quickly, and thus further reduce the energy of the flash.

This tendency of a lightning stroke to side-flash accounts for the various freaks of lightning frequently reported in the newspapers after a severe electrical storm, such as balls of fire jumping from a metal chandelier, gas jet, or bedpost, to another metallic object, when lightning strikes some object in the immediate vicinity. Where such phenomena occur in buildings equipped with lightning rods, the explanation in nearly every case is that either the rod or the ground plate is improperly constructed. The latter may be too small or the former improperly shaped to carry off the charge quickly. Two differently shaped copper rods of equal weight and length will have the same ohmic resistance and, therefore, be able to take care of a direct current with equal facility; but where the current is of an alternating nature, one rod will be much more efficient than the other. For example, if one rod consists of a No. 4 gauge copper wire and the other of an equal weight of smaller wires twisted together in rope form, or a thin, flat strip of copper of the same weight, the latter two will carry off an alternating current much more readily than the larger wire, because they offer a greater area of surface to the current than the large conductor. This is because alternating currents travel principally on the surface of conductors, and seldom penetrate to the central portion of the metal; consequently, the impedance developed is much less in stranded and ribbon type lightning rods than in solid round conductors of equal weights and lengths. The question naturally arises, why, in view of the fact that the intensity of lightning is great enough to cause it to jump great distances, do we not increase the air-gap between the teeth of lightning arresters and thereby damp the oscillations more quickly? The answer is that the air-gap must not be greater than can be broken down by an electric discharge of any kind that might be dangerous or injurious to the instruments in the circuit.

As a matter of fact, the lightning effects we feel in our telegraph circuits are very seldom due to a direct stroke, being in nearly every case due to the side-flashing of a stroke in the vicinity of the pole line. This should be evident from the fact that when a stroke occurs a "click" is simultaneously heard in all the wires in that neighborhood. It is hardly probable that the stroke hits each conductor.

Fuses cannot properly be called lightning arresters, although they usually constitute part of the equipment in switchboards. They should be classified as "protectors," their sole duty being to protect instruments from the heating effect of excessive current by melting, and thus breaking the circuit, in a shorter period of time than would be required by such current to develop heat enough to destroy or injure the instrument. The type of fuses to be installed depends upon local conditions and must meet the requirements of the National Board of Underwriters.

Telegraph and Telephone Patents.

ISSUED OCTOBER 21.

1,076,020. Automatic Switch for Telephone Exchange Systems. To E. E. Clement, Washington, D. C.

1,076,041. Telephone Transmitter. To W. Kaisling, Chicago, Ill.

ISSUED OCTOBER 28.

1,076,944. Telegraphic Perforating Receiver. To H. Bille, Copenhagen, Denmark.

1,076,990. Telephone System. To C. W. McGonigle, Algona, Wash.

1,077,185. Party-line System for Automatic Telephone Exchanges. To F. Aldendorff, Antwerp, Belgium.

1,077,225. Telephone-system Station Instrument. To A. E. Keith, Hinsdale, Ill.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, November 11:

American Telephone and Telegraph Co.	118⅞
Mackay Companies	76
Mackay Companies, preferred	64¼
Western Union Telegraph Co.	61

PERSONAL.

MR. RICHARD DECKER PRESCOTT, inspector general of telegraphs, Panama, who has been in New York several days on business and pleasure, will return to Panama next week.

MR. ALEX. GRANT, assistant engineer for telegraphs, Melbourne, Australia, arrived in New York from Europe on the steamer "Caronia," November 10. He spent several days in New York investigating the telegraphs, and left for home on November 16 by way of Vancouver, B. C.

MR. W. D. WEAVER, formerly editor of the *Electrical World*, New York, has received from the French Government the decoration of Officier de l'Instruction Publique. The decoration consists of a violet rosette.

COL. ROBERT C. CLOWRY, former president of the Western Union Telegraph Company, accompanied by his secretary, Mr. Frank J. Scherrer, was in Omaha, Neb., October 28 and 29. He was the guest of honor at several social functions.

MISS HELEN M. GHEGAN.—Announcements have been received of the wedding of Miss Helen M. Ghegan to Mr. J. H. Wertz, of Newark, N. J., on September 24. Mr. and Mrs. Wertz are at home to their friends at No. 178 North 12th street, Newark. Mrs. Wertz is the daughter of Mr. John J. Ghegan, president of the J. H. Bunnell & Company, New York, and is well known to the electrical fraternity, having been an occasional attendant, with Mr. and Mrs. Ghegan, at railroad and telegraph conventions.

G. ALFRED HALL, of Washington, D. C., and ALBERT G. HALL, of Doylestown, Pa., twins and old-time telegraphers, recently celebrated their eighty-second birthday. They began telegraphing in 1849. Both brothers are active, physically and mentally. During the Civil War Mr. G. A. Hall was made United States prize auctioneer at New Orleans, where he sold in the twenty-seven months he was there millions of dollars' worth of property captured by the Union army. Mr. A. G. Hall has also actively engaged in politics. In 1867 he was elected collector of the District of Columbia.

SENATOR WILLIAM L. IVES, who recently retired from active service with the Western Union Telegraph Company, at 195 Broadway, New York, has returned to the city after a sojourn of several weeks among friends at various New England and western points. He spent one week with the Honorable C. K. Hunt, at Winsted, Conn. Mr. Hunt himself is an old-time telegrapher and pioneer telephonist.

Mr. Hunt well knows how to entertain veteran old-time comrades. Mr. Ives also visited his old home at Seneca Falls, N. Y., and from his appearance he seems to have taken on renewed vigor.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. CLARENCE H. MACKAY, president of this company, arrived in New York from Europe on the steamer "Olympic," on November 12.

MR. CHAS. C. ADAMS, vice-president of the company, has returned from Indianapolis, Ind., where he went on business connected with the service.

MR. H. W. HETZEL, traveling auditor, New York, has returned from a trip through the Western Division.

MISS EDYTHE GERTRUDE COLLINS, daughter of Mr. E. W. Collins, general superintendent at Chicago, Ill., was married to Mr. Russell Atherton Bogardus, on October 29. Mr. and Mrs. Bogardus will reside in Cuyahoga Falls, Ohio.

MR. JOHN H. HESS, general manager of the Monticello Telephone Company, Monticello, N. Y., formerly identified with the electrical engineering department of this company was a recent executive office visitor.

MR. J. W. JOHNSON, JR., has been appointed manager of the Taylor, Tex., office of the Mackay Telegraph and Cable Company.

MR. C. H. FERRY, manager at Akron, Ohio, has returned to duty after a brief rest.

MANAGERS APPOINTED.—Managers have recently been appointed as follows: L. L. Spence, at Ensley, Ala., vice J. W. Blackman, resigned; A. M. Jacobson, at Moline, Ill.; T. G. Spaulding, at Quincy, Ill.; E. F. Fahrendorf, at Dayton, Ohio; E. F. Jackson, at Alexandria, La.; W. C. Hege, at Winston-Salem, N. C., vice M. R. Vickers; J. W. West, at Paducah, Ky.; A. L. O'Connor, at the Crown Hotel office, Providence, R. I.; F. J. Sheehan, at Amesbury, Mass.; R. C. Smith, at Kewanee, Ill.; M. G. Donelin, at Atchison, Kan.; C. L. Cross, at Newton, Kan.

NEW FLORIDA OFFICE.—An office was opened by this company at Winter Garden, Fla., on October 15.

RENOVATED OFFICES.—The work of renovating the offices at Kansas City, Mo., and Omaha, Neb., has been completed.

RIGHT-OF-WAY FOR LINES ON SOUTHERN PACIFIC.—Judge Wolverton, of the United States District Court, in Portland, Ore., has entered a decree giving the Postal Telegraph-Cable Company permission to use the right-of-way of the Southern Pacific Railroad for the construction of its lines.

AROUND THE WORLD IN FIVE MINUTES.—*The Postal Telegraph* for November contains an interesting article, taken from the *Children's Magazine*, telling the story of the travels of a telegram around the world in five minutes. It is a well-written story, and makes interesting reading for the old, as well as the young.

Postal Promotions.

The promotion of Mr. J. J. Cardona to be assistant treasurer of the Postal Telegraph-Cable Company is significant in more than one way. Apart from the honor of the appointment it is a recognition of the principle of rewarding faithful employes who have demonstrated their worth, with promotion to higher positions. This is in accordance with the policy laid down by the vice-president and general manager of the company, Mr. Edward Reynolds.

The promotion of Mr. Robert J. Hall from a clerkship in the auditing department to that of chief clerk in the office of the assistant treasurer is another illustration of the application of this principle.

Mr. Reynolds, himself, furnishes a conspicuous example of the result of fitting one's self for advancement, whatever position one may occupy, and TELEGRAPH AND TELEPHONE AGE has been consistently preaching this gospel for years.

Mr. Cardona's promotion is the latest instance showing the results of conscientious performance of duty and fidelity to trust. The excellent training he received under his able predecessor well fitted him for the duties of his new office, and it was no more than right that his knowledge and experience should be recognized when an opportunity presented itself.

There seems to be a tendency in some quarters to give preference to technically trained men in filling important positions, rather than to men with ripe experience and the necessary technical knowledge of the duties of such positions. Technical men are all right and necessary in their legitimate field, but scientific training does not carry with it special knowledge and experience, and these are the two most important qualifications necessary to fill positions in the telegraph service. The wisdom of the practice of promotion from the next lower rank to higher positions, fitness being considered, cannot be gainsaid, and we are always glad to see faithful service rewarded.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

MR. BELVIDERE BROOKS, vice-president, left New York, November 7, on a two weeks' trip through the Southwest.

MR. H. C. WORTHEN, general manager, Southern Division, Atlanta, Ga., was a recent New York visitor.

MR. M. C. RORTY, manager joint telephone arrangements, New York, left on November 8 for a business trip through the West. He will be gone two or three weeks.

MR. J. F. SLACK, of Oklahoma City, Okla., has been appointed chief operator at Fort Smith, Ark. Improvements are to be made in the Fort Smith office, including the establishment of a complete power plant. Mr. Slack has had a wide experience in handling wires for both railroad and commercial purposes.

Mr. John McRobie, general manager of the American District Telegraph Company, New York, has returned from Chicago and other western points, where he has been on company business.

Severe Storms Cut Off Telegraph and Telephone Service.

On November 9 a severe blizzard, accompanied by gales, did much damage to telegraph and telephone lines, and paralyzed steam-railroad and street-railway traffic in the middle western states, including western Pennsylvania, Ohio, West Virginia, Illinois, Indiana and other sections. Poles and wires were prostrated in all directions from the weight of wet snow and the high winds, and the damage was so great that it will require many days to restore the service to normal conditions. The snow was ten feet deep in many places, and much damage was done to shipping on the lakes.

The storm was especially severe around Pittsburgh, Cleveland and Chicago, and those cities were practically cut off by telegraph and telephone for some time, there being no workable wires west of Buffalo. Both telegraph companies suffered alike, but by dint of hard work and efficient organization rapid progress was made in restoring communication. This is the worst early-winter storm in many years.

THE CABLE.

Mr. Scrymser's Gift to the Red Cross.—Mr. J. A. Scrymser, president of the Central and South American Telegraph Company, New York, recently donated $100,000 to the American National Red Cross. Mr. Scrymser's gift will be applied to the fund for the purchase of land in Washington, on which the government is to erect a building for the Red Cross, as a memorial to the women of the Civil War.

Cable Between Marseilles and Algiers.—The French Government has laid a new submarine telegraph cable between Marseilles and Algiers, a distance of 400 nautical miles.

New Cable in the East.—A new cable, 2,280 nautical miles in length, is to be laid between Aden and Colombo by the Eastern Telegraph Company, bringing the aggregate length of that company's cables up to 110,367 nautical miles, in addition to 6,200 miles of land line.—London *Electrical Review.*

Japan Desires Reduced Cable Rates to America.—The Japanese Government, it is stated, purposes entering into negotiations, with the object of securing reduced rates for cable messages to the United States across the Pacific Ocean.

THE TELEPHONE.

Mr. W. E. Bell, division commercial superintent, American Telephone and Telegraph Company, Chicago, Ill., was a recent New York visitor.

Telephones in Tokio.—The Japanese Government has decided to install 3,000 telephones in Tokio during the current fiscal year.

German Telephone Relay.—It is stated that a new telephone relay invented in Germany permits of a great extension of telephonic communication. Conversations at a distance of 1,240 miles could, it is reported, be heard with as much distinctness as those held over half that distance at present.

A Telephone Comedy.—Prince Charles of Wrede was fined $7 by courtmartial at Wurzburg, Germany, for insulting a telephone girl over the wire. As the girl is a government employe, the charge came under the head known as "Beamtenbeleidigung," or insulting an official. The prince tried to excuse himself by saying that he was exasperated at the bad service. It was admitted that the service was so bad that anything he might say about it would not have been an exaggeration; but even that did not give the prince the right to be insulting in his remarks.

Telephone and Telegraph Society of the Pacific Coast.

The Pacific Telephone and Telegraph Company, through the courtesy of President G. E. McFarland and General Manager J. C. Nowell, tendered a banquet on October 27, at the Hotel Francis, San Francisco, Cal., to the recently organized Telephone and Telegraph Society of the Pacific Coast.

The dinner was attended by 250 members of the organization, including the related organizations of the Pacific Telephone and Telegraph Company, the Western Union Telegraph Company and the Western Electric Company. Speeches were made by President McFarland and General Manager Nowell, of the Pacific Telephone and Telegraph Company, and President J. H. Corcoran, of the Telephone and Telegraph Society.

Mr. M. G. Guernsey, associate counsel for the American Telephone and Telegraph Company, delivered a brief address on the government ownership of telephone and telegraph companies, as contrasted to private ownership.

The officers of the Telephone and Telegraph Society are: President, J. H. Corcoran; A. H. Griswold and F. H. Leggett, vice-presidents; A. C. Rogers, secretary-treasurer, and C. W. Burkett, C. S. Casassa, P. H. Coolige, J. P. Downs, D. P. Fullerton, J. W. Gilkyson, R. W. Gray, C. P. Morrill and A. C. Stannard, executive committee.

CANADIAN NOTES.

Mr. C. E. Davies, supervisor of equipment, Great North Western Telegraph Company, Ottawa, Ont., was a recent executive office visitor.

Montreal Telephone Service Impaired by Fire.—A fire in the Bell Telephone exchange in Montreal, Que., November 6, destroyed the local and long-distance switchboards, and left the business section of the city without telephone service.

Picking Up Wireless Messages on Telephones.—A train dispatcher of the Candian Pacific Railway, at Vancouver, B. C., on November 5 picked up on his telephone dispatching circuit a wireless message from a ship at sea, announcing her approaching arrival at San Francisco, Cal. A similar phenomenon was observed a few years ago by Mr. W. J. Camp, assistant manager Canadian Pacific telegraphs, Montreal, and the late W. W. Ashald, superintendent of telegraph, Grand Trunk Railway, Montreal, while experimenting with telephones between Montreal and Fort William, Ont. They picked up a wireless message evidently from some yacht or steamer on the St. Lawrence river.

RADIO TELEGRAPHY.

Signor Guglielmo Marconi was recently elected a senator of the Italian parliament, but it was afterwards discovered that he was one year too young, and, therefore, could not qualify.

Mr. E. J. Nally, vice-president and general manager of the Marconi Wireless Telegraph Company of America, New York, has been elected a director of the Marconi Wireless Telegraph Company of Canada, Limited. He attended a meeting of the directors of the latter company in Montreal, Que., November 11.

Wireless on Ocean-Going Vessels.—The National Seamen's and Firemen's Union, in London, has resolved that the members should refuse to sign on ocean-going vessels not equipped with wireless apparatus after May 1, 1914.

Time Ball on "Titanic" Memorial Tower.—This company started a time-ball service on the "Titanic" memorial tower of the Seamen's Church Institute, New York, on November 1. The ball is dropped at noon every day in the year by a direct signal from Washington.

Washington Radio Engineers to Organize.—A meeting of resident members of the Institute of Radio Engineers in Washington, D. C., will hold a meeting on December 3 for the purpose of forming a Washington Section of the Institute. Mr. Emil J. Simon, 81 New street, New York, is secretary of the Institute of Radio Engineers.

Radio-Stations at Newcastle, N. B.—The radio-station now being erected at Newcastle, N. B., will cover about fifty-four acres, and the steel tower will be 506 feet high. Six wooden towers, each 300 feet high, are also being constructed, and all will be built on concrete foundations. The main steel tower is now practically finished. It is stated that the plant will have a forty-kilowatt equipment, with a voltage of 1,000. It will be operated by the Universal Radio Syndicate.

Meeting of Institute of Radio Engineers.—At the meeting of the Institute of Radio Engineers, held at Columbia College, New York, November 5, Dr. Lee de Forest presented a paper on "The Audion-Detector and Amplifier." He discussed the principles of the operation of this device; described its use as a sensitive detector for radio communication and its more recent adaptation as a practical amplifier of exceedingly minute pulsating currents. The paper was accompanied by demonstrations of the apparatus described by Dr. de Forest. Dr. E. F. W. Alexanderson, of the General Electric Company, Schenectady, N. Y., will present a paper at the next meeting of the Radio Institute, on December 3, on some recent developments in radio frequency alternators.

International Wireless Telegraphy.—It is reported from Brussels that an international company for radiotelegraphy has just been formed in that city. The company, which provisionally receives a subsidy of $10,000 from M. Robert Goldschmidt, general secretary of the Belgian Association of Engineers, is to carry out scientific and practical work. It is also proposed to make legislative suggestions to governments, in order to guarantee the uninterrupted transmission of wireless telegrams according to a uniform system. The company further intends to issue regular publications, which are specially to assist the meteorological information service, and the Brussels Observatory is, for this purpose, to be equipped with special apparatus for wireless telegraphy.—London *Electrical Review.*

Two More Wireless Rescues.

On September 29 the steamer "Templemore" caught fire in mid-Atlantic, and summoned help by wireless. The call was answered by the steamer "Arcadia," which rescued the crew of the "Templemore."

On November 4 the steamer "South Point" was disabled in a heavy storm at sea, and a wireless call for help was sent out. It was answered by the steamer "Rappahannock," which towed the disabled vessel to Queenstown.

International Study of Radiotelegraphy.

At a meeting in Brussels, Belgium, on October 13, a commission was organized for the scientific study of radiotelegraphic waves and their phenomena. The officers are: W. Duddell, of London, president; Prof. W. Wien, of Jena, Germany, vice-president; M. Robert Goldschmidt, of Brussels, secretary.

On and after January 1, 1914, at least until March 1, 1914, certain test messages will be sent from a station in Brussels at hourly intervals, on a wave length of 3.300 meters. Check measurements of the wave frequency, group frequency, power and other details will be made and recorded at Brussels. Observers are invited to measure these signals, as often, and at as many different places, as possible. It is hoped that national committees may be regularly appointed to co-operate in the movement, the objects of which are to increase the knowledge of electric radiation and meteorology.

Fessenden Wireless Patents Upheld.

Justice Buffington, in the United States Circuit Court of Appeals for the Third District, on October 20, handed down an opinion in the patent infringement case of the National Electric Signaling Company et al. versus the Telefunken Wireless Telegraph Company of the United States, upholding patents Nos. 918,306 and 918,307, issued to Reginald A. Fessenden, April 13, 1909. These patents, it is stated, cover practically all systems employing high-spark frequency methods of operation, and are very important, as having a considerable effect upon the present stations now in operation. They employ group impulses having a group frequency higher than commercially used alternating currents, but within the limits of audition. At the same time Fessenden's United States patent No. 928,371, relating to means for tuning the circuits of wireless apparatus, was held to be void for lack of inventive novelty.

The present case came up on appeal from the United States District Court for the Eastern District of Pennsylvania, where the plaintiffs lost. The decision of the lower court is now reversed, and the case is remanded for a new decree in accordance with the finding of the higher court, and also ordering an accounting.

The primary object of the invention described in the two patents first named was the prevention of atmospheric disturbances in wireless signaling.

In the evidence an interesting account was presented of the first transmission of signals of high-group frequency from the Brant Rock, Mass., station during the night of December 11, 1905, and their receipt by an operator at San Juan, Porto Rico, who reported the matter to the Bureau of Equipment of the United States Navy. The bureau undertook at once an investigation to determine the source and character of these new and novel signals, finally locating the station whence they emanated. The commercial value of high-frequency spark signaling was attested both by several well-known experts and a number of radio-operators. It was also shown that, whereas a tuned receiver would respond at its natural frequency when excited by atmospheric disturbances, and thus interfere with signaling, an untuned receiver when thus disturbed would enable the operator to distinguish sharply between the noise or disturbance caused by atmospheric discharges and the characteristic high shrill pitch of the incoming signals, thus clearly establishing the value of Fessenden's combination of high-spark frequency at the sending station and an untuned receiver at the receiving station.

Messrs. Samuel M. Kintner and Halsey M. Barrett, receivers for the National Electric Signaling Company, on November 7 filed a suit in the United States District Court, at Trenton, N. J., against the Marconi Wireless Telegraph Company of America, charging infringement of patents owned by the National Company.

OBITUARY.

Mrs. Minnie H. Golden, wife of Mr. J. E. Golden, superintendent of telegraph of the Tidewater Pipe Line Company, Bradford, Pa., died on October 20.

Mrs. J. B. Norris, aged seventy years, wife of Mr. J. B. Norris, an old-time and military telegrapher, an official of the Western Union Telegraph Company at Chattanooga, Tenn., died in that city October 28.

Harry G. Samuels, an old-time telegrapher, well known in Chicago, for many years manager of the Logan and Bryan brokerage houses in California, died at San Francisco, on November 1. He was a brother of F. W. Samuels, formerly manager of the Postal Telegraph-Cable Company, at Indianapolis, Ind.

S. C. Mason, aged seventy-five years, a well-known old-time telegrapher, retired twelve years ago, died in Lockport, Ill., November 3. He entered the telegraph service as messenger for the O'Reilly Lines at Lockport, in 1850, and later became manager of the office. Deceased was for several years chief clerk to Colonel R. C. Clowry, then vice-president and general superintendent of the Western Union Telegraph Company at Chicago.

John E. Selden, a well-known telegrapher in the New England States a half century ago, died recently in Chicago, where he was living in retirement with relatives. Mr. Selden was eighty-three years of age, and a native of Connecticut. In the fifties, sixties and seventies, he worked at Springfield and Boston, Mass., New Haven and Hartford, Conn., and was manager of the main business office for the Postal Telegraph-Cable Company at 253 Broadway, New York, for some time previous to his retirement, fifteen years ago.

The Western Union-American Bell Telephone Case.—The Supreme Court of the United States on November 10 declined to direct the United States Circuit Court of Appeals to send up for review the $5,000,000 litigation between the Western Union Telegraph Company and the American Bell Telephone Company growing out of a contract in 1879, whereby the former went out of the telephone business as a competitor of the latter. The Western Union got a decree from the New England Courts.

Reid Memorial.

The chairman of the Reid Memorial Committee hopes to close the subscriptions within the near future, if those who intend to subscribe or to increase their subscriptions, but have not yet done so, will forward remittances promptly.

There are still some of Mr. Reid's old acquaintances and friends who have not yet subscribed, although they have signified their intention to do so.

It will now require only a few hundred dollars more to make the amount of the fund sufficient for the purpose.

Mr. F. J. Daley, Chicago, Ill., writes: "I certainly appreciate your action in renewing my subscription, as in every issue I find something new and very instructive which is too good to be passed."

Magnetic Club Fall Dinner.

The regular autumn meeting of the Magnetic Club was held at the St. Denis Hotel, New York, November 12, a large number of members and guests being present. The menu was out of the ordinary, consisting of an old-fashioned Thanksgiving dinner, including cider, roast turkey, pumpkin pie, etc., and was greatly enjoyed.

During the dinner there was singing and music by professional entertainers, and, taken altogether, a delightful evening was spent.

The guests of honor were Messrs. E. Reynolds, vice-president and general manager of the Postal Telegraph-Cable Company; J. B. Taltavall, publisher of TELEGRAPH AND TELEPHONE AGE, and Alex. Grant, assistant engineer for telegraphs, Melbourne, Australia.

At the conclusion of the dinner President Charles P. Bruch read some letters of regret from several members who were unable to be present, including Col. Samuel Reber, U. S. A., W. J. Dealy, M. J. O'Leary, Melville E. Stone, W. H. Baker and others, after which he made a few brief and interesting remarks about the success of the Club during the twenty-five years of its existence and spoke hopefully of its future. He then introduced Mr. Edward Reynolds, the guest of honor, as follows:

"Since our last meeting a member of our club has been honored by being charged with most important duties and great responsibilities. I know that I am voicing the sentiments of his fellow-members in this club in congratulating him most cordially upon his appointment as the helmsman of a great enterprise, in assuring him of our hearty support in all that he undertakes, and in expressing to him not only personal good wishes, but also the earnest wish that he may succeed to the utmost in promoting the best interests of both the company itself and those whose livelihood depends, in large measure, upon the company's success.

"He needs no introduction to us in his individual capacity, because many of us have been his fellow-workers for years. We have had no occasion to regret the acquaintance, nor, as I believe, will anyone have occasion to regret acquaintance with him in the capacity in which I now introduce him to you—Mr. Edward Reynolds, vice-president and general manager of the Postal Telegraph-Cable Company."

As Mr. Reynolds arose he was greeted with loud cheers. He said:

"I am glad to be here to-night as your guest of honor. It is an honor that any man might be proud of. I am glad to receive your cheers because it strengthens me to go on with the work I have in mind. By the reception you have given me here this evening, I am deeply sensible of the fact that you have faith and confidence in my hopes and purposes and I hope that you will not be deceived in that regard.

"I understand, of course, that you are paying honor to the office of general manager of the Postal Company, but I cannot help but feel that it is at least partially personal.

"The Magnetic Club was not designed by its promoters to serve any company or interest. It was brought into being to provide a place where all men in a similar line of business might meet for a social hour, and learn to know each other better; but in recent years conditions and influences have caused the Club to be, in effect, a Postal organization, and for that reason I feel free to talk to you as my business associates. You have known me as an associate for many years and you shall continue to know me in the future as such, for I shall continue to be the same always.

"I am deeply sensible of the fact that if success is to attend my efforts as general manager of the Postal Telegraph-Cable Company, it is going to be measured by the loyalty and co-operation I receive from the great rank and file. While I may outline a policy, the fact remains that you have to execute it, and the success of that policy depends on the enthusiasm and the faith you have in it and in the hopes and purposes that I entertain.

"I would like to add that I have no desire to obtain success in my new field unless that success can be secured in a manner that will command your admiration and respect; but in the final analysis, when I come to lay down the reins of office, if I can feel that I have conducted myself as to secure this admiration and respect, and at the same time promote the interests that I am charged to direct, I shall indeed feel that I have not lived in vain.

"What I would like to see is a larger part of the great rank and file attend the dinners of this Club, and I think it is the duty of every official of this company who has anything to do with this Club to get right behind that sentiment and to have the staff feel that within the body of this Club, and especially at its public dinners, all meet upon a common ground.

"It is my earnest hope that this Club will live and prosper and continue to meet the just expectations of its members and friends."

At the conclusion of Mr. Reynolds' remarks, Mr. J. B. Taltavall, also a guest of the Club, who recently returned from a trip to Germany, spoke briefly of the German telegraph organization and service, which, he stated, were very efficient. He referred to the high intelligence of the German telegraph employes.

The next speaker was Mr. Alex. Grant, assistant engineer for telegraphs, Melbourne, Australia, also a guest of the Club. Mr. Grant briefly recounted his observations during his trip around the world, investigating telegraph plants in various countries.

Other speakers were Messrs. Louis de Goll, of Baltimore, Md.; S. S. Garwood, of Philadelphia, and H. B. Logan and C. F. Leonard, of New York.

An intermission of ten minutes was then taken for social intercourse, during which time the tables were removed, and the evening's festivities were brought to a close with a vaudeville entertainment.

Among those present were:

New York—F. G. Austin, J. de Jara Almonte, J. J. Alcock, Frank Brookfield, C. P. Bruch, J. C. Barclay, F. J. Block, W. P. Bowman, J. R. Beard, Col. E. B. Bruch, T. F. Boles, W. W. Blackmar, P. M. Bachelder, C. Brown, J. Costelloe, S. Cohen, J. J. Cochran, W. I. Capen, Col. A. B.

Chandler, A. H. Clarke, M. R. Cockey, J. F. Cleverdon, Robert N. Cleverdon, Walter S. Cleverdon, Fred Cleverdon, E. A. Coney, J. J. Cardona, A. Caruthers, J. Doran, M. M. Davis, W. B. Dunn, J. A. Davison, T. J. Donovan, J. A. Dupius, A. J. Eaves, T. E. Fleming, V. F. Frore, A. A. Fraser, J. Flood, J. J. Fredericks, Wm. Finley, J. J. Ghegan, D. H. Gage, jr., T. J. Howlett, W. E. Harkness, T. E. Heffren, R. J. Hall, W. S. Hallett, H. W. Hetzel, P. A. Hickey, E. Kimmey, F. J. Kernan, O. Kennedy, A. F. Kavanaugh, W. J. Kavanaugh, A. Lockwood, C. F. Leonard, L. Lemon, F. Lund, H. B. Logan, G. I. Lenihan, D. J. McQuade, H. G. Madden, D. McNicol, W. H. Mathews, J. A. Manning, C. E. Merritt, F. E. McKiernan, D. F. Mallen, J. McNeill, J. J. McCauley, M. A. McConnell, J. J. McDermott, A. McNeill, J. J. McCormack, W. H. Michner, R. H. Miller, F. F. Norton, J. Nelson, G. J. O'Brien, J. P. O'Donohue, F. G. Payne, Fred Pearce, W. O. Powers, E. B. Pillsbury, R. G. Post, M. W. Rayens, L. O. Rogers, D. F. Reagair, H. J. Reinhardt, Edward Reynolds, C. Ruffer, T. G. Singleton, D. Shortall, P. R. Shingler, W. V. Stahl, H. H. Sherman, I. Smith, C. Shirley, J. F. Shugrue, J. F. Skirrow, Ed. Sawyer, W. L. Stearn, Wm. Scarborough, J. W. Sullivan, F. Sullivan, Frank J. Scherrer, C. A. Tinker, E. P. Tully, J. T. Tynan, J. B. Taltavall, T. R. Taltavall, A. Walsh, H. Weiss, W. T. Wetmore, J. J. Whalen, A. J. Ward, W. J. Walsh, A. D. Williams, jr., H. E. Wilson, R. L. Wishard, R. H. Weaver, J. J. Wallace, A. Warnke, Chas. Yacht, H. Zweigel.

Baltimore, Md.—Louis de Goll, J. A. Vogt.

Boston, Mass.—C. A. Richardson, J. D. Mcdonald.

Buffalo, N. Y.—H. D. Reynolds, C. E. Newman, L. M. More.

Binghamton, N. Y.—F. G. Wyman.

Harrisburg, Pa.—C. E. Diehl.

Monticello, N. Y.—J. H. Hess.

Melbourne, Australia—Alexander Grant.

Newark, N. J.—M. J. Coogan, J. F. Coogan.

Newport, R. I.—P. S. Durgin.

Philadelphia, Pa.—C. E. Bagley, S. S. Garwood, J. A. McNichol, E. W. Miller, J. W. Wilson.

Pittsburgh, Pa.—H. Scrivens, A. W. Rinehart.

Rochester, N. Y.—R. J. Little.

Syracuse, N. Y.—J. W. Weed.

Washington, D. C.—G. M. Foote.

Death of Sir William H. Preece.

Sir William Henry Preece, aged seventy-nine years, the eminent English electrician, whose name and fame are world-wide, died in London, November 6.

He was born in Wales, on February 15, 1834, and was educated at King's College, London. For half a century he was engaged in the practical work of telegraphy, and, in more recent years, telephony also. Of these years of service twenty-seven were in the post-office, the preceding sixteen having been spent as an employe of the Electric Telegraph Company, which existed prior to 1870, in which year the Crown took over the telegraph.

In 1852 Sir William, then Mr. Preece, entered the office of the late Edwin Clark, who was then chief engineer of the company. From 1854 to 1856 he acted as assistant to Latimer Clark, and in the latter year he was made superintendent of the southern district. During the early part of his career Sir William took out patents on a duplex system. In 1860 he was appointed by the London and Southwestern Railroad as superintendent of the electrical system. He entered the post-office service, in 1870, as division engineer for the South of England, and afterward became engineer-in-chief and electrician.

In 1877 Sir William visited the United States in company of Sir Henry Fischer. The result of their investigations was the introduction of "sound reading" into England. He also took with him the the system of quadruplex telegraphy. In 1884 he again crossed the Atlantic and this time he returned to introduce the Delany multiplex system. In 1907 he visited America as the guest of Mr. Andrew Carnegie. In 1884 Sir William began experimenting with wireless telegraphy. He worked out an electromagnetic system which was for a long time—and before the Marconi system in England—in practical operation between Lavernock, near Cardiff, and Flatholm, an island in the Bristol Channel, a distance of three and a half miles.

Sir William was, for some years, president of the Institution of Civil Engineers, and was a past-president of the Institution of Electrical Engineers. He was joint author with Sir James Sivewright of a text-book of "Telegraphy," with Dr. Maier, of "The Telephone," and with Mr. Stubbs, of a manual of telephony, being, besides, a lecturer of remarkable ability.

Death of Major J. O. Kerbey.

Major Joseph Orton Kerbey, aged seventy-six years, a well-known old-time and military telegrapher, died in Washington, D. C., October 29.

Deceased learned to telegraph at the Outer Depot, of the Pennsylvania Railroad, in Pittsburgh, Pa., in the '50's, and for a time was division operator of the Pittsburgh division. At the outbreak of the Civil War he was in the South, and rendered secret service under authority from the War Department. His experiences were described in his book, "The Boy Spy."

Strictly speaking, Major Kerbey was never in the military telegraph corps but in the signal corps, where he held a commission as lieutenant. He was afterwards commissioned major.

After the Civil War he re-entered the commercial telegraph service. He was manager of the Atlantic & Pacific office in Pittsburgh, Pa., and during the great railroad strike, in the autumn of 1877, rendered especially good service, for which he was commended by General Eckert, then president of that company. He later served as United States Consul at Para, Brazil. The remains were buried in Arlington Cemetery on November 3.

Deceased is survived by his wife, two sons and a daughter.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

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J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, NOVEMBER 16, 1913.

First-Class Operators on First-Class Wires.

In order to obtain the greatest efficiency from a given system all the parts must be adjusted with reference to one another so that they will work in unison, and produce harmonious and effective results. No one would think of driving a tack with a sledge-hammer, or use a full-jewelled watch to indicate the time of a town clock. The same principle applies to telegraph circuits.

Naturally, circuits are graded; some are first class, others second class and lower, and it would be highly inconsistent to put a third-rate operator down to a first-class wire, or a first-class operator to a third-rate wire. Operators are, therefore, selected to man wires in accordance with their ability.

The importance of assigning first-class men to first-class circuits cannot be overestimated. Such men, with their wide experience, can handle wires of this class with the least friction, and keep the business moving at a uniform high rate of speed, whereas an inferior operator would soon disorganize the system, and cause loss to the company.

Beginners, or low-rate operators, cannot be expected to do the work of highly paid, experienced men, but, of course, it should be impressed upon them that as they become more proficient they will be assigned to more important wires and receive more pay. Operators are classified according to their ability, and ability must necessarily be based upon their records as workmen. As they become more experienced in one grade they become qualified to move into the next higher grade, and so on, until the goal of their amibition is reached.

The telegraph companies derive great benefit in carrying out the rule of fitting the operator to the circuit. It means to them fewer errors on first-class wires, and less consequent litigation. It is a well-known and positively settled fact that highly paid, first-class operators seldom make errors, and when such men establish a reputation for first-class work they are naturally proud and jealous of their records and exercise the greatest vigilance to maintain them. Their work is an honor to themselves and to their employers.

Young operators, as a rule, are ambitious to become first-class telegraphers, but they should understand that they cannot become such at once, and that the mere attempt to work a first-class wire does not change their status. The time element in their education is one that cannot be short-circuited, and there is no known method of cutting it out. It is only by patient and diligent work that they can hope to attain the object of their ambition. But there is no doubt that they will reap their reward by conscientiously following this rule. Every first-class operator has passed through this experience, and every future operator will have to do the same.

Deficit in English Telegraphs.

For the enlightenment of those who are preaching the gospel of government ownership of the telegraphs in this country, and consistently closing their eyes to the cost, the substance of the latest report of the British postmaster-general, which is printed in another column of this issue, will furnish some food for thought. It is there shown that the British telegraphs during the year covered was conducted at a loss of $4,787,800. This was not an exceptional year, either; it has always been so since the government took hold of the telegraphs.

One bright side of the report, however, is that of the telephone operation, which shows a surplus; yet it should be remembered that the service is still in a transitory state, and the figures given cannot be regarded as representing the normal. By this, we do not wish it understood that we are pessimistic; on the contrary, we sincerely hope that the good showing on the financial side of the telephone service will continue and increase as the years pass, and thus demonstrate that it is within the range of possibility for a government to conduct a public service at a profit. When this can be done generally, then the advocates of government ownership of everything will have good ground to stand on.

GOVERNMENT OWNERSHIP BILL INTRODUCED.—Representative Lafferty, of Oregon, on October 27, introduced a bill in the House of Representatives, Washington, D. C., providing for government ownership and operation, under the Post-office Department, of all telegraph and telephone lines. The bill provides for a commission of eleven members of the Interstate Commerce Commission and three representatives of the owners to appraise and condemn existing lines.

The Telephone Among the Zulus.

A glance at the accompanying illustration suggests the modernization of an old quotation which might properly be rendered, "The telephone hath charms to sooth the savage breast."

The picture shows a Zulu chief talking over the telephone in the Western Electric Company's African headquarters, in Johannesburg, South Africa. Apart from his "full dress uniform," the expression on his countenance indicates that he is enjoying the telephone conversation in true American fashion. His dress, of course, is not strictly orthodox from the American standpoint, but according to the Zulu idea he is faultlessly attired. His head-gear, in one respect, has its counterpart in the modern feminine head covering—the buffalo horns are disagreeably offensive to those standing at close quarters. The lower part of his legs are decorated with pipe clay, which forms a cheap substitute for socks.

A ZULU CHIEF AT THE TELEPHONE.

No doubt, the telephone in the once "dark continent" is exerting a civilizing influence among the ebony-colored natives, and the time would seem to be at hand when these warriors will find it more profitable to telephone than to war against their neighbors.

Financing the First American Telegraph Line.

Early in 1845, Mr. Amos Kendall, after much consultation, took steps to organize a company to erect a line of telegraph from New York to Baltimore and Washington. It was thought best, however, to attempt its construction first between New York and Philadelphia, and to limit the request for capital to the probable cost of that selection. The commerce between these great cities was large and active. The intercourse by telegraph would be, it was naturally presumed, also large and valuable. The telegraph once thoroughly established between these two leading commercial cities, and the invention fulfilling the high expectations now aroused respecting it, its onward progress would, it was believed, be immediate and rapid. To aid in securing capital for this purpose, Mr. Ezra Cornell and Mr. O. S. Wood went to New York to exhibit the machinery upon a short experimental line. Offices were opened, one at 112 Broadway, and the other in a building on the site of the old Metropolitan Hotel. Permission, however, to allow the connecting wires to be strung along the tops of houses was obtained with great difficulty, and only after paying Prof. Silliman, Jr., $50 for an opinion respecting its safety, which induced the owners of property to consent to their erection. The price of admission to see the telegraph at work was twenty-five cents. That seemed a strange way to enlist capital in a great city like New York. With this embargo, notwithstanding the wonderful character of the invention, there were not visitors enough to pay expenses. Everything indicated poverty. The exhibitors were so poor that one of them was glad to use a couple of common chairs for his nightly rest. It was certainly a strange sight to see the future princely founder of Cornell University making his breakfast out of the proceeds of a shilling picked up from the sidewalk of Broadway, and which he said was one of the best meals he had ever had in all his life.

The estimated cost of a line from Fort Lee to Philadelphia was $15,000. It was a very modest sum to ask of the great city of New York. But the men of capital looked over their immaculate collars at the ticking machinery, and into the faces of the hungry exhibitors, and up at the wire straggling among the chimney-pots, and then down at the meager furniture and said "No." Each man feared to be the first fool. But what capitalists would not do, humbler men, and the friends of the patentees, did. One of the first men in New York to invest his money in the new device was the keeper of an eating-house in Nassau street, where chicken-pie could be got for ten cents a plate, and who afterwards became one of its directors. The money needed was finally raised, but chiefly outside of New York. Mr. Corcoran, of Washington, was the first to contribute.

TAXATION IN TENNESSEE.—The Tennessee Board of Tax Equalizers has increased the assessments on telephone and telegraph companies $1,500,000 over the assessments made by the Railroad Commission. The assessments are made on a mileage basis, the largest increase being on the Cumberland Telephone and Telegraph Company, which was raised from $75 to $100 per mile. The assessments on the Western Union Telegraph Company and the Postal Telegraph-Cable Company were raised from $40 to $60 per mile.

Course of Instruction in the Elements of Technical Telegraphy—LI.

(*Copyrighted.*)

(*Continued from page 648, November 1.*)

[The Course of Instruction in the Elements of Technical Telegraphy, which has been running regularly in this journal since October 16, 1911, has met with wide-spread favor and is being studied diligently by thousands of telegraphers and others throughout the world. It is being translated into Spanish, and printed in South American electrical journals, and has attracted universal attention for its clearness of expression and its practicability. It has been endorsed by the officials of telegraph, telephone, cable and railroad companies, many of whom have acknowledged the improvement in the technical standing of their progressive employes, and they commend the course as being of the most practical kind of instruction.

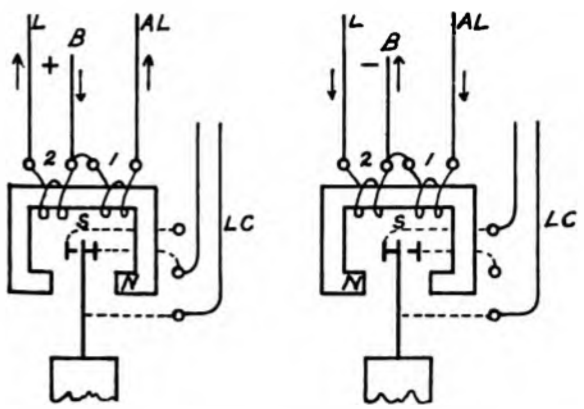
This course was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, and is being published now for the benefit of those of our readers who desire to fit themselves for higher positions in the engineering branch of telegraphy, and it has been a valuable aid in this direction. It is elementary, and devoid of higher mathematics, yet it is fundamental in character and extremely easy to learn.

Each chapter is complete in itself, and the chapters are arranged in natural order so that the student acquires the knowledge step by step in logical sequence. Each chapter is followed by test questions on the subject of the chapter, thus enabling the student to review his progress from time to time.

Back numbers containing these valuable lessons can be obtained at 10 cents per copy.]

The Polar Duplex (*Continued*).

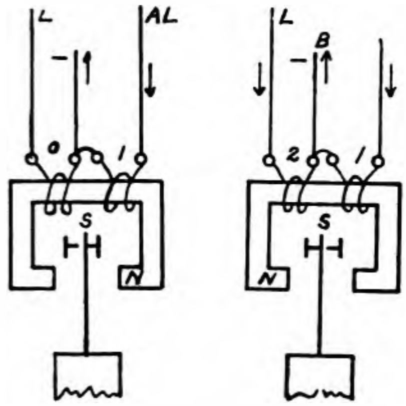
Now, suppose both keys to be closed, and a + and — current put to line at the home and distant stations, respectively. The line coil now receives a current due to the E. M. F. of the home and distant batteries, while the artificial line coil has the E. M. F. of the home battery alone, and the current in the line coil may, therefore, be regarded as possessing double the strength of that in the artificial line. As the polarity of the pole-pieces is only affected by the excess current in either coil, and the direction of the line coil winding is opposite to the movement of the hands of a clock, the polarity of one pole-piece is counteracted while the other is strengthened (Fig. 68), and the armature, responding, closes the local circuit.



FIGS. 68 AND 69—POLARITY OF POLE-PIECES.

At the distant station the current enters from the line, and the effect of an excess current in the main line coil would be to open the local circuit, were the local connections the same as at the home station. But the marking side of the distant relay is reversed (Fig. 69), and the attraction of the armature, resulting from a preponderance of current in the line coil, closes the local circuit. The home sounder thus responds to the closing of the distant key, and the distant sounder to that of the home station.

When the home key is opened, the negative pole of the battery is put to line, and the potential at both ends of the main line are now equal; but while the distant relay, actuated by the current in the artificial line coil, opens, the home relay remains unaffected, because, owing to the change in current direction, the pre-existent polarity of the pole-pieces is maintained. (Fig. 70.)



FIGS. 70 AND 71—POLARITY OF POLE-PIECES.

Should the distant station now open his key, the line coils will receive the excess current, but while the home relay is reversed (Fig. 71), the distant relay armature retains its previous position, owing to the change in the direction of current resulting from the reversal of the pole changer.

The polar relay is not always equipped with three local binding posts. When there are only two terminals, and the sounder cannot be put on the front stroke, both stations must, by closing their keys, put similar poles to line. For example, assuming the home and distant stations to have zinc to line through their closed pole changers, then the relays being actuated by the currents in the artificial lines, and the direction of current being, in each case, towards the battery, the armatures are attracted to the same sides, and the third binding-post dispensed with.

Fig. 72 shows the terminal connections of a polar duplex. The pole changer has six binding-posts, two of which are in connection with the key local circuit. The springs are connected to the main battery through binding-posts 1 and 3, and the contacts and lever to line and ground respectively via posts 2 and 4. A S is a three-point switch used for grounding the line. S C is a compensation resistance equal to the internal resistance of the main battery. Binding posts 2 and 3 of the polarized relay are usually joined with a piece of wire and the lead from the lever of the ground-switch connected to either post.

With the pole changer in the position shown, the + pole of the main battery is to ground and the — pole to line via both contact screws. The lever of A S being on stud S, the current passes through it and splits at binding-posts 2 and 3 of the relay, one part traversing the line coils and passing to line via post 1, the other going through the artificial coils and thence to the artificial line via terminal 4. This

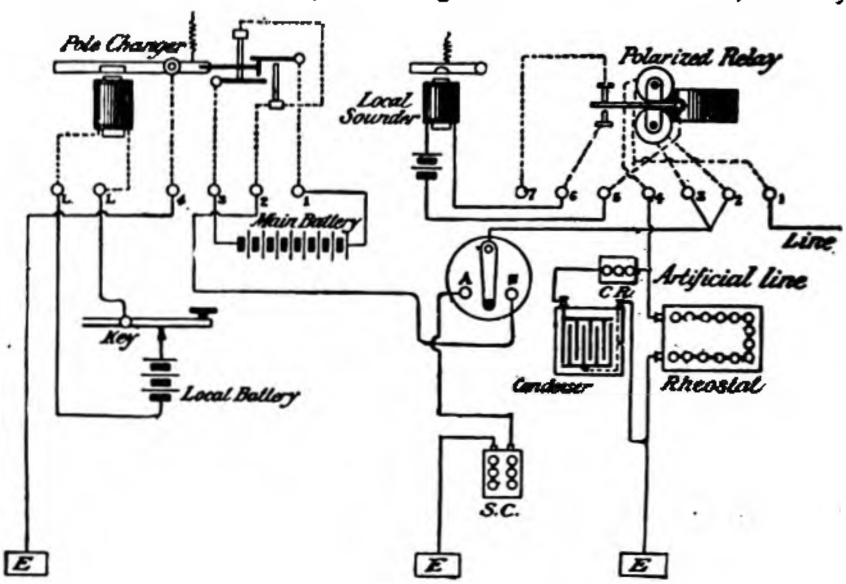


FIG. 72. DIAGRAM OF POLAR DUPLEX CONNECTIONS.

pole changer arrangement of connections, though often used, is objectionable, inasmuch as it leaves the way open for a temporary disturbance of the circuit, should the pole changer happen to be out of adjustment. For instance, should the lever be for an instant separated from both springs, or should both springs be forced from the contacts by the levers, through bad adjustment, the line would be open, for an instant, at the pole changer during each reversal; whereas, with the arrangement of connections given in connection with Fig. 70, the line would still be direct to ground under the above faulty conditions, either through the contact screws or through L and the remaining tension spring.

Maver's Standard Book on American Telegraphy.

MR. GEORGE CRIGHTON, superintendent Western Union Telegraph Co., London England, writes: "Many thanks for your kindness in renewing my subscription. I hope I shall have the privilege, for many years to come, of perusing your excellent journal. It is a unique compendium of telegraphic and telephonic information, scientific, official and personal."

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What is the object of testing telegraph lines?

Why should the electrical condition of lines be tested at stated intervals?

What are the principal causes of interruption?

If the continuity of the circuit is interrupted, what is the name of the interruption?

What are the causes of a partial disconnection or a high resistance?

What is the cause of an escape?

What is a cross?

When two wires come into contact, what kind of cross is this called, and when two or more wires swing and touch one another what kind of a cross causes it?

What is a weather cross?

What is the effect of a defective ground wire or plate when used as a common terminal for two or more wires?

When a wire is "open," what is the effect on the relays?

When a wire is "open," how should a way station proceed to determine which side of his office the trouble exists?

Having ascertained the direction of the fault, what should the operator then do?

If the relay does not close when the office ground wire is applied to both sides of the line, what does it indicate?

What are the usual causes of disconnection?

How are partial disconnections tested?

What is the method of testing for an escape? Also, for a cross?

When two wires are crossed, how can one of them be utilized?

In using galvanometers or other measuring instruments for testing purposes, what are the two principal kinds of measurements employed?

What is a Wheatstone bridge?

What are the elements of the Wheatstone bridge, and what is the bridge principally used for?

What range of resistances can ordinarily be measured with the Wheatstone bridge?

Study the principle of the Wheatstone bridge, as described on page 196 of the present text-book.

(To be Continued.)

Telephone Pioneers of America.

HENRY W. WILDER.

Mr. Henry W. Wilder, of the plant department of the Southern Bell Telephone and Telegraph Company, Atlanta, Ga., whose protrait is presented herewith, began his telephone career in Leominster, Mass., in 1881. He started as a messenger and successively filled the positions of night operator, inspector, collector and lineman at Leominster. He afterward occupied positions in the electrical department of the New England Telephone and Telegraph Company in Boston and Worcester, and from 1900 to 1903 was electrical engineer for the Hudson River Telephone Company, at Albany, N. Y. Between 1903 and 1905, he had charge of the telephone

HENRY W. WILDER, ATLANTA, GA. (1881)

switchboard installation work for the Western Electric Company. He was in Philadelphia for the year 1903, and in 1904 and 1905 was in charge of like work in New York City and Brooklyn.

During 1905 the Siamese Government, feeling the need of an up-to-date telephone system, called on the American Telephone and Telegraph Company, at New York, for an engineer to prescribe for their wants. Mr. Wilder was recommended for the position and received the appointment. At the expiration of his two-year contract at Bangkok, Siam, the return trip through India and the Suez Canal gave Mr. Wilder an exceptional opportunity to see the various telephone systems in use, the coast cities in Japan and China being visited on the outward trip.

Since returning to America, Mr. Wilder has been with the Southern Bell Telephone and Telegraph Company, at Atlanta, Ga., where he now holds the position of district plant superintendent, with headquarters in that city.

Manufacture and Maintenance of Storage Batteries.

The following is a full abstract of a paper read by Mr. H. M. Beck, engineer of the Electric Storage Battery Company, at the last convention of the National Independent Telephone Association.

"The lead storage battery dates from about 1860 and was discovered by a Frenchman, Gaston Planté. Planté took two sheets of lead, insulated them from each other, and submerged them in a dilute solution of sulphuric acid in water. He then passed a current of electricity through them and noticed that one, the positive, became oxidized. Upon reversing the current, this oxide was reduced to a finely divided sponge lead and the other plate was oxidized. This combination, namely, sponge lead, dilute sulphuric acid and oxide of lead, constitutes a storage battery and Planté found that if the two sheets of lead were connected through an external circuit, current would flow.

"This simple experiment covers the fundamental theory of the storage battery as we know it to-day. In place of plain sheets of lead, we now use various forms of plates designed to increase the surface exposed to the electrolyte, or to be especially efficient in holding and locking the active material in place. Planté's method of forming the active material by current was very slow and expensive, and electrochemical methods are now used to produce the same results in a much shorter time.

"There is another very large class of plates, in which the active material is mechanically applied to the plate or grid in the form of a paste or cement, instead of being formed from the body of the plate itself, as in the Planté type, and from the process of manufacture these plates are known as the 'pasted' type. These two types of plates, the Planté and pasted, cover practically all those in commercial use to-day.

"A complete storage-battery cell consists of the following parts: Two plates or groups of plates, positive and negative, supported in a glass jar or lead-lined tank, the latter holding the electrolyte or dilute sulphuric acid. The positive and negative plates are insulated from each other by separators, usually of wood, one of which goes between each pair of plates. On top of the plates, a piece of heavy glass known as a glass hold-down, is placed for the purpose of keeping the separators in place. The glass jars or tanks are made deep enough, so that there is a very considerable space under the plates for the collection of sediment, without danger of its touching the plates and short-circuiting them. On top of the jar there is a glass cover plate, which performs the double duty of keeping dirt out and the acid in the cells, at the same time considerably reducing the evaporation. The jars or tanks are provided with some kind of a suitable insulating support. In the case of glass jars, this support usually consists of a wood or glass sand tray, filled with sand, for the purpose of providing a uniform support and thus preventing breakage. For lead-lined tanks insulators, preferably of the oil type, are used, these resting on stringers or vitreous pedestals.

"The couple type of cell is manufactured only in the smaller sizes and has been developed rather from the standpoint of convenience than the best battery design. The positive plate of one cell is permanently burned or welded to the negative plate of the next and these pairs hang directly on top of the jars. Thus, there are no bolted connections, except at the terminals and the plates can be very easily lifted out, whenever desired, for examination or replacement.

"In telephone service, we use our must rugged positive, known as the Manchester plate. This plate consists of a non-corrosive grid cast from hard alloy, containing a large number of round openings. Into these openings, buttons or spirals of pure lead ribbon, corrugated on one side, are forced under hydraulic pressure. The function of the grid is simply to act as a conductor and furnish a rugged support for the buttons. The buttons alone constitute the active material, and a very appreciable percentage of this plate is sacrificed in order to gain ruggedness and capacity for standing abuse. Experience has shown that this sacrifice is well worth while, and that where subjected to neglect or abuse, the plate will give less trouble and last longer than types, which under ideal conditions, show a considerably greater life. What is required in any service is, first a cell that will stand up, and second, one that will give the maximum efficiency. High efficiency alone is of little use, if the cell will not stand the service.

"The Manchester plate is formed or oxidized by an electrochemical process which reduces the time required, as compared with the Planté method of current reversals, from six weeks to less than two days.

"The Box negative plate is used as standard, except in the smallest sizes, where the Exide is furnished. This plate consists of a cast hard alloy grid containing a large number of square openings. The faces are covered with perforated lead sheathing, thus making a number of individual enclosed spaces or boxes. These boxes are filled with the active material and are designed with the purpose of holding it securely in place.

"The Exide negative plate is used for very small cells, which are usually only called upon for comparatively light work. It belongs to the same class as the box plate, and differs only in the design of the grid.

"The wood separator consists of a thin unperforated wooden diaphragm, equipped with a number of vertical wooden dowels. These separators hang between the plates and are supported by rubber pins, which rest on top of the plates. The thin diaphragm affords an unperforated wall, and thus prevents material from lodging between the plates and causing short circuits. The vertical dowels act as spacers and furnish the mechanical strength required for keeping the plates apart.

"Untreated wood contains some very dangerous acids, which, unless removed, will attack the positive plates and may ruin them. To obviate this danger, wooden separators are subjected to a chemical treatment which removes these acids and renders them perfectly safe. After the treatment it is necessary to keep the separators in a damp condition, as, if they dry out, they shrivel up and are unfit for use.

"The wooden separator is not only extremely efficient in keeping plates apart and preventing short circuits, but chemically tends to increase the efficiency of the cells and maintain the capacity of the plates. After being in service, they become rather soft and will not stand much handling. Where they are not disturbed, they have a very long life, and, in general, constitute one of the most marked advances in storage-battery design of recent years.

"The location of a battery has much to do with the results obtained. Battery work, at the best, is not a pleasant duty, and where the cells are inaccessible they are sure to be neglected. The room should be large enough, so that the cells are all accessible, and, except in the smaller sizes, it is preferable to arrange them in one tier.

"Good ventilation is essential, not only to take care of the gases given off during the charge, but also in order to carry off the acid fumes and thus keep the tanks, stringers, insulators and surroundings generally, in a reasonably dry condition and prevent excessive depreciation.

"Hydrogen is very light and collects at the top of the room, so that the exhaust should be located in, or near the ceiling and preferably connected to a flue. The inlet should be at the floor and located so that the currents of air will move across the room without forming pockets. In many cases, there is a window at one end of the room and a door at the other. If the window is kept slightly open at the top and an opening left in the bottom of the door, this arrangement will prove fairly satisfactory. A flue is preferable, however, as it is more effective in carrying off the acid fumes and preventing them from spreading through the adjoining rooms.

"For a clear understanding of the methods used for operating storage batteries some idea as to the changes which take place in the cells during charge and discharge is essential. While it is impossible to give an accurate formula for the chemical changes which take place during charge and discharge, certain facts dependent upon them are well established, and these constitute the basis of our operating methods.

"First, it should be understood that the term 'storage battery' is not strictly accurate, as the electrical current is not directly stored. What does happen is that the current passing through the cell causes certain chemical changes to take place, these being reversible and capable of producing current during discharge. Thus, what is really stored is chemical, and not electrical energy.

"Generally speaking, when a cell is fully charged the active material of the negative plate is reduced to a pure lead sponge, *i. e.*, lead in a very finely divided condition, so that it offers an enormous surface to the electrolyte. The active material of the positive plate consists of an oxide of lead, and the electrolyte a dilute solution of sulphuric acid and water, there being no acid in the plates themselves, all of the acid being in the electrolyte. As the cell discharges, some of the acid from the electrolyte goes into the plates, sulphating the active material of both. At the same time, the positive plates lose oxygen.

"The loss of acid from the electrolyte to the plates causes the specific gravity to fall during discharge and the sulphating of the active material combined with the loss of oxygen in the positive plates results in the voltage of the cell decreasing. Experience has shown that it is dangerous to the plates to allow these actions to go beyond certain points corresponding to certain voltage and gravity limits, and these have, therefore, been arbitrarily fixed as the minimum discharge limits.

(To be Continued.)

Treatment of Wooden Poles.

A paper on the treatment of wooden poles with preservatives was read by Mr. F. B. Uhrig, of Kansas City, Mo., at the recent convention of the Kansas Gas, Water, Electric Light and Street Railway Association, held at Hutchinson, Kan. An abstract of the paper follows:

"There are, in modern use, three methods of treating poles to increase their life," the speaker said. "(1) the closed-tank pressure method; (2) the open-tank method; and (3) the application of a preservative compound in liquid form by means of a brush. Dead oil of coal tar, or carbolineum, as it is called, is the preservative substance. Poles treated fifty years ago are still in service. In the closed-tank method of treatment, the antiseptic preservative is forced into the outer part of the pole to a depth sufficient to prevent exposure of the untreated inner portions by abrasion, checking, etc. The open-tank treatment consists in placing the butt end of the pole in a tank into which an antiseptic preservative, preferably carbolineum, has been poured to a depth sufficient to cover the pole for a distance of about eight feet, or from the butt to a point two feet or so above the ground line. The oil is then heated to a temperature somewhat greater than boiling water, which temperature it seems to be the best practice to maintain until air bubbles cease to appear at the surface of the liquid. The oil should then be allowed to cool; or else the poles transferred to another tank containing cold oil. Into the partial vacuum thus produced, the pressure of the air forces the preservative. A treatment by this method requires about twenty-four hours, during which the pole is in hot oil for eight or nine hours. The third method of treatment is commonly known as the brush treatment, and consists of applying the carbolineum to the base of the pole with a brush. The oil should be applied from the butt to a point a foot above the ground line, and the bottom of the butt should be covered. Only seasoned poles should be treated, and the wood should be dry when the preservative is put on. It is preferable that the preservative be applied hot—at a temperature of 150 to 175 degrees of Fahrenheit. An average thirty-foot pole will absorb about half a gallon of the oil if it is properly applied. The method of treatment is simple and effective if it is properly applied.

Prevention of Electrolytic Corrosion of Lead Cable.*

BY BERNARD C. GROH.

The lead sheath of a telegraph or telephone cable offers an extremely low resistance to electrical currents. An idea of the conductivity of the lead covering of a telephone cable can be obtained from the fact that 1,000 feet of 400-pair No. 22 B. & S. gauge cable has a resistance in the lead sheath of approximately one-eighth of an ohm.

In all street railway systems with grounded return there is always more or less current flowing through the earth. This current in passing through the earth will, of course, take advantage of all buried metallic structures, as metallic structures are of much lower electrical resistance than the earth itself. The lead sheath of all electrical cables in underground conduit offers a path of very low resistance to these return currents, and cables will always be found acting as a part of the return system of the street railway.

It will be seen, therefore, that current will flow from the tracks of the street railway, and also from other metallic structures that are acting as a return of the trolley system, to the cables of the telegraph or telephone company. The degree in which the cables and other buried metallic structures act as an electrical return, depends upon the condition and adequacy of the return system of the street railway company. Such currents will enter the cable over a widely distributed area and will almost invariably be found leaving the cables at definitely located points. Such points will usually be found adjacent to the power house of the trolley system.

These conditions will exist when the negative bus-bar of the power station is grounded. This is the prevailing practice. If the positive bus-bar of the power station were grounded the current would be leaving the cables over a widely distributed area, instead of at a few determined points. The electrolytic action on cable sheaths occurs only when the current is leaving the cables through earth. Therefore, in modern practice, the danger points are in small areas that can be definitely determined by a survey, and not distributed over large areas, as would be the case with the positive bus-bar of the power station grounded.

The electrical current, when leaving the cable sheath through other than a metallic conductor, always causes more or less of corrosive action on the lead. This corrosive action is called "electrolysis," and results in a pitted appearance of the lead. No electrolytic action occurs where the current enters the cable. Under certain conditions and where the amount of the current is comparatively large, a chemical action may take place that will tend to destroy the lead. The current has a tendency to decompose certain soluble salts in the earth and form an alkaline substance on the cable which in time is liable to attack the lead.

It will be seen, therefore, that two points must be considered in guarding against electrolysis, namely:

(A) The prevention, as far as practicable, of current entering the cable sheath.

(B) The providing of a metallic path for the current where it leaves the cable so that the amount of current leaving through the earth will be negligible.

The electrical condition of the cable sheaths at various points can be determined by means of a voltmeter survey. The difference in electrical potential and the direction of current flow between the cables and adjacent buried metallic structures, such as gas and water mains and the rails of the trolley company, should be determined at each manhole and entered on a map of the underground system.

The usual method of making a voltmeter survey is by means of a portable voltmeter with a 15-volt scale. One wire from the voltmeter is connected to the cable sheath, and the other to earth and other metallic structures adjacent to the manhole. The wires from the voltmeter are usually attached to two poles for convenience in handling.

In addition to the metallic return, other preventive measures may be employed to advantage, among which the following may be mentioned:

All cables in a manhole should be bonded together if there is any potential difference between them.

In order to prevent, as far as is practicable, current entering the cable, all cable in contact with metallic structures that are in direct contact with street car rails should be insulated. This can be accomplished by means of insulated joints on the cable at each end of the metallic structure. Such a joint insulates the lead sheath in contact with the metallic structure from the sheath of the rest of the cable. In order that the current will not leave the main cable through earth at the insulated joint, the insulated section should be bridged with suitable insulated wire or cable. If this bridged cable is lead covered, it should also have insulated joints at each end.

Another point that should be guarded against is the electrolytic action on anchor rods. No guys connected to anchors buried in earth should come in contact with the messenger or supporting strand for aerial cable.

Electrolysis surveys should be made at regular intervals. If no changes in the system of the street railway company or material additions to gas and water systems are made, a survey every twelve months is sufficient. If changes in the railway system are being made from time to time and new metallic structures are being installed in the streets, more frequent surveys are necessary in order to insure at all times a safe condition of the cables against damage due to electrolytic action.

*From *Telephony*.

JOINT POLES IN PORTLAND, ORE.—The city council of Portland, Ore., has passed an ordinance requiring telephone and other public service companies having pole lines to use the same poles.

Saccharine Process for Seasoning and Preserving Timber.

The Powell timber seasoning and preserving process, which, it is stated, has been successfully applied for several years, is described in the *Electrical Review* of London.

The process originated in the use of saccharine materials to fill the interstices of timber and prevent ingress of the mycelium of dry rot. The preliminary experiments showed that by impregnation with a solution of sugar and its by-products, timber can be seasoned rapidly and without deterioration. Moreover, the stable hydrocarbons of sugar are incapable, in the absence of soluble nitrogenous matter, of nourishing septic organisms, while, by the addition of arsenic solution and other poisons, insect attacks can be repelled. The solution, the exact composition of which varies with the density of the timber, and the use to which it is to be applied, penetrates every cell and fissure of the timber without the application of pressure or vacuum, and the interstices are filled with a material which has a reasonable approximation to an amorphous form of timber. The seasoning and preservative action thus consists in replacing moisture and unstable juices by a substance which appears to enter into molecular combination with the timber, and then to remain absolutely inert. As compared with air drying, the process is very rapid, and fills the interstices with preservative material of appreciable mechanical strength instead of leaving them shrunken and empty.

The telegraph poles or other timber to be processed are stacked in open tanks, suitable spacing and pinning down cross-pieces being used. Liquor at about 140° F. is then pumped in till the timber is completely submerged, and the temperature is gradually raised to about 215° F., rapid temperature control being effected as and when necessary by aid of coils. During this stage, which occupies about fifteen hours, according to the size and density of the timber, all the contained air bubbles out of the timber, and the sap juices are driven off; the albuminous materials in the timber are meanwhile coagulated. During the cooling stage, which occupies about the same time as the heating, the absorption of the liquor chiefly occurs, and every interstice in the whole bulk of the timber becomes filled with poisoned saccharine matter, which is subsequently visible neither as syrup nor crystals, and which will not leach out under any exposure to weather. Any degree of dryness (and hence a high insulation resistance) can be secured without injuring the subsequent properties of the wood, but the only materials removed from the wood are air and moisture, for which are substituted preservative matter and such materials as arsenic, required to repel insect attack. Telegraph poles and the like need not be taken from the processing tank to the drying room or kiln, but cross-arms and such smaller pieces should be so dried. When sufficiently desiccated, the wood is absolutely seasoned and ready for use.

Powellized timber is practically non-absorbent to moisture under ordinary conditions of weather exposure; even during prolonged submersion the wood absorbs less than 50 per cent as much moisture as unprocessed timber, and the preservative and poisonous materials are not leached out appreciably.

Construction of Condensers.

Electrically conducting foiled paper is now generally used by English manufacturers of electrical condensers. The paper is dried slowly by exposure to currents of warm air and covered with tin. Two strips of the foiled paper, interleaved with two strips of plain paper, are rolled up and immersed in melted paraffin wax, the number of turns depending upon the capacity required. The usual sizes of paper at present in use are for interleaving paper 4 inches wide by ½ a millimeter thick, and for the foiled paper 3½ inches wide by 1¼ millimeters thick. The connecting lugs are strips of annealed copper foil which are slipped into place between the foiled surface and the interleaving paper. They should make contact with the foiled surface over practically its full width and should protrude about one inch. They should be placed at the middle of the foiled strips. The rolls are placed in a hermetically sealed metal case. It is necessary to see that the paper has been carefully covered with the foil so that the insulation resistance and capacity may be correct. The most satisfactory workshop test is made with a good strained suspension reflecting galvanometer, with the usual universal shunt box, short circuit and reversing keys and a primary or secondary battery giving at least 400 volts. They are finally tested for insulation and electrification after being fitted in the case.

Elementary Telegraphy.

An excellent little volume on elementary telegraphy is that of H. W. Pendry, of the Central Telegraph office, London, England. The fundamental principles of electricity and their application to telegraphy are clearly explained, and, after the student has thoroughly mastered the contents of the book, he knows a great deal about the principles which are, afterwards, of easy application to practical work.

There are chapters on batteries, instruments, telegraph lines and telegraph systems, and, although the English practice is described, the principles are the same for all systems, whether American, English, French, or German. Principles are the important things to know.

The mathematics used are of the simplest kind, yet they are of the highest importance and value to the student, as they show how to arrive at results.

The price of this book is $1.50 per copy, and copies can be obtained of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Marconi Trans-Atlantic Duplex Service.

The Marconi trans-Atlantic receiving station at Louisburg, N. S., was opened the last week in October. This station will work in conjunction with that at Glace Bay, one of the stations being used for sending and the other for receiving, the two being separated by a distance of ten miles. They will operate with the station at Clifden, Ireland, and the new station at Leterfrack, seven miles from Clifden.

By January 1 it is expected to have two additional lines of communication open between Carnarvon and Torvyn, Wales, and Belmar and New Brunswick, N. J., and later another line will be opened between Boston, Mass., and Stavanger, Norway.

The separation of sending and receiving stations permits of duplexing. The stations are located so that the energy from the transmitting station has a minimum effect upon the receiving aerial. Although the receiving and sending stations are separated, the sending and receiving operators work in the same room, yet there is no confusion of signals, because the waves liberated for transmission do not reach the receiving aerial.

The stations now being erected at Belmar and New Brunswick, N. J., are forty miles apart. They will have thirteen masts, 400 feet high. The New Brunswick staff will consist of sixteen men and that at Belmar, thirty-five. It is expected that the stations will be ready for operation by the first of the year. New high-power stations of the same type are also being erected near San Francisco, Cal., and on the Hawaiian Islands, for trans-Pacific service.

Work will soon begin on the high-power station near Boston to work with a similar station now being built by the Marconi Company for the Norwegian Government at Stavanger, and other stations of the same improved type will be erected to form a chain of wireless communication for commercial purposes with Brazil, Argentina and other principal places in South America.

Mr. E. J. Nally, vice-president and general manager of the Marconi Wireless Telegraph Company of America, New York, in speaking of the development of wireless communication between ships at sea and between ship and shore, says:

"Few persons ever think of another fact of most vital importance to the continued use, without hitch, of Marconi's invention, now a common factor in our daily lives, increasing our personal comforts, as well as our business facilities, and providing a constant means of livelihood for increasing thousands of employes of all grades. I refer to that marvellous organization which has been built up side by side with the technical development of wireless on board ship. I think I may trace its origin to the basic business axiom, laid down by Marconi and his aides from the outset, that it was not right to sell their installations, drawing immediate profit, and then leave their clients to work out their own salvation. They realized at once that it would avail a shipowner nothing to be possessed of a plant, working it how and when he willed, if other shipowners did not work on similar regulations and methods.

"The question of language between ships of different nationalities is of much more complex nature than it is on the land lines of the Continent, for instance. A Swiss operator may talk to operators in neighboring countries of three nationalities; one wireless operator at sea may communicate during his voyage with operators of as many as twelve nationalities besides his own. Added to the language difficulties there is that presented by the different manner of doing things in different countries and ships—different sense of responsibility, of initiative, and ideas of discipline. All of these obstacles were obviously almost insurmountable if apparatus were to be disposed of finally by the manufacturer to each and every shipowner, the latter being left to his own resources to reap the best benefit he could.

"Clearly, there was to be an international creation, not only to supply the shipowners with apparatus of recognized efficiency and uniform standard, but also to supply him with operators corresponding to the nationality of the ship, trained on uniform lines, possessing the same *esprit de corps*, subject to the same rules and regulations, and, however numerous their nationalities, all having a fair knowledge of one common language. In this direction, and in this direction only, was it felt that wireless could be applied successfully at sea.

"Accordingly, after Mr. Marconi had developed his invention to an extent at which its utility to shipping was obvious, the Marconi International Marine Communication Company, Limited, was constituted for the object I have mentioned, and how wonderfully and effectively it has succeeded is the evidence of history, as recorded in the 'Republic,' 'Titanic' and 'Volturno' disasters, and in the many unrecorded instances of daily travel by sea.

"A good deal has happened since the conception and realization of the international wireless scheme. The rapidly increasing use of the wireless on board ships and the vast systems planned and in progress of international long-distance wireless, to compete with cables, rendered desirable the formation of national corporations in all the principal countries, and companies associated with Mr. Marconi have been constituted in New York, Montreal, Berlin, Paris, Rome, Brussels, St. Petersburg, Madrid, Argentina and Sydney, to look after the maritime interests of the principal powers, leaving the company in London free to care for its own, now enormous, interests in the British mercantile marine.

"In addition to these offices, inspection and repair depots have been opened at all important seaports throughout the world, where vessels carrying wireless can have their plants inspected and repaired, if necessary.

"The object of our companies forming this international organization," said Mr. Nally, "is to carry on the work they have begun in conjunction with the different governments to render it still more efficient, and to apply their experience and immediate contact with the maritime communication to the solution of problems which are confronting us now, and those likely to arise in the future.

"The conduct of ocean telegraphy in the hands of one international organization has rendered possible the development of a newspaper enterprise on board ship on efficient and economic lines. On numerous steamers a daily paper is now published, containing the latest news from all over the world, received from powerful transmitting stations on each side of the Atlantic. Obviously, a service of this kind can be run more cheaply for a large number of vessels than for a few. Apart from that, the cost of erecting and working a high-power station purely and simply for one line of steamers, in addition to the cost of compiling the news and forwarding it, would make the charge to the shipping company prohibitive."

Mr. Nally states that great improvements are being planned for these international ship newspapers. They will be steadily brought up to the requirements of the traveling public, more especially in the cases of the larger ships of all lines whose passenger list equals in numbers the population of a fair-sized town, and exceeds in influence and widespread interests the population of some larger places.

Mr. Richard O'Brien's New Duties.

Mr. Richard O'Brien, traffic supervisor of the Western Union Telegraph Company in Pennsylvania and New Jersey, with headquarters at Scranton, Pa., has decided to cease his present strenuous work, but will remain subject to the call of the company in an advisory capacity.

RICHARD O'BRIEN, SCRANTON, PA.

He has had many years of important duties with the Western Union Company, and has had charge of its lines and offices along the Delaware, Lackawanna and Western, the Central Railroad of New Jersey, the Lehigh Valley and other roads in Pennsylvania and New Jersey since 1867.

Mr. O'Brien has been prominent also in telephone work and progress. He constructed the first telephone lines at Scranton in 1877, only one year after that invention was shown him at the Centennial Exhibition in Philadelphia; he established the first telephone exchange in Scranton and was a pioneer in extending the service throughout northeastern Pennsylvania. He proved his faith in the great possibilities of the telephone when most people considered it only a toy, and he still retains his interest and faith in its progress. Mr. O'Brien is a director of The Bell Telephone Company of Pennsylvania.

In retiring from work in the telegraph field, Mr. O'Brien expects to devote a portion of his energies to the building up of his interests in Scranton, which he considers the healthiest city in the country, as well as one of the most promising for future prosperity.

Mr. O'Brien is also a director of the People's National Bank and the first vice-president of the Scranton Real Estate Company—*Telephone News.*

Telephone and Telegraph Rates.

At a meeting of the National Association of Railway Commissioners, held in Washington from October 28 to 31, a report was made by a committee on telephone and telegraph rates and service.

The report gives instances of telephone rates in cities where competitive conditions exist and also where monopoly conditions prevail, and states that scientific rate-making has not been developed. Without question, the report continues, competition has been the means of the public receiving service at a lower cost, but this does not necessarily mean that the rates are either reasonable or remunerative. Many companies have entered the field of competition with low rates, and in a short time found it necessary to get nearer the plane of their competitor, or, in some cases, the competitor has met the lower rate, this nearly always resulting in a consolidation of the two plants within a short period of time. A remedy for these conditions is being sought by both the public and the utility operators. There can be no question that duplicate plants in the same city are a waste of money and a public burden. State control of such utilities offers the best remedy for these conditions. Government control has not proved entirely successful. For example, the Japanese Government had, on March 31, 1911, 45,000 persons on the waiting list for telephone service. There are now twenty-eight States exercising control over telephone utilities.

The Committee had little to say relative to telegraph rates and service further than that from investigation there was apparently less complaint against this utility than against any other.

More Marconi Miracles.

BY OSCAR MOLL, COLOGNE, GERMANY.

[The following article was written by Mr. Moll twelve years ago, and notwithstanding the lapse of so many years, it fits well at the present time. Some of Mr. Moll's prophecies have not yet come true, but who dare say that they will not. The idea of carrying a wireless outfit around in the vest pocket and "tapping the ether" when one desires to communicate with a friend or business associate has been referred to in the press recently, but Mr. Moll seems to have seen such a possibility through his prophetic eyes years ago, and tells his visions in a humorous manner. We have no doubt the article will be read with much interest.—*Editor.*]

The riddle of the sphinx is solved at last. Space is demolished and time is nowhere. Though the traveler be exiled to the furthest solitudes of the Saharan waste, or buried deep in the thickets of antipodean lands, it matters not. He has but to pull the Marconi coherer and other weird appurtenances to the wireless system from his traveling bag, and lo! he can converse at will with his friends, or his beloved spouse at home, whom circumstances precluded from accompanying him. They can descant at large on business, the weather, the children's health or ailments, and other domestic affairs without hindrance. The wireless waves his Mercury.

We are not joking, as the foregoing is a trifle, a mere bagatelle, for greater marvels await our bewildered contemplation. No more trivial links twixt man and man, or man and wife, but mightier links between all the states and empires of the world, 'twixt the empire and all the universe to boot.

Hitherto the motto has been "Britannia rules the waves." Henceforth, it is to the wily Italian that their governance must be delegated, for it is to his wonderful invention, plus the still more startling ones of his entourage, that we owe these mighty marvels. Even to describe these is a task which baffles the pen of a mere mortal, and we fear, in the attempt to compass it, to petrify with amazement the very brains of your readers. Of mere wireless telegraph or garden marconigrams we will say nothing. They have degenerated into commonplaces of the day. Space is already chock full of the dots and dashes and symphonic or syntonic harmonies which the wireless system is ever firing into it (to the intense disgust of the winged creatures) mitrailleuse fashion, to convey the thoughts of humanity from realm to realm. But this was not enough; this was but a feeler, a mere dip in the ocean of the wireless possibilities of the Marconi brain. The telephone, with its articulate speech, was always chuckling, as it were, at the spasmodic crudities of Morse transmission, and the ether must be taught its duty accordingly. To conceive was to do. Straightway, the Marconian waves permit us, while sitting comfortably in our office, to call up our Saharan or antipodean friend aforesaid, and discuss our business with him, or in the intervals of serious work to whisper soft nothings to our loves or wives at any distance without, *mirabile dictu*, the intervention of troublesome exchange, and possibly amused and interested "co-hearers of the wrong sort," through some unhappy contact of the wires. So, at least, we are assured by the Marconi board, and hence each loved or loving one has but to wear a literal "coherer" next his or her heart, and the two hearts beat as one by the grace of Marconi, as well as Cupid or Hymen.

Nay, more even than this. Space being demolished, or rather, made the vehicle of thought, distance of even millions of miles dwindles into naught. Hence, the Society of Astral Philologists, recently formed, are working night and day at the British Museum, translating, or endeavoring to translate, the constant stream of replies coming in from some of the planets in response to wireless messages.

Curiously enough, the Venusian language seems almost as "dotty" as the obsolete cabalese, while the Martian lingo has more dash about it, as might indeed have been expected.

The Mercurian, Saturnian and Uranian dialects so far defy comprehension, but Marconi and Braun are compiling a universal code, which will render communication easy so soon as they send out the specifications for their ethereal telephone to the planetary patent agents and get a clear acknowledgment.

Mere conversation is but a prelude to action, and the Marconian waves could naturally not rest until they compassed the business, as well as the preliminaries. Hence, we may now see all round our coasts those gigantic power stations, towers and installations, which, catching up the aqueous tidal waves as they roll in, instantly transmit them into those titanic wireless waves by which our ships are driven silently and swiftly to and fro without any of those clumsy, old-fashioned engines, paddles or screws, with their dirty and noisy accompaniments of smoke, rattle and vibration.

The coal bunkers are now cosy saloons, and coal itself is already a rare museum curiosity, for all our inland vehicles are worked on the wireless system, and even the nursemaid, with her perambulator, sits at ease with her soldier lover and propels her charge in a circle around them by wireless ethereal influence.

The old-fashioned confusion of telegraph and telephone wires, tram wires and cables *et hoc genus omne*, which filled the air with grimy cobwebs, is a thing of the past, and many a palatial mansion built by the improvident cable shareholders are now the homes of the wireless, not guileless telegraph kings. Their walls are papered with the worthless scrip of the defunct companies.

Copper has fallen from its high estate, having been "discharged" as a conductor in favor of the wireless waves, and gutta-percha, likewise humiliated, now plays the degraded rolē of a mere golosh ingredient, or a substitute for rubber in the making of Marconi motor tires.

What need, indeed, of insulation, when all the world, plus the outside universe, is welded into one by wireless energy? Here, however, forsooth, comes the rub—the fly in the ointment. Perfection is no man's prerogative, not even Marconi's. Gruesome tales are in the air, as well as wireless waves, and find utterance in the base anti-wireless press, and by the "anti-funkers" of secrets going astray in the ethereal realms and reaching the wrong parties, to the destruction of business connections, and even of domestic peace, of hostile vessels filching the Marconian force and "cutting in between the wind and their mobility," to quote a modified Shakespeare, making an easy capture by virtue of the stolen power, and so on.

On a smaller scale of importance, too, we cannot forget, as a type of many cases, the recent fracas in Kensington Gardens, when a gay Lothario, after fixing a rendezvous with his best girl, found a material rumpus awaiting him there, owing to six other girls, all, moreover, of the up-to-date athletic type, having received the same message through his ignorantly supplying them all with coherers of the same syntonic range.

Observations of an Amateur Wireless Operator.

BY R. H. CORSON, JERSEY CITY, N. J.

Referring to the interesting article in TELEGRAPH AND TELEPHONE AGE of September 16, on the subject, "Wireless and Weather," and also to Mr. Willis H. Jones' statement in the same issue that wireless signals are distorted when passing over regions known to contain considerable iron ore, the writer is moved thereby to add a few observations made over a period of six or seven years at a small home station, with very crude equipment, located at Jersey City, N. J. The aerial is an irregular parallelogram of 14 B. & S. copper, containing about 200 feet of wire and elevated about thirty-five or forty feet from the ground at all points. It is about sixty feet across in one direction and about forty feet across in the other, and it is closed. One leading-in wire, from about the center of one of the sixty-foot sides brings it into the station.

A piece of galena, weighing about two ounces, lying upon a smooth surface of lead, with a contact made by a two-inch piece of No. 40 copper wire, is used as the detector, with a three-slide tuning coil.

Upon this apparatus, at various times, the following Atlantic navy stations have been picked up: Portsmouth, Boston, Newport, Fire Island, Brooklyn, Philadelphia, Cape Henlopen, Arlington, Washington, Norfolk, Beaufort, Charleston, Key West, Pensacola, San Juan and once, upon the night of February 7, Colon. Commercial stations, as far east as Eastport, Me., as far South as Tampa, Fla., and along the Lakes to Chicago, Milwaukee and Duluth have also been heard.

In connection with Mr. Jones' statement that wireless signals are distorted in passing over regions containing considerable bodies of iron ore, I am reminded that while Cape Cod, "M C C" (I presume his call is "W C C" at present, although it was plain "C C" when he first came in), 230 miles away, is a nightly visitor after 10 o'clock, under all conditions of weather, summer and winter, yet the recently abolished station at Atlantic City, "Ax," about ninety miles away, could be heard only on nights that were unusually cold, and then only in the dark of the moon.

Upon two or three occasions in daylight "Ax" was heard and, in support of Mr. Taylor's observations, it is remembered that the days were cloudy.

As wireless operators sailing from New York have told me that once they get clear of Sandy Hook they receive signals from Atlantic City with great strength, I have imagined that the formation of the earth at Atlantic Highlands was the interfering influence. But since it was the practice of one of the commercial wireless offices at New York to relay its Atlantic City business via Bridgeport, Conn., I regarded the Highlands as an interfering influence felt only in the vicinity of New York.

This view was modified a little later, when the commercial station at Cape May, about thirty miles further south opened, for his signals came in with great regularity, and seemingly without the interference which Atlantic City suffered.

In connection with the observations based upon the weather map, it was not noted that cloudiness about New York had any effect upon distance, but it was repeatedly and distinctly noted that stronger signals and more distant signals were picked up the further the sun had travelled south of the line, and that the most distant of all came during the dark of the moon, especially if the temperature was low in this vicinity.

Perhaps, therefore, some of the wide variation from night to night observed by Mr. Taylor may be accounted for by the moon's influence, as well as by the effect of cloudiness.

LETTERS TO THE EDITOR.

Induction on Straight Wires.

Editor TELEGRAPH AND TELEPHONE AGE:—

SIR:—Permit me to call your attention to the few paragraphs on page 611 of your October 16 issue, under the heading, "Induction of Straight Wires."

You have here a confusion of electromagnetic and electrostatic induction. While the "inductive capacities" of the substances which are mentioned, such as resin, glass, paraffin, india-rubber and gutta-percha are important factors affecting the characteristics of cables in which they are used for insulating one conductor from another, the magnetic permeability of these materials is, in all cases, practically the same as that of air. The magnetic action by which a current in one wire induces a current in a parallel wire is, for all practical purposes, entirely independent of the insulating substances between the conductors.

While it is possible to shield a conductor from becoming charged by electrostatic induction, it is not practicable to materially alter or suppress the electromagnetic induction of one conductor on another, except by the introduction of masses of magnetic material, such as iron, between the two.

JOHN B. TAYLOR.

SCHENECTADY, N. Y.

Psychology and Telegraphy.

BY REX D. MILES, TACOMA, WASH.

A few words more on the relation of psychology to telegraphy have become necessary, since Mr. E. E. Bruckner, in his article in your issue of October 1, has introduced the metaphysical side of the question. It is the writer's contention that the question is not one involving metaphysics, except in so far as the law of suggestion may be applied for the recovery of self-confidence. The explanation of operators' paralysis, as given by the writer in the September 1 issue of TELEGRAPH AND TELEPHONE AGE, involves only simple university psychology.

If Mr. Bruckner will kindly re-read the article in question, he will find that the subconscious mind is not mentioned. The term subconscious was used in the sense of expressing the subconscious workings of the nervous cells. A subconscious motor impulse may be defined as being the automatic continuation of a nervous impulse originally directed and trained by the conscious mind. Seventy-five per cent of our daily acts are subconscious. It is only necessary to desire to do some certain act which we have done before, such as to roll a cigarette, when, if we have practiced that art for some time, every moment necessary for the completion and perfection of the cigarette is directed subconsciously through the simple law of the nervous impulse automatically following the same course as taken during the time of learning at the direction of the conscious mind.

The simile is not a good one, yet it will be seen that expert telegraphy is simply a re-establishment of motor impulses originally controlled and directed by the conscious mind. Each movement made by the hand in sending is not thought of in the conscious mind, because that is entirely unnecessary, once the connections have been established between visual, auditory and motor cells to form a path for the subconscious motor impulse.

It is only when each separate movement of the hand begins to be directed with the conscious mind that operators' paralysis makes itself felt, the cramp resulting from the confliction between the conscious and subconscious motor impulses.

Mr. Bruckner's formula for the recovery of a perfect sending arm, auto-suggestions to the subconscious mind, or entity, expressing "a deep desire for a stronger arm, a steadier nerve, and more perfect signals, and absolute confidence in the ability of the subconscious to bring such desire to a complete realization," would be absolutely unavailing, unless the operator had such perfect faith and confidence that he stopped thinking of the hand entirely, which would, of course, obliviate the conscious motor impulse and give the subconscious motor impulses (not the subconscious mind), free room to direct the movements of the hand.

The writer guarantees the recovery of a perfect sending arm to any who will follow the following instructions:

Think of the letters being sent in terms of sound images, the way they sound on the wire, and not in terms of the letters themselves, or in terms of the movements necessary to send them. This restores the nervous impulse to the path via the auditory cells, and gives the motor cells controlling the hand the automatic guidance of the auditory cells.

Maintain a conscious desire to reproduce on the sounder the sound images being formed in the mind, and listen carefully to the sounder for the reproduction.

Forget the hand entirely. No thought need be given to the position of the hand, or to the flexibility of the wrist, as that will be taken care of automatically through the medium of the kinesthetic, or resident, sensations from the arm itself to the motor cells.

If these directions are followed conscientiously for a week or two, it will result in permanently re-establishing the path for the subconscious motor impulse, and as long as the operator keeps his mind off from his hand, and thinks only of the matter to be transmitted, or of the sound images of the letters, the conscious impulse will never again conflict with the subconscious.

The cramped condition of the muscles will disappear of itself when the course of the nervous impulse is restored to normal.

While it is true that the cause and relief of operators' paralysis and writers' cramp can be very nicely explained through the hypothesis of the subconscious mind, and its amenableness to control by suggestion, unfortunately, this is not the true explanation.

From what we know of the anatomical structure of the nervous system, and the nerve cells of the brain, and the course taken by motor impulses in acts such as telegraphy, typewriting, long-hand writing, etc., it is certain that the true explanation of the cramp is as was stated in our previous article.

English Telegraphs and Telephones.

According to the postmaster-general's report for 1912-13, the number of telegrams sent from offices in the United Kingdom was 88,494,000, a decrease of 0.7 per cent. Foreign Continental telegrams numbered 4,760,436 outward and 3,741,724 inward, the largest items being French and German telegrams. Foreign telephone calls numbered 94,073 outward and 109,054 inward, France and Belgium being the only countries concerned. On the post-office trunk telephones there were 36,019,086 calls (including Continental), showing an increase of 7 per cent; 3,330 circuits were in use, with 243,968 miles of wire. In London there were 244,320 telephones, an increase of 6.6 per cent, with 595,499 miles of wire; in the provinces, 486,443 telephones, an increase of 3.1 per cent, and 874,921 miles of wire. The total revenue from the telegraphs was $15,837,000, and from the telephones, $28,928,500, including, in each case, about $265,000 as the estimated value of services rendered to other departments; the expenditure amounted to $20,625,000 on telegraphs and $26,978,000 on telephones, and there was a deficit on the former of $4,787,830, while the latter showed a surplus of $1,950,370.

THE RAILROAD.

Lackawanna Wireless Calls.—Mr. L. B. Foley, superintendent of telegraph, Lackawanna Railroad, New York, announces that the Department of Commerce has assigned call letters to the Lackawanna's wireless stations at Scranton, Pa., and Binghamton, N. Y., as follows: Scranton, "W T P," Binghamton, "W B T."

Meeting of Eastern Railroad Telegraph Superintendents.—A meeting of the Eastern Division of the Association of Railway Telegraph Superintendents was held in Washington, D. C., November 13, in the office of Mr. W. H. Potter, superintendent of telegraph of the Southern Railway, who is also chairman of the Eastern Division. Matters of general interest to the members were discussed.

The Train Dispatcher.

The requirements of successful train dispatching may be separated into two grand divisions; the man and his surroundings. Given a first-class man, with proper equipment, and good dispatching is practically assured.

The man should be old enough to be mature in his views and impressed with the importance of the position he holds. His usefulness is not exhausted at the age of thirty-five, nor at forty-five, unless he has been worn out by excessively nerve-trying conditions; and these, when imposed, are detrimental not only to the man, but, in far greater degree, to the service. Amid encouraging, and not discouraging, conditions there is no reason why a dispatcher should not be a better and more useful man at fifty-five than at thirty-five. At thirty-five he has no more than acquired a fair experience in all the situations which may be expected to come, and which do come in endless variety in the line of daily duty. If he lived to be 105 he would not be beyond learning something new. Such is the value of experience.

The personal equipment of a successful dispatcher comprises a varied knowledge and peculiar mental ability. He should know the road thoroughly and should have opportunity to keep in touch with it without loss of sleep, or pay, and without the necessity of extra work to make up for loss of time from the office occasioned thereby. To ride over the road should be considered a part of his duty. His judgment should be the best, that he may make such moves as will result in the greatest good to the greatest number of trains. His foresight should be as far-reaching as human nature will permit, so that he may anticipate future situations and make provision for them. His power of concentration should be cultivated so that he can keep his mind strictly on the business in hand, and allow no outside influence to draw his attention to other things. He should have sufficient confidence in himself and his own ability, so that he will not be disturbed by criticism, and that he will not depreciate his own value when others find fault with his work. Criticism is to be expected and should be accepted as a matter of course. Neither should he be so egotistical that he cannot entertain a suggestion from others. The train dispatcher's office is no place for one who is too sensitive or too self-opinionated.

INDUSTRIAL.

Vibroplex Absorbs Mecograph.

The Mecograph Company, of Cleveland, Ohio, which formerly manufactured the Mecograph transmitter, has been taken over by Horace G. Martin, who for many years has manufactured the well and favorably known Vibroplex transmitter. This brings the sending-machine interests practically under one head and removes a great deal of uncertainty that has existed among telegraph people as to just where they stood on the question of sending devices.

Hereafter, the Vibroplex, as well as the Mecograph, will be manufactured by Mr. Martin at his New York factory, which is an assurance that the Mecograph will be brought up to a high standard of construction and that the universally conceded perfection of the Vibroplex will be maintained.

Mr. Martin was the originator and patentee of this class of sending machines, and the first instrument ever placed on the market was known as Martin's "Autoplex." Then came the Vibroplex, which seems to have been an inspiration, so satisfactory has this instrument proven in the hands of thousands of users during the ten years of its existence.

It is understood that the combined patents covering all transmitters of the wig-wag type and which are owned by the Martin interests are basic and practically control the entire manufacture of this class of apparatus. Patents covering the Martin interests have been sustained by the United States Circuit Court of Appeals for the second circuit, New York, and by the United States District Court for the Northern District of Ohio, Cleveland. A suit is pending in the United States Court against another infringer, and will be tried shortly, and the manufacturer states that he will vigorously prosecute in the United States District Court any other parties infringing these patents.

Mr. J. E. Albright, No. 253 Broadway, New York, is the sole agent for the Vibroplex, as well as the Mecograph.

The Hall Switch and Signal Company, New York, has just received an order from the National Railways of Mexico for Gill selectors and telephone equipment for telephone train dispatching. The Hall Company recently completed a train dispatching and message circuit on the Central Railroad of New Jersey, and has received orders from the same railroad for additional equipment.

Association of Purchasing Agents Organized.—The National Association of Purchasing Agents was organized in New York, October 16. It will be devoted entirely to the interest of purchasing agents and buyers, and will form sub-associations in all sections of the country. Mr. H. T. Leeming, of Thos. A. Edison, Inc., Orange, N. J., is the temporary chairman, and E. B. Hendricks, P. O. Box 1406, New York, is temporary secretary and treasurer.

Manufacture and Installation of Concrete Poles.

At the recent convention, in Hutchinson, Kan., of the Kansas Gas, Water, Electric Light and Street Railway Association, Mr. C. L. Brown, of Abilene, Kan., presented a paper on the manufacture of concrete poles. The following abstract of the paper will be of interest to our readers.

The Riverside Light and Power Company, of Abilene, Kan., has been developing and installing a hollow reinforced concrete pole for the overhead distribution of electric power. These poles have been made in four different sizes: a pole with 6-inch top and 10-inch butt, which takes the place of 6- and 7-inch top, 20-foot cedar poles; a pole with 6-inch top and 11-inch butt, to replace 7- and 8-inch top, 25-foot cedar poles; a pole with 6-inch top and 12-inch butt, which is substituted for 7- and 8-inch, 30-foot wooden poles; and a pole having 6-inch top and 13-inch butt diameter, which is used to replace 35-foot cedar poles up to eight inches in top diameter. The poles are octagonal in cross-section, and taper gradually from six inches in top diameter to the sizes of butt just mentioned. They are cast in forms laid horizontal, and are reinforced with four, six and eight carbon-steel rods, the rods being square in cross-section, and being twisted. The rods run through the pole from butt to top. A three-piece mold or form is used in casting the pole. The bottom is a plain pallet of plank, as long as the pole. The other two pieces of the form are made of two-inch planks, the length of the pole, increasing in width from six inches at the top to from ten to thirteen inches at the base, depending on the length. These two sides are set on their edges on the base or pallet, and held in place with cleats nailed on the outside of the forms. U-shaped irons keep the forms from speading when the concrete is being poured. The form is completed by tacking tapered three-cornered strips in the corners of it. The concrete mixture consists of a mortar of one part Portland cement to three parts of sand. When mortar has been poured into the form, at the open top side of it, to a depth of about three inches, a core consisting of a hollow cone of galvanized iron is placed in the form, the cone being six inches in diameter at the base and tapering to two and a half inches at the top. The core is wrapped with cheap building paper cut into strips, and wound on spirally, which permits the cone to be drawn out when the concrete has set. After the cone is placed two of the reinforcing rods are laid in at equal distances from the sides of the form and the core, and then the mold is filled about half full of mortar and thoroughly tamped. Then two more reinforcing rods are put in, and the form filled until the mortar covers the core; after which the remaining rods are put in place, the form filled with the cement mixture, this thoroughly tamped and the top side of the pole smoothed off with a trowel. When the concrete has taken the initial set, the core is pulled out, and, in from twenty-four to forty-eight hours, the form is removed and the pole rolled off to the ground, where it is left from twenty-five to thirty days to cure. During the curing process the pole should be wet thoroughly every day. Provision for climbing is made by placing nuts in the cement, and screwing galvanized-iron bolts into these through holes in the sides of the form. The bolts are backed out before the concrete has thoroughly set, and can be screwed into place again to form steps, after the pole has been erected. The gains for cross-arms are made by putting blocks in the form before the pole is poured. Wooden or iron plugs placed in the cement at the proper places while it is soft, provide means of attachment for heel bolts, these plugs being removed before the concrete has finally set. Holes for bolting on cross-arms can be provided in the same way, but it is considered preferable to fasten the cross-arms on with U-bolts passing around the pole and through the arm. The cost of pole complete has been found to be only slightly more than the cost of cedar poles, but the cost of setting is considerably greater in the case of the concrete pole. The company has been using these poles about a year and has had no trouble from their breaking. The appearance is good, and the company and the town are pleased with them.

Wireless and Air Craft.

On the night of September 9, a German naval airship was lost, with eighteen men, in a storm on the North Sea, all of the men being drowned.

In the gangways of this airship, which was of the Zeppelin type, was built a room for wireless telegraphy, and, according to accounts, the airship was in wireless communication with Heligoland and with the torpedo-boat flotilla. Further, it seems certain, says the *Wireless World*, that when the storm grew threatening, Captain Hanne sent out messages for assistance. Unfortunately, this assistance arrived too late to rescue all the officers and members of the crew of the ill-fated vessel, but that the wireless service enabled the airship to get in touch with land and with other vessels is a sufficiently convincing proof of its usefulness.

A good deal of work has been done in the direction of applying wireless telegraphy to air craft, which has demonstrated in so unmistakable a manner its potentialities as a life-saving medium. But wireless has already been found useful on airships for checking chronometers and finding the position of the ship by the three-point problem of surveying.

The applications of this agency are now so widespread that much progress has been made in directions, which, in the ordinary way, receive but little recognition, and its application to air craft one of them. The advantage of being able to communicate with land or other stations while in the air has been exemplified on many occasions, notably in the case of the now almost forgotten Wellman flight, when an unsuccessful attempt was made to cross the Atlantic some years ago. The tragedy of the North Sea is another instance of what wireless telegraphy is capable of, although it must be remembered that it has other useful functions to perform which are essential to the safety and proper navigation of air craft.

New Book on Wireless Telegraphy and Telephony.

That wireless telegraphy and wireless telephony possess a very wide popular interest is evidenced by the rapidly growing literature upon the subject.

The latest book along these lines is "Wireless Telegraphy and Telephony Without Wires," by Charles R. Gibson, F. R. S. E., and published by J. B. Lippincott Company.

The author's aim in this work is to give the general reader a comprehensive view of wireless telegraphy and telephony, and he uses analogies wherever they may be helpful in enabling the reader to grasp the meaning of some hidden action.

This book is not a mere compilation from other works, but is really original in its design and descriptive matter, and will form a valuable and worthy addition to the already extensive bibliography on wireless. It describes the principles of the various wireless systems, and deals with the history of the art, which leads the reader and student by easy steps up to the present-day practice.

The work is entirely devoid of mathematics, and is well written and illustrated.

Among the contents are chapters on fundamental principles; bridging the Atlantic; other systems; general principles of telephony; the evolution and development of wireless telegraphy; telephoning without wires, etc. The chapters on the historical features of the development of the art are valuable for reference.

This work is entitled to serious consideration at the hands of all those interested in wireless, whether in the capacity of student, engineer or practician, because it is authoritative and comprehensive, and it will, no doubt, find a permanent place in electrical libraries.

The book contains 156 pages and 28 illustrations, and is five by eight inches in size.

The price of the book is $1.00, and copies may be had of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Operators' Wireless Handbook.

Operators' Wireless Telegraph and Telephone Handbook, by Victor H. Laughter, is an excellent work for those who wish to obtain a general knowledge of what wireless telegraphy and wireless telephony are, and how the systems work. It describes the various pieces of apparatus employed in wireless communication, and their uses, also the various wireless telegraph systems.

A short history of early wireless methods prepares the reader to better understand the later improved systems. The book contains many illustrations, the diagrams being especially clear, which makes them easily understood. The various systems and connections are thus portrayed.

The volume is devoid of mathematics to confuse the beginner. The price is $1.00 per copy. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

MUNICIPAL ELECTRICIANS.

BOSTON FIRE-ALARM HEADQUARTERS.—Mayor Fitzgerald, of Boston, Mass., has vetoed a bill providing for fire-alarm headquarters in that city.

TELEPHONE FIRE ALARM IN SYRACUSE.—The fire-alarm telephone system in Syracuse, N. Y., is to be changed so that calls will be handled through a private switchboard at the city hall, instead of going through the telephone exchange.

FIRE-ALARM BUREAU, LOS ANGELES, CAL.—It is stated that the Bureau of Fire and Police Telegraph in Los Angeles, Cal., is to be abolished, and the equipment of the bureau placed under the control of the Department of Electricity. The management of the bureau is to be vested in an advisory commission, to be composed of the city electrician and the heads of the police and fire departments.

NEW POLICE TELEGRAPH IN OAKLAND, CAL.—A new system of police telegraph has been introduced in Oakland, Cal. It comprehends a complete telephone and telegraph system, a "dictaphone," which permits of sending messages to various stations simultaneously, and lights over the boxes to signal patrolmen on their beats. The system was devised by chief of police W. J. Petersen and city electrician George Babcock.

FIRE-ALARM HEADQUARTERS IN CAMBRIDGE.—A new building is being erected in Cambridge, Mass., for the accommodation of the headquarters of the fire-alarm system. The chief of the fire department will also have his night headquarters in the same building, and a fire-engine will also be housed there. Superintendent George L. Pickett, of the Boston fire-alarm system, and Ralph Sweetland, engineer of the New England Insurance Exchange, say the new building is not suitable for the fire-alarm headquarters because it is not fireproof.

ODD CALLS FOR MESSENGERS.—District messengers are frequently called upon to perform odd services in their line of work. In a Southern city one was delegated to deliver a dog to an adjoining town, and in Memphis, Tenn., a messenger was called to get a baby and deliver it to the telegraph office. The boy answered the call promptly, and delivered the mite of humanity, as ordered.

An Excellent Book on Telephone Construction and Installation.

"Telephone Construction, Installation, Wiring, Operation and Maintenance" is the title of a book by W. H. Radcliffe and H. C. Cushing, jr., which is intended for the amateur, the wireman and the engineer who desires to establish short telephone lines. It is also intended for the guidance of the contractor in building small exchanges in factories, mills or small towns. It is written in plain, everyday language, and a knowledge of the telephone and its application is not prerequisite, as the book explains everything in the simplest manner.

The authors are both well known writers on electrical subjects, and have the great advantage of knowing thoroughly what they write about, both being electrical experts.

The book has 125 illustrations, which are very clear and helpful in the study of the text matter. The construction of the various instruments are explained in detail and well illustrated, and the merest novice cannot fail to gain an understanding of them. Chapters are devoted to inspection and maintenance of telephone instruments; testing telephone line wires and cables, and wiring and operation of special telephone systems.

After a study of this book one will have gained a very good practical working knowledge of the telephone and its applications. The best part of the work is the clear manner in which the construction of the instruments is explained, and this gives the student a sure foundation to build upon. Unless one knows how the instruments are constructed, it is extremely difficult, if not impossible, to gain a reliable understanding of the operation of the telephone. This is the first thing a person should learn, and this book will be found very helpful in acquiring such knowledge.

The price of the book is $1.00 per copy. Copies can be obtained of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

INTERCOMMUNICATING TELEPHONES ON TUG.—On the recommendation of Mr. J. F. Caskey, superintendent of telegraph, Lehigh Valley Railroad, South Bethlehem, Pa., the company's new steel tug "Perth Amboy" has been equipped with an intercommunicating telephone system. Western Electric apparatus was employed.

LETTERS FROM OUR AGENTS.

NEW YORK WESTERN UNION.

Miss E. A. Bowen, formerly, and for many years, of the main operating department, died on October 28.

E. V. Hale, son of T. P. Hale, of the plant department of this company, was killed by coming in contact with a live wire on October 28. Mr. Hale was a young man of much promise.

NEW YORK POSTAL.

Mr. C. Barnett has been appointed manager of the 344 East Forty-fifth street office, vice J. Fiarello, resigned.

Miss M. J. McCable has been assigned to the Knickerbocker Hotel office, vice Miss G. Jones, transferred to the Vanderbilt Hotel office.

Mr. F. Lund, of Superintendent Leonard's office, has the sympathy of his office associates and friends in the recent death of his wife.

Mr. M. Klepper has been transferred from the 1572 Broadway office to 1397 Broadway, vice C. A. Francis, resigned. Mr. Klepper has been succeeded by Mr. L. Schwartz, transferred from the Thoroughfare Building. Mr. Flanagan has been transferred from 1947 Broadway to the Thoroughfare Building in place of Mr. Schwartz, and Mr. W. Redlefsen has been promoted from operator to the managership of 1947 Broadway, in place of Mr. Flanagan.

ST. LOUIS WESTERN UNION.

Mr. Fred. Ramin, formerly of the Barclay department, has been appointed clerk to the wire chief.

Mr. W. N. Manley, repeater chief in the overland department, has resumed his regular duties after an attack of bronchitis.

Miss Alma Snyder, assistant wire chief, is taking a leave of absence, and her position is being filled by Mr. H. V. Crain, assistant quadruplex chief, Mr. E. L. Frey, of the traffic department, assuming Mr. Crain's duties.

Messrs. W. J. Dill, D. R. Flotron and F. M. Sullivan, night assistant quadruplex and wire chiefs, each possesses a copy of McNicol's "American Telegraph Practice," which they highly endorse.

The regular monthly meeting of the Western Union Electrical Club was held November 4 in the Commercial Building. A lecture on intermediate switchboard tests and patching was delivered by Mr. W. L. Rhodes, of the American Telephone and Telegraph Company. Several names were proposed for membership and accepted. The committee consisting of Messrs. McGrory, H. V. Crain and Joseph Barry, for the purpose of securing a new lecture room, was successful in obtaining convenient quarters in the new St. Louis Library Building on Olive street. Renewed interest is being taken in these meetings, and a large and enthusiastic membership is looked for this winter.

TO LIMIT FREE TELEGRAMS FROM SENATORS.—A resolution has been introduced in the United States Senate to limit the value of telegrams a senator may send at government expense to $60 a year. It is charged that the privilege of sending telegrams on official business at government expense has been abused, and an investigation was made with the result stated.

Telegraph and Telephone Age

No. 23. NEW YORK, DECEMBER 1, 1913. Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

Automatic Telegraphy.

Now that automatic telegraphy has come to stay, each inventor is striving to evolve some method which will prove to be so superior to those of his competitors that he can readily dispose of it to one or more of the various telegraph companies.

Unfortunately their efforts are too often misdirected in part or wholly through not fully appreciating the requirements of such a system as viewed from the company's standpoint. This is particularly true with inventors who have had but little or no practical experience with the actual conditions of working circuits, and the manner in which messages and press matter must be handled in order to meet favor with the critical public. This statement is apparently verified by the fact that, notwithstanding several hundred patents have been taken out for as many different systems, there are but little over a baker's dozen in practical operation at the present time. Nevertheless, one should not belittle the value of the discarded systems for the reason that many of them disclosed new principles of operation in parts which served as stepping stones for subsequent developments. In fact, each of our present approved systems is the final product, evolved principally through the partial failure of prior inventors.

Obviously the speed of transmission is a very important point in every automatic system and altogether too many inventors have considered that to be the ultimate aim, but such is not the case. If it were true, each company could reinstall one or more of several discarded systems they are privileged to use and thereby increase the present speed several hundred per cent. The practical speed, as viewed by the company, is represented by the actual time occupied in getting a message in shape for delivery at the receiving station after the original copy is offered for transmission, as is the case when two Morse operators handle it. A quick start and a finished product is the first and most important requirement of an automatic system; then comes speed of transmission over the line; the greater the better. If inventors will keep these two requirements in mind and work towards those ends they will be traveling in the right direction, regardless of whether the system is for single or multiple transmission.

Probably the first, or at least a very early practical attempt to substitute mechanical for manual labor in the transmission of telegraph characters, was the one devised by Bain, which dates back to the year 1851, when he conceived the idea of employing perforated tape for that purpose. Bain's method was to first punch dots and dashes in the ribbon and then run it through a metal roller beneath brushes of wire. Whenever a hole in the paper occurred the two-line brushes met and closed the circuit for a period of time, the duration of which was proportional to the length of the punched characters, which temporarily made electrical contact possible.

About the year 1858 Wheatstone improved Bain's method by utilizing perforated holes for the sole purpose of controlling the up and down movements of two levers, which, in turn, control contact points to which the line battery is connected. The improvement lies in the fact that Wheatstone's method permits of duplex operation by connecting a battery of opposite polarity to each contact point and using the latter as a pole-changer. The speed attained by this transmitting pole-changer of course depends upon the rate of speed with which the perforated tape is caused to pass over the two levers, and the carrying capacity of the wire. This type of transmitter, slightly modified, still constitutes the direct or the indirect sending apparatus of many automatic systems to-day, such as the Barclay Printer and the Wheatstone system.

In the latter system the characters come out at the receiving station on running tape in the form of dots and dashes which are subsequently copied in message form on a regular blank for delivery.

In the Barclay printing telegraph system the line impulses forming the characters operate a sensitive polarized relay at the receiving station, which, in turn, controls a set of mechanism which successively form local circuits leading to a number of magnets. Each of these magnets represent a certain letter or character and when operated causes the typewriter, which constitutes the recording apparatus, to print such letter or character on a receiving blank in the same manner as though an operator had struck that letter key by hand.

The circuit leading to any desired letter magnet is timely constructed and closed by this selecting mechanism through the particular arrangement or order in which the line impulses successively arrive, viz.: according to the relative positions and arrangements of the dots and dashes of the Barclay alphabet.

The receiving instruments of practically all modern automatic multiplex printing telegraph systems are constructed with a view of being able to similarly respond to some definite order or timing of the arriving line impulse, hence the distinction between any two systems consists principally in a different mechanism and a different alphabet for accomplishing the same or an equivalent purpose. The complete mechanism which will best fulfill the greatest number of requirements, as viewed from the company's standpoint (and that is the principal consideration) will naturally become and remain the standard type of apparatus until something better is evolved.

The trend of improvements at the present time is towards attaining greater speed through the reconstruction of receiving apparatus having a greater mark of merit and in neutralizing the effects of distorted line impulses which great speed itself tends to cause. Quite recently the transmitting speed of the Wheatstone automatic system has been nearly doubled by means of the introduction of a vibrating relay in the circuit, the principle of operation of which was fully described and illustrated in the October 1 issue of TELEGRAPH AND TELEPHONE AGE.

There is also a demand for an efficient automatic multiplex system which will permit transmission over circuits in either direction as desired; that is to say, be the equivalent of as many single line wires as there are multiplex circuits. Fortunately the result of efforts directed in that line indicate that an efficient multiplex system embracing these qualifications may soon be put in practical operation.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, November 24:

American Telephone and Telegraph Co.	119
Mackay Companies	77
Mackay Companies, preferred	63½
Western Union Telegraph Co.	62½

Telegraph and Telephone Patents.

ISSUED NOVEMBER 4.

1,077,278. Printing Telegraph System and Alphabet. To D. S. Hulfish, W. J. Herdman and E. S. Lorimer, Toronto, Ont., Canada.

ISSUED NOVEMBER 11.

1,078,106. Harmonic Relay. To K. B. Miller, Chicago, Ill.

1,078,201. Support for Telegraph and Telephone Wires. To H. L. Hoybook, Tyler, Tex.

PERSONAL.

MR. E. E. HUDSON, fourth vice-president of the Thomas A. Edison, Inc., Orange, N. J., recently returned from a pleasure trip to Cuba.

MR. F. G. CREED, of the Creed automatic printing telegraph system, Croydon, England, after spending a few weeks in this country, sailed for home on November 15.

MR. FRANK JAYNES, formerly and for many years general superintendent of the Western Union Telegraph Company at San Francisco, Cal., together with Mrs. Jaynes, recently visited friends in New York.

MR. JOHN W. KEPHART, a former telegrapher, now a practicing lawyer in Cambria County, Pa., who was a candidate for the Superior Court judgeship, was successful in the election held on November 4, and made a wonderful record.

MR. E. C. BOILEAU, manager of the wire service of the Commercial Exchange, Philadelphia, Pa., and one of the most expert operators in the country a generation ago, has been elected to the Select Council of that city. Mr. Boileau was associated with Mr. Thomas A. Edison in the seventies in testing new telegraphic inventions.

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MR. CHARLES C. ADAMS, vice-president, New York, and Mrs. Adams, spent Thanksgiving with their son at Pomfret School, Pomfret, Conn.

MR. J. E. ZECHER, assistant day traffic chief for this company at Philadelphia, Pa., has been appointed manager at Atlantic City, N. J., vice C. Troeller, jr., resigned. Mr. Zecher was born at Lancaster, Pa., November 16, 1882, and learned telegraphy at that place. On May 1, 1898, he was appointed operator for this company at Atlantic City and afterwards went with the Western Union and worked at various places, returning to this company September 16, 1907. He was appointed assistant day traffic chief in April, 1912.

JAMES A. DUNN, brother of Mr. William B. Dunn, assistant secretary of this company, was accidently drowned on Sunday, November 2, at Stapleton, Staten Island. Deceased was for many years employed by the New York Commercial Company, importer of rubber, and was considered an expert in that industry.

TIME-BALL SERVICE.—The time-ball service recently established on the "Titanic" Memorial Tower in New York is operated by a wire of this company direct from Washington. The ball is dropped every day in the year, and is of special benefit to shipping interests.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

MR. THEO. N. VAIL, president of this company, has returned from his trip of rest in the South.

HEADQUARTERS TRANSFERRED.—The headquarters of district traffic superintendents, J. M. Creamer, at Philadelphia, Pa., and L. D. Wilbourn, at Boston, Mass., have been transferred to New York.

A CONFERENCE of division wire chiefs took place at the executive office in New York during the week ending November 22. Messrs. G. M. Yorke, general superintendent of plant; R. E. Chetwood, plant engineer; L. McKisick, assistant general superintendent of traffic; J. C. Hubbard, general supervisor of lines, and H. W. Drake, of the engineer's office, were occasional attendants during the meetings. Among those present were: A. W. Douglas, San Francisco, Cal.; C. R. Fisher, Denver, Col.; I. D. Hough, Dallas, Tex.; J. C. McDowell, Atlanta, Ga.; C. W. Steinhauer, Chicago, Ill.; W. T. Rogers, C. W. Frey and C. Friedlander, New York.

MR. J. C. BABBITT, of Marinette, Wis., formerly of Jackson, Mich., has been appointed manager for this company at Battle Creek, Mich.

MR. EDGAR H. DAVIS, cashier of the Springfield, Mass., office, was married on October 27 to Miss Ruth Rogers, of Brattleboro, Vt., at which place Mr. Davis was formerly manager.

MR. ROBERT H. MORRIS, the well-known electrician of this company at New York, will retire on March 1. Mr. Morris has been in the telegraph service continuously for more than fifty years. He came to New York in the early spring of 1865, forty-nine years ago, starting with the American Telegraph Company, which afterward became part of the Western Union Company. He has been in the employ of the latter company ever since.

When the duplex was first brought out Mr. Morris made a study of the device and was more familiar with it, from a practical standpoint, than anyone else in the service at that time. This is also true with reference to the quadruplex, and on account of his practical knowledge of these multiplex systems he has had full charge of the installation of these devices in the main office ever since they came into practical use. When the duplex and quadruplex were introduced into the Chicago office Mr. Morris was sent there to assist in their installation.

Mr. Morris has many friends and admirers in and out of the telegraph service who will regret seeing him go. He himself feels that he is too young to retire, but the well wishes of his many friends will go with him. He is of an unassuming and retiring disposition and his success has been due altogether to his unquestioned ability, extensive knowledge of telegraph apparatus and his quiet manner rather than to anything that savored of self-assertion. Mr. Morris is a well-preserved man of fine physique, and judging from his present activity, one could easily believe that he would be a valuable asset to the company for many years to come.

THE CABLE.

MR. S. FENN, traffic manager, and Mr. A. E. Powell, engineer of station equipment, Western Union cable service, London, England, arrived in New York, November 13, on a trip of inspection. Mr. Fenn expresses himself as well satisfied at the manner in which the cable office of his company is being conducted in New York. A dinner was tendered to Messrs. Fenn and Powell on the evening of November 19 by Vice-President Newcomb Carlton at the Café Lafayette, New York, at which the following-named officials, all having to do with the Western Union cable service, were present: Newcomb Carlton, vice-president; A. G. Saylor, general manager; J. C. Willever, United States manager cable system; G. M. Yorke, general superintendent of plant; W. N. Fashbaugh, general superintendent of traffic; L. McKisick, assistant general superintendent of traffic; H. W. Ladd, auditor; J. F. Nathan, commercial superintendent; M. C. Allen, division plant superintendent; S. B. Haig, division traffic superintendent; W. A. McAllister, traffic superintendent, central cable office, and John Simmonds, division cable manager. Messrs. Fenn and Powell sailed for London on November 29, on the steamer "Carmania."

JAPAN-CHINA CABLES.—Some new arrangements have lately been concluded between the Japanese Government and the Great Northern Telegraph Company, whereby the former is laying a new cable between Nagasaki, Japan, and Shanghai, China. The line will, however, be limited to the transmission of Japanese telegrams and Japanese and Chinese official dispatches. The cable between Formosa and Chuauchishan, which has hitherto been exclusively used for the service of the island, will in future be utilized for general international purposes, while the Ogasawara cable, which has hitherto been used for messages to America only, will now be employed also for messages to Hong Kong.—London *Electrical Review*.

REVISED CABLE RATES.—The Commercial Cable Company has just issued a rate book containing a number of important changes in cable rates and, in addition, much information useful to patrons of the cable service. It contains a complete series of cable charts of the world; also a lucid explanation of the deferred plain language service and a table showing the differences in time between New York and the principal countries of the world.

RENEWAL WORK ON COMMERCIAL CABLES.—The Commercial Cable Company's steamer "Mackay-Bennett" has sailed from Halifax, N. S., for England, to take aboard new cable and do some renewal work on the Irish coast.

NEW CABLE BETWEEN ENGLAND AND IRELAND.—The English post-office is laying a new cable between Holyhead and Dublin. The distance is a little more than fifty miles.

MR. C. E. THATCHER, of San Francisco, Cal., writes: "TELEGRAPH AND TELEPHONE AGE is a fine publication, and is very interesting."

THE TELEPHONE.

MEDAL FOR DR. BELL.—The gold medal of the Royal Society, London, has been conferred on Dr. Alexander Graham Bell, in recognition of his inventions, notably the telephone.

MR. A. P. CRENSHAW, assistant secretary and assistant treasurer of the Chesapeake and Ohio Telephone Company, Baltimore, Md., recently retired after thirty-five years of active service.

LONG DISTANCE TELEPHONE IN NORWAY.—The telephone line between Christiania and Hammerfest, Norway, has been completed as far as Harstad. The distance between Christiania and Harstad is about 500 miles.

NANTUCKET TELEPHONE SERVICE CUT OFF.—Judge Sheldon, of the Supreme Court, Boston, on November 14 enjoined the Nantucket Telephone Company from doing business because of its failure to make its State tax returns. The Island of Nantucket was deprived of its telephone service in consequence of this action.

READJUSTMENT OF TELEPHONE RATES IN NEW YORK.—Proceedings have been started by the Merchants' Association for a general readjustment of charges for telephone service in New York City, based on a physical valuation of the property of the New York Telephone Company. The company has, through Mr. F. H. Bethell, vice-president, expressed its willingness to co-operate freely in such a scheme of readjustment.

TELEPHONE AND TELEGRAPH SOCIETY IN ATLANTA.—At a meeting of officials and employes of the Western Union Telegraph Company, the American Telephone and Telegraph Company, the Southern Bell Telephone and Telegraph Company, the Cumberland Telephone Company and the Western Electric Company, in Atlanta, Ga., on November 13, plans were laid for the organization of a telephone and telegraph society. The meeting was held at the Ansley Hotel and was attended by about 300 persons.

ENGLISH TELEPHONE SERVICE.—Mr. Herbert Samuel, Postmaster-general of England, who recently made a trip to Canada and the United States, stated, in London, that after making some study of the telephone service in Chicago, New York and Seattle, Wash., he had come to the conclusion that the service of these places was distinctly more efficient than that in England at the present time. He stated, however, that England was ahead of the United States in the development of the automatic telephone system.

TELEPHONE CONVERSATION TIMING DEVICE.—A timing device has been introduced to measure telephone conversations. It consists of five small sand glasses supported in a metal frame. The glasses are graduated so as to require one, two, three, four and five minutes for the sand to run from the upper to the lower tubes. The sand in the first glass runs out at the end of one minute, that in the second at the end of two, and so on. When the fifth glass is emptied the timer is inverted automatically and the sand runs the other way.

BOSTON PLANT CHAPTER.—The twentieth regular meeting of the Boston Plant Chapter, Telephone and Telegraph Society, of New England, was held in Boston, November 25. Joseph A. Parks, Esq., member of the Massachusetts Industrial Accident Board, made an address on "The Massachusetts Workingmen's Compensation Act"; "The Massachusetts Industrial Accident Board," and "The Massachusetts Employe's Insurance Association." Mr. Gordon S. Wallace, 125 Milk street, Boston, Mass., is secretary of the chapter.

Telephone Postal Card.

At a recent convention of supervisory post-office employes at Toledo, Ohio, the subject of a telephone postal card was considered.

Mr. P. Kerr Higgins, general manager of the Texas Independent Telephone System, Waco, Tex., on April 28 of this year, presented the matter to Postmaster-General A. S. Burleson, who thanked Mr. Higgins for the suggestion.

In his letter Mr. Higgins wrote:

"I wish to suggest the introduction of what might be known as a 'Telephone Postal Card.' The intention is that this card would bear a special stamp, say five cents, and it would be sent to destination in preference to all other mail matter. It would show not only the address, but also the telephone number of the one to whom it was sent. Upon its arrival at destination a clerk would immediately call up the telephone number, ask for the person the card was addressed to and read the message. If the person was not in word would be left, as is done in the case of a long-distance message, e. g., "Have Mrs. Doe call post-office for message to her."

"A reply postal card would be ten cents. The number of words could be limited and no liability assumed other than is now assumed on a special delivery letter."

RADIO TELEGRAPHY.

WIRELESS IN GERMAN AFRICA.—The German Government will erect a powerful wireless station at Togoland, German West Africa. It will have sufficient power to communicate direct with Berlin.

MONOTONE WIRELESS TELEPHONE RECEIVER.—Experiments are being conducted with a wireless telephone receiver designed to vary the sensitiveness of the instrument by cutting in and out some of its coils by means of a switch.

LONG DISTANCE WIRELESS.—The United States Transport "Thomas," which arrived in San Francisco on November 13 from Manila, reported that on September 24, when the ship was near Guam, the scores of the Pacific Coast League baseball game were received on board, over a distance of 4,700 miles.

WIRELESS TIME SIGNALS FROM PARIS TO WASHINGTON.—The naval observatory at Washington is now regularly receiving time signals from the observatory of Paris by wireless telegraphy between the Eiffel Tower and the naval radio tower at Arlington, Va. The scientific object is to measure by the velocity of the propagation of radio signals over the intervening distance the precise difference of longitude between Paris and Washington.

WIRELESS IN NORWAY.—The Norwegian Post and Telegraph Department has planned to erect a series of wireless telegraph stations around the coast from Christiania to the Swedish frontier in the south and to the Russian frontier in the north. There will be fourteen stations in all.

WIRELESS TELEGRAPH RESEARCH.—The Postmaster-General of Great Britain has appointed a committee "to consider how far, and by what methods, the state should make provision for research work in the science of wireless telegraphy, and whether any organization which may be established should include problems connected with ordinary telegraphy and telephony."

WIRELESS IN PORTUGAL.—The Portuguese Government has planned an extensive system of wireless telegraph stations on the Continent and in its colonies. The stations at Lisbon and Oporto are well advanced, and that at the capital will be equipped with apparatus of sufficient power to communicate over a distance of 2,200 miles by day, and twice that distance at night.

WIRELESS STATION AT COLUMBIA UNIVERSITY.—A wireless telegraph station has been added to the electrical equipment at Columbia University, New York. This installation has been made possible by a recent gift of $8,000. The station is meant for the benefit of the special students sent by the United States Naval Academy to take graduate work at Columbia.

IMPERIAL WIRELESS CHAIN.—The Postmaster-General of Great Britain is prepared to consider applications to tender for the construction of the second three high-power wireless stations of the Imperial chain from any wireless company, syndicate, or contractors who are able, by means of a practical demonstration, to satisfy him of the capacity of the system for continuous efficient communication by day and night over a distance of not less than 2,000 geographical miles.

WIRELESS IN FLOODED DISTRICTS IN THE WEST.—As a result of the recent storms and floods in Ohio, Pennsylvania and West Virginia, especially in the Ohio valley, the proposition to construct a chain of wireless stations from Pittsburgh to Cairo, Ill., is again being brought to the attention of the public. The city council of Youngstown, Ohio, has taken the matter up in earnest and has granted a franchise for the establishment of a wireless station in that city.

WIRELESS AT CHATHAM POINT, B. C.—It is stated that the Canadian Government has decided to erect a wireless station on Chatham Point, British Columbia. This station will do away with what is known as the "dead section" along the British Columbia coast. Owing to the high hills, which rise almost perpendicularly from the winding channel between Cape Lazo and Alert Bay, it is impossible for the station at these two points to communicate with each other at any time. It is to bridge this gap that the Chatham Point station will be erected.

Trans-Atlantic Wireless Telephony.

Mr. William Marconi recently conducted wireless telephone experiments between Glace Bay, Cape Breton, and Clifden, Ireland, for which purpose it is stated that regular wireless telegraph traffic was suspended for thirty minutes. The result of the experiments have not been announced officially, but it was learned from one of the operators that "it was all that was expected."

Wireless Distress Call from Another Burning Steamer.

The Spanish steamer "Balmes" caught fire at sea, 200 miles from Bermuda, November 13, and sent the wireless distress signal, which was answered by the Cunard Line steamer "Pannonia." The 103 passengers of the "Balmes" were transferred to the "Pannonia" next morning, and the "Balmes" was taken in tow, headed for Bermuda. The two vessels arrived at St. George's Harbor, Bermuda, November 16, and the fire in the hold of the "Balmes" was soon extinguished by means of pumps.

Wireless Injunction.

A preliminary injunction was granted on November 17 by Judge Rellstab, in the United States District Court at Trenton, N. J., restraining the Marconi Wireless Telegraph Company from further alleged infringement of the Reginald Fessenden patents controlled by the National Wireless Signaling Company. The order was so worded as not to affect the contracts between the Marconi Company and the United States Government.

The court required the Marconi Company to furnish a bond of $25,000, which may subsequently be increased, as a guarantee to make restitution to the National Company in the event of a final decision being given against the Marconi Company.

Under the Fessenden patents it is claimed that the effect of static disturbances upon the receiving instruments has been overcome, so that there is no longer confusion between the sounds emanating from a wireless transmitter and those produced by static disturbances.

The validity of the Fessenden patents has been upheld in the Third Judicial Circuit, of which the New Jersey district forms a part.

The National Company alleged infringement of the patents by the Marconi Company at the Wanamaker and other stations of the Marconi system in New York and elsewhere.

The New Jersey Court later suspended until some future time the injunction against the Marconi Company as to its present stations.

SERIAL BUILDING LOAN AND SAVINGS INSTITUTION.—A meeting of the shareholders of the Serial Building Loan and Savings Institution will be held at 195 Broadway, New York, on Tuesday, December 16, at 5 p. m., for the purpose of nominating officers and directors. The annual meeting of the shareholders will be held at the same place on Tuesday, January 20, 1914. Mr. Edwin F. Howell is secretary.

Mr. De Goll on Machine Telegraphy.

Among the speakers at the Magnetic Club dinner at the St. Denis Hotel, New York, November 12, was Mr. Louis de Goll, of the Universal, formerly the Rowland Telegraphic Company, Baltimore, Md., who made some interesting remarks on the subject of machine telegraphy. President Charles P. Bruch introduced Mr. De Goll as one who had been foremost in hastening the time when machine telegraphy shall come into extensive use.

Mr. De Goll thanked the chairman for the unexpected opportunity to address a body of telegraph men. He spoke of the persistent efforts of the past twelve years to adapt the invention of the great scientist, Prof. Rowland, to the present conditions of telegraph operation, and humorously repeated a remark of Prof. Rowland's when his first great machine was ready for use: "If the telegraph companies have any trouble handling these machines on their present wires, they will build new pole lines especially for them." He spoke of the generous aid he had received from the telegraph companies and administrations, who had devoted their best men and their best facilities to the trials, and of the repeated efforts of his company to improve and simplify the apparatus, which, at each successive trial, was pronounced "interesting." Nevertheless, he declared his unswerving fidelity to the conviction that machine telegraphy will soon be found in extensive use. He described, calling it "a day dream, if you choose," the conditions that would prevail when this came to pass, picturing an automatically operated operating room, heavily charged trunk circuits operated by the machine transmission, delivery to and reception from the individual correspondent, and intense interchange of intercommunications by telegraph between commercial houses, largely replacing correspondence by mail and the elimination of the major delays in getting a message from sender to recipient. He dwelt upon the tireless efforts of various groups of inventors and the courage and daring of men of capital who were supporting them, all of whom were deserving of recognition and praise.

The following speaker, Mr. S. S. Garwood, of Philadelphia, in the course of his remarks, asserted that the world's progress had been made by the world's dreamers, illustrating this by historical references, and concluded by expressing the hope that this dream of machine telegraphy to which they had listened would be realized.

"Eighty Years."

In going through old papers, a friend of the late James D. Reid recently came across a pamphlet, the text of which is a fac-simile of Mr. Reid's writing, and is notable for its legibility and beauty.

The pamphlet contains a likeness of Mr. Reid; a view of the City of Edinburgh, under which are the words "James Douglas Reid, Born, Edinburgh, March 22, 1819," and a picture of the house where Mr. Reid was born. The outside cover bears nothing but the words "Eighty Years."

The pamphlet is characteristic of Mr. Reid and will be of interest to all his friends and associates, particularly to those who have subscribed to the fund that is being raised for the purpose of erecting a suitable monument over his grave.

Mr. Reid himself was evidently the author of the verses, with the exception of the quotation from Young.

The text of the pamphlet is quoted below:

EIGHTY YEARS.

"Age should walk thoughtful on the solemn shore
Of the vast ocean it must sail so soon."

Young.

1819-1899.

Eighty years! How swift they pass! How empty now they seem!
How like the fabric of a changeful dream!
And yet how dear some memories they bear
Of gallant hearts whose love I came to share.
Some bitter drops, 'tis true, have reached my waiting cup,
But love turned all to wine, and filled the chalice up.
And now I see through all life's chequered past,
That Love is King and triumphs at the last.

Noble friends were mine in plenty as the busy years went by,
When labor was a glory, and my life a cloudless sky,
And many such remain to me, still loved, and true, and dear,
Who bless my life and give it now its restfulness and cheer.
And the years rest lightly on me, the steady pulse beats strong;
Life has not lost its glory, though the days may not be long;
And I can still look upward to man's best and noblest Friend,
Who never yet has left His own, but crowns them at the end.

I have tried to live a kindly life, and not without success.
Wealth has not come, but better far, the wish and hope to bless.
And great would be my joy to feel, as I sit to-night, alone,
That some true heart had beat more firm from the throbbing of my own.
But all is well! God's blessing rest on every friend I know,
Whose love has given my passing life its cheeriness and glow.
Farewell! We ne'er may meet again as we tread earth's lower road,
But some fair morn, now soon to dawn, may we meet at home with God.

I have prepared this booklet because the memory of many kindnesses was strong upon me, and I felt a desire to express, in some way, my gratitude to friends and God. To friends it will go as a token of my loving remembrance. J. D. R.

Manufacture and Maintenance of Storage Batteries.

(Concluded from page 681)

"During charge, the sulphuric acid is driven back into the electrolyte from both plates, causing the specific gravity to increase, and, at the same time, the active material of the positive plate is oxidized. This action, combined with the driving out of the sulphuric acid from both plates, causes the voltage to increase. It is evident that when all of the acid has been driven out of the plates into the electrolyte, the electrolyte cannot get any stronger, so that the specific gravity reading will reach a maximum and will not show any further increase, no matter how long the charge is continued. Almost simultaneously, all the active material of the positive plates becomes completely oxidized. Since there is no further sulphate to reduce, *i. e.*, acid to be driven out of the plates, and no more positive active material to oxidize, the voltage will cease rising and will not show any further increase, even if the charge is continued indefinitely.

"It is evident, therefore, that since the current can produce no further chemical change in the cell, this point corresponds to the fully charged condition. In other words, when the voltage and gravity will not rise any higher, the current has produced all the chemical changes possible in the cell, and the cell has been charged to its full capacity. It should be emphasized that the indication of the complete charge is not that the voltage and gravity have reached any given figures, but that they have reached a maximum, or ceased rising. It will be found that under different conditions, and at different times, the same cell will be in exactly the same state of charge, although its actual voltage or gravity readings may vary widely.

"It is evident that when the plates no longer absorb the energy of the charging current it must still go somewhere or show itself in some form, and, as a matter of fact, it shows itself as a more or less violent bubbling or gassing of the electrolyte. In other words, as long as the plates are absorbing the electrical energy being put into the cells, there is very little action evident, but as they become fully charged and cannot absorb any further energy, this shows itself in the form of a gradually increasing amount of gassing, until, finally, practically all of the energy comes off in the form of a gas. Thus, the gassing of the cells forms an additional check or indication of the charge. There should be no gas within the working limits during discharge.

"For the average operator, it is neither necessary nor advisable to attempt to go too far into the theory of a storage battery. Let him rather master the few principles which are used under ordinary conditions, and if anything unusual comes up, apply to the manufacturers. Above all, do not experiment.

"There are four points in the operation of a storage battery which must be looked out for. If these are properly handled, no trouble need be expected.

1. The battery must be charged properly.
2. The battery must not be discharged too long.
3. Short circuits between the plates must be prevented.
4. The plates must not be exposed to the air. They must be kept covered with electrolyte and only water of a proper purity used for replacing the evaporation.

"The most important of these points is the charging. Experience has shown that if charged too much, the excessive gassing washes out the active material of the positive plates, and this decreases their capacity and life. On the other hand, undercharging results in unevenness, sulphating, lack of capacity, and if carried to extreme, will result in a rapid disintegration of the plates. The standard method of charging has been designed to meet both of these conditions to the best advantage.

"Charges are divided into two types, commonly known as regular charges and overcharges. Regular charges are simply intended to restore the capacity of a battery after a discharge, and are discontinued before the cells are quite full, with the object of obviating harmful gassing. Overcharges, given at intervals of about two weeks, are carried to a complete maximum, *i. e.*, until the voltage and gravity will not rise any higher, and are for the purpose of evening up the cells and keeping them in good condition. The common practice is to continue the overcharge until the voltage and gravity have ceased rising and for one hour after the highest readings are obtained. The intervening, or regular charges, are cut off a little below the point reached on the previous overcharge, usually about .05 of a volt per cell where voltage is used, or five points in gravity, if gravity is used.

"The special points to be emphasized in connection with the charges are, in the case of the regular working charges, to cut off promptly. If in doubt, cut off too soon rather than continue the charge too long. On the other hand, in case of the overcharges which are given for special purposes, such as the initial or the first charge given cells when they are put in commission; the regular weekly or biweekly overcharge and boosting charges, and those given individual cells or whole batteries for the purpose of restoring them to good condition, when they have gotten into bad shape, the important point is not to cut off too soon. If in doubt, continue charging until absolutely sure that the cell has had sufficient, even at the risk of charging too long. A partial charge on these occasions is only a temporary remedy and will probably result in the cells showing poor efficiency and capacity, and gradually falling behind until they are in trouble again.

"For charging, normal rates are preferable. Too high rates, if maintained, increase the amount of gassing, which is objectionable, whereas at lower rates, the indications of the completion of the charge are not well defined, so that inaccurate charging is apt to result. The usual limits are placed at not less than one-half normal, or over forty per cent above normal rate.

"Where the cells are large enough to obtain an accurate specific gravity reading, it should be used for governing the charge in preference to voltage.

The great advantage of the specific gravity is that the readings are largely independent of the current flowing in the cells, whereas the voltage at any time is directly dependent on the current and varies with it. In very small cells, where it is not always possible to get an accurate gravity reading, the voltage is sometimes preferable.

"Floating is a term applied to a method of operation now used quite largely, especially in the case of the larger offices. Where practical, it is always advisable to charge a battery during the heaviest part of the office load. Where this is done and the battery becomes fully charged while there is still a heavy office load, it often pays to continue running the generator, at the same time reducing the voltage so that the battery, although floating across the terminals, will lie idle. The slight charges and discharges balance one another, and the battery simply acts as a regulator on the generator. With this arrangement, the same results are accomplished as when charging through the heavy loads; namely, the generator carries the office load direct. Since the current does not have to be stored in the battery, this loss, as well as some added depreciation, is eliminated.

"The proper adjustment for floating is to reduce the voltage across the battery to an average of 2.1 volts per cell. At this pressure the battery will automatically take care of itself, the charges and discharges balancing each other so as to keep the cells in a fixed condition.

"When discharging the point to be guarded against is overdischarge; that is, discharging too long. As already explained, the voltage and gravity discharge limits are arbitrarily fixed as a result of experience, and it has been found very injurious to the plates to discharge them any further. The usual discharge voltage limit is 1.75 volts per cell, with normal rate of current flowing. The gravity limit varies with the type of cell, but averages about thirty-five points drop below the maximum.

"For checking the discharge, the gravity readings is much more valuable than the voltage, due to its being independent.

"The prevention or detection of short circuits, call for a regular system of inspections and readings, which must be gone through as a matter of routine, no matter whether the cells seem to be operating all right or not. Neglect of this general principle is responsible for a large part of the abuse in telephone service. The tendency is rather to leave the cells alone as long as they will operate and until they fail, and this practice results in serious injury, as already explained.

"Where the cells are in good condition, which means uniform condition, they should all begin to gas at the same time, toward the end of the charge. Where they start gassing irregularly, something is wrong in the cells which are behindhand. These have evidently had more discharge than the cells which come up promptly. Since the external discharge of all the cells is the same, the explanation is usually an internal discharge, due to a short circuit, and a careful investigation should be made at once. The gassing inspection only requires a few minutes at the end of charge. All that is required is to look over the cells when they first begin to gas, in order to see whether they are uniform, and, if not, to note any which are behindhand, so as to investigate the trouble at the first opportunity.

"Keeping the plates covered with electrolyte should be a simple operation, but, for some reason, it is very frequently neglected. There is a continual evaporation going on from the electrolyte, which must be replaced at intervals by the addition of pure water, or the electrolyte will fall below the tops of the plates. If the plates remain exposed to the air for any length of time, they lose their charge and are likely to be injured. As water alone evaporates in the electrolyte, pure water alone should be used for replacing and never acid or electrolyte. For some reason, there is an idea abroad that acid is lost and that, therefore, it must be replaced by the addition of acid to the cells at intervals. A great deal of trouble has resulted from this misunderstanding.

"There is a very slight loss of acid, but this is so slight that it can be practically overlooked, as we almost never run into any trouble from too weak electrolyte. On the other hand, too strong electrolyte, resulting from continual addition of acid, is likely to injure or ruin the plates. Except where acid is actually lost, as in the case of the broken jar, the safest plan is to write the manufacturer and get his advice before adding anything but water to the cells."

The Recent Storm in Cleveland.

The storm of November 9 and 10 in Cleveland, Ohio, was one of the most severe ever experienced in that vicinity. Both the Western Union and Postal Telegraph-Cable Companies as well as the telephone company lost practically all of their wires, and poles were broken down for miles on a stretch. High tension and trolley wires were badly entangled with the prostrated telegraph and telephone lines, causing immense damage and the death of many persons by shock. The storm started Sunday afternoon with rain, which soon turned into sleet and snow. The wires became coated with ice to the thickness of one inch or more, and this heavy strain, together with that resulting from the gale blowing at the time, snapped the poles and broke the wires.

The snow was piled up to a depth of five or six feet and surface traffic was at a complete standstill. The telegraph companies by November 12 succeeded in getting service into fair shape. The greatest damage was done within a radius of fifty miles around the city.

Wire Patrol by Aeroplane.—An electric power company in California has employed Mr. R. Fowler, an aviator, to patrol its lines between Oakland and Oroville in an aeroplane. Fowler will carry a lineman with him. Telegraph and telephone companies will be interested in this latest idea in line maintenance.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

ADDRESS ALL COMMUNICATIONS TO

J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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NEW YORK, DECEMBER 1, 1913.

Seventy-five Thousand Telegraph Offices in this Country.

One of the most interesting facts about the joint operation of the telegraph and the telephone services is the rapidly extending use of the telephone in locally handling long-haul telegrams. The fact that a telegram can be sent from one's office or house by telephone to the nearest telegraph office of any company, and thence telegraphed to its destination, strongly appeals to the public mind, and, according to reports from all over the country, this use of the telephone is so rapidly increasing that the telegraph companies are obliged to enlarge their clerical forces in order to properly handle the business.

Over 70,000 cities, towns and hamlets in the United States have telephone connection. About 30,000 of these places possess telegraph facilities, but by the co-operation of the two services, those places that have no telegraph offices, but have telephone service, really have the equivalent of both, and it is possible for them to enjoy telegraph facilities by sending their telegrams by telephone to the nearest telegraph office. By means of the associated telephone and telegraph interests, nation and world-wide facilities for practically instantaneous communication is afforded and a universal service is made available to the inhabitants of the whole country. Such a possibility was not dreamed of a few years ago; now it is an every-day incident. These wonderful developments can only be measured by comparison with the facilities available a few years back, and from these comparisons we are able to note what progress is being made.

As the public becomes more educated as to the possibilities of the complementary operation of the telephone and telegraph for the communication of intelligence to distant points, these facilities will become increasingly utilized. The local telephone wires are becoming, to a large extent, feeders for the telegraph wires, and the thousands of places now without telegraph facilities, but have telephone service, are no longer isolated telegraphically from the rest of the world, because the nearest telegraph office can always be reached by telephone, hence a large percentage of the 75,000 telephone offices may practically be regarded as telegraph offices.

Such a combination of the telephone and the telegraph is an ideal one, and the thought that one can send a message to any part of the country or the world and receive a reply, without leaving the house or the office, is as impressive as it is interesting.

Long Distance Wire and Wireless Telephony.

It is interesting to note the efforts being put forth to render trans-Atlantic wireless telephony and transcontinental wire telephony a reality. At the present time attention is directed to two notable projects of this character. Within the past few days it was reported that Mr. William Marconi had been carrying on trans-Atlantic wireless experiments, and in this issue we print an article referring to transcontinental telephony by wire. While nothing official has been given out as to the result of Mr. Marconi's efforts, it has been hinted that the experiment was "all that was expected." This statement, of course, may mean anything, but the inference is that the experiment was successful, to some degree at least.

The transcontinental telephone project is not new and it possesses, to a large degree, the elements of probable success. At the time the New York-Denver telephone line was established, nearly two years ago, it was announced that the lines would be extended across the continent and that conversation between New York and San Francisco would be a future probability. There did not then seem to be any doubt that, with proper equipment, such a service would be practicable. It is now announced that the gap between Denver and the Pacific Coast is being bridged by a specially constructed telephone line and that by the year 1915, when the Panama-Pacific Exposition opens, it will be possible to telephone from New York to San Francisco direct.

With all the valuable experience telephone engineers have had, no doubt they are reasonably certain that transcontinental telephony will eventually be successfully accomplished.

Trans-Atlantic wireless telephony is an entirely different problem, but no doubt that, too, will be realized in due time. It is theoretically possible; it only remains for engineers to find the way to put the theory into practice. The fact that the problem has been and is still being worked at by the most eminent wireless engineers, leads to the conclusion that they must be hopeful of successful results.

New Telegraph and Telephone Headquarters at 195 Broadway, New York.

The accompanying illustration shows the Dey street elevation of the new building to be erected at 195 Broadway on the corner of Dey street, on the site of the present building which has been the headquarters of the Western Union Telegraph Company since 1875. The Broadway elevation is of the same design but only one-third of the width of that on Dey street.

The building will cover a plot 75 feet on Broadway and 275 on Dey street, with a wing on Fulton street of about 33 feet front. It will be 27 stories high. The Fulton street wing will be topped by a two-story tower surmounted by a bronze figure about 17 feet high.

DEY STREET SIDE OF NEW WESTERN UNION BUILDING. NOTE COMPARATIVE SIZE OF ADJACENT BUILDING.

In architectural language, the design consists of nine superimposed orders, each being three stories in height, with the exception of the first order, which has two high stories. The two lower stories are of the Doric order while all the rest are of the Ionic order. The columns are of the "engaged" type, that is, they are half columns set against the face of the building. The entire front of the structure is of granite and the back and side walls will be finished in white enamel brick.

The extreme height of the building from the curb line is 352 feet. There are five basements extending 62 feet below the curb, the superstructure being erected on caissons extending down to solid rock.

There will be two time balls, one on the Broadway corner and one near the Dey street end, each being 87 feet high. Midway between them there will be a steel flag-pole 200 feet high above the roof.

There will be 14 entrances to the building on the ground floor—nine on Dey street (including one to the Subway), four on Broadway and one on Fulton street.

The store windows will be of bronze work finished Pompeiian verde-antique and the inside bronze work will be finished similarly. The window frames will be of hollow and Kalamine bronze, and the door transoms and partition sashes hollow steel. There will be 1,687 windows in the structure, all wire glass. There will be 20 high-speed traction elevators in the building and five stairways. For fire protection there will be three fire pump lines. The entire building will be given up entirely to the executive and general offices of the Western Union Telegraph Company and the American Telephone and Telegraph Company.

The first section, on Dey street, at the rear of the present building, is now nearing completion. When it is finished the offices of the Western Union Telegraph Company will be moved into it and the present building taken down to make way for the new structure. The section which is now being built is to be finished in May, 1914, and the rest of the building will be completed in about two and a half years thereafter.

The new structure will be one of the handsomest and most imposing in the lower part of the city and the design strikes one very favorably by the harmonious proportions of its parts and its elegant simplicity. Mr. William Welles Bosworth, of 527 Fifth avenue, New York, is the architect.

TELEPHONE AND TELEGRAPH EXHIBIT AT PANAMA-PACIFIC EXPOSITION IN 1915.—The American Telephone and Telegraph Company, with its associated companies, together with the Western Union Telegraph Company, will erect a building within the Palace of Liberal Arts at the Panama-Pacific International Exposition in San Francisco, in 1915, wherein will be exhibited all that is most interesting in the history of the telephone, the growth of the business since its inception to date in five-year epochs; and many other interesting things. In one of the enclosures there will be delivered a series of lectures, illustrated by motion pictures, and other views, explaining and describing many of the interesting features connected with the world-wide service of telephone and telegraph, and demonstrations of long-distance telephony will be given.

MR. A. C. LOFTIN, manager, Western Union Telegraph Company, Trenton, Mo., writes: "I find the dear old AGE growing better every issue. I noticed in a previous issue where a good brother operator in one of the Western towns advised you to discontinue his subscription because ham and eggs were too high. Now let me tell you there is a difference in taste and quality between that fellow and me, as I find in each issue many articles well worth the price of the year's subscription."

Course of Instruction in the Elements of Technical Telegraphy—LII.

(Copyrighted.)

(Continued from page 678, November 16.)

[The Course of Instruction in the Elements of Technical Telegraphy, which has been running regularly in this journal since October 16, 1911, has met with wide-spread favor and is being studied diligently by thousands of telegraphers and others throughout the world. It is being translated into Spanish, and printed in South American electrical journals, and has attracted universal attention for its clearness of expression and its practicability. It has been endorsed by the officials of telegraph, telephone, cable and railroad companies, many of whom have acknowledged the improvement in the technical standing of their progressive employes, and they commend the course as being of the most practical kind of instruction.

This course was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, and is being published now for the benefit of those of our readers who desire to fit themselves for higher positions in the engineering branch of telegraphy, and it has been a valuable aid in this direction. It is elementary, and devoid of higher mathematics, yet it is fundamental in character and extremely easy to learn.

Each chapter is complete in itself, and the chapters are arranged in natural order so that the student acquires the knowledge step by step in logical sequence. Each chapter is followed by test questions on the subject of the chapter, thus enabling the student to review his progress from time to time.

Back numbers containing these valuable lessons can be obtained at 10 cents per copy.]

How to Balance a Polar Duplex.

We have seen that, with the distant station on ground, and a balance obtained at the home station, the tongue of the home relay remains unaffected by outgoing signals and will lie against either of the pole-pieces, provided it is not in closer proximity to one than the other. To insure against this, request the distant station to ground, and then remove the home battery from the line by placing the lever A S over stud A (Fig. 72). The pole-pieces are now magnetized by the permanent magnet, and the tongue should lie against either the marking or spacing side. If it does not remain on the side it is placed, adjust screw H, (Fig. 62), until the bias disappears, and then cut in the home battery by reversing the ground switch. If now the armature is affected and shows a partiality for either pole-piece, the resistance in the rheostat must either exceed, or be less than the resistance of the main line, and must be adjusted until the tongue remains neutral as before. Place your finger on the tongue and feel how strong the bias is, then add resistance to the rheostat until the pull is perceptibly weaker or stronger. In the former case continue unplugging until the tongue remains neutral; in the latter case short circuit some of the coils in the rheostat by inserting plugs until the same result is obtained.

If the line wire should, however, be much affected by induced currents, or "crossfire," it will cause the armature to vibrate and it may be impossible to adjust it so that it will remain quiescent against either stop. In this case proceed as follows: Turn up the adjusting screws so that the vibrations will come very light. Then reverse the ground switch and adjust the rheostat resistance until these vibrations appear as light now as they did before. When the vibrations exactly correspond in either position of the ground switch (that is to say, whether the battery is to line or not), the rheostat resistance will be equal to the line resistance.

Having thus obtained a resistance balance, the pole changer is now rapidly opened, and closed, and if clicks be heard on the relay, the resistance, C R, (Fig. 72), is adjusted until the clicks are eliminated.

Request the distant station to cut in and dot and notice whether reversals of the home pole changer affect the signals. If they do not the duplex is ready for business.

It frequently happens that, owing to bad adjustment, or dirty contacts, of the distant pole changer, the signals from the distant station are only recorded when the home key is in one position. To prove the distant battery, request the distant station to close his key, and then ground the wire at the home switchboard. Insert a milliameter or voltmeter in the circuit, and note the deflection. Then reverse the wedge and request the distant station to open his key. If the distant battery and pole-changer are all right, the deflections will correspond. In the absence of Weston instruments the distant battery may be felt by going on ground and testing the pull on the relay armature with the distant key open and closed.

In the case of a disconnection, or ground, nothing will be received from the distant station, while the home balance will be upset, and the wire should be singled at the board and tested in the usual manner.

We have seen that, as long as the balance is properly maintained, the receiving apparatus will remain totally indifferent to the outgoing currents; but in bad weather this equilibrium is being constantly disturbed, for, whilst the resistance of the artificial circuit remains unchanged, that of the main circuit is constantly changing, owing to defective insulation, which produces inequalities in the strength of the outgoing currents that give rise to serious irregularities in working. At such times the currents that come in from the main line are not only weakened by losses through leakage, but suffer under the further disadvantage of having to overcome the bias to which the relay armature is subjected whenever the currents from the home battery divide unequally between the main and artificial branches.

For the same amount of line variation the bias will be more pronounced with a large battery than with a smaller one, because the higher electromotive force will produce a greater difference in the intensity of the currents traversing the real and artificial lines. Suppose, for example, that Fig. 72 represents one terminal of a polar duplex circuit, operated on a potential of 100 volts and that the resistance of the main line circuit, which normally balances on, say, 5,000 ohms has, through leakage or otherwise, been diminished to 4,000 ohms. Then if no corresponding change be made in the artificial line, the amount of current leaving the main battery (which, for the sake of simplicity is assumed to have no internal resistance) will be 45 milli-amperes

$$\left(\frac{5000 \times 4000}{5000 + 4000} = 2{,}222 \text{ ohms} = \text{resistance of cir-}\right.$$

cuit, $\frac{E}{R} = I$, or $\frac{100}{2222} = .045$ ampere, $= 45$ milli-amperes) of which 25 milli-amperes will pass into the shorter or main line circuit $\left(\frac{100}{4000} = .025\right.$ ampere, $= 25$ milli-amperes) and 20 milli-amperes into the longer or artificial circuit.

If we now substitute a battery of double the voltage, the current outflow, which will also be doubled, will divide between the two lines in the proportion of 50 milli-amperes in the main line to 40 milli-amperes in the artificial line. With a battery of 300 volts the amount of current generated will be 135 milli-amperes, and in this case the real line will absorb 75 milli-amperes as against 60 in the artificial line.

We have thus with 100 volts a difference in strength between the main and artificial currents of 5 milli-amperes; with 200 volts, a difference of 10 milli-amperes; and with 300 volts a difference of 15 milli-amperes; or, in other words, the amount of bias produced on the relay armature is directly proportional to the number of volts employed.

From this it would appear that in regular practice, where for various reasons a balance cannot always be accurately maintained, it ought to be possible to operate a duplex circuit to better advantage with a small battery than a large one, provided, of course, the former always furnishes current enough to work the distant apparatus. The lower electromotive force, as a matter of fact, admits of a great range or margin of variation in the main line, without practically affecting the working of the circuit, and consequently without calling for any corresponding compensation in the artificial circuit.

The polar relay is a very sensitive instrument and is readily actuated by incoming currents of comparatively small value, when its armature is free from restraint or uninfluenced by the outgoing signals; and the cause of the irregularities in the working of a duplex circuit in bad weather is not so much due to the loss of current in the main line, as to the extra effort required on the part of the incoming current to overcome the bias in the relay when any serious disparity exists between the values of the outgoing currents.

New Book.

"Manual of Telephone Troubles" is the title of a new book by W. A. Gibson, Detroit, Mich., issued in leaflet form and bound in a loose leaf binder. It contains 225 pages and the subject-matter covers every phase of telephone work, starting with the description of the simplest case of trouble and method of clearing it, then covering, on succeeding pages, every case of trouble that is liable to occur in standard apparatus or circuits. The pages are printed on one side only, the blank side being available for drawings of special circuit diagrams, etc. The binder is so arranged that additional pages can be inserted at any time.

The author of this work is an experienced telephone man and describes actual troubles met with during a period of twenty years' experience in the telephone field. The publishers have included only such data as the telephone man needs, eliminating the unnecessary details and avoiding technical words and phrases, wherever possible. The information is written in clear, simple language and constitutes an every-day encyclopedia for the practical telephone man.

The book is four and one-half inches by seven and one-half inches in size and can be carried in the pocket. It is bound in flexible leather and the price is $3.50. Copies may be obtained on receipt of price of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions.]

What is the meaning of the word "bridge" in connection with this type of measuring apparatus?

What kind of galvanometer is most suitable for use in connection with the Wheatstone bridge?

In measuring for conductivity of a telegraph line with a Wheatstone bridge, what is the method of procedure?

What is the "loop" test, and what is it used for generally?

What are earth currents, and do they interfere with conductivity tests?

How can the effects of earth currents be eliminated in making tests?

In case earth currents are so strong that an accurate measurement cannot be made with the Wheatstone bridge, what method must be resorted to?

How is the resistance of a ground connection at a distant station determined by the loop method of measuring?

How is the position of a ground located? Also that of an escape?

What is the double measurement method?

What is the Varley loop test?

In case the resistance of a wire is abnormally high, what is likely to be the cause?

In order to locate a bad joint, what is the usual method adopted?

In testing with the Wheatstone bridge, what is the method employed to test insulators and other high resistances?

The Function of Retardation Coils in Telephone Circuits.

In telephone circuits it is necessary to handle not only high-frequency voice currents, but also the low-frequency alternating current used for ringing, and the direct current used for supplying talking current to the transmitters, and for operating relays and other signaling devices. So that direct current may not be wasted in the circuit, it has been found necessary to use a condenser. In a somewhat similar manner, the retardation coil is used to prevent waste of talking current, and, in combination with the condenser, is used to separate alternating from direct current under the great variety of conditions which are found in telephone practice. The *Western Electric News* gives a clear description of the function of retardation coils in telephone circuits.

A retardation coil consists essentially of a coil of insulated wire wound around an iron core, and provided with suitable terminals. The coil is often placed in an iron shell, which serves to protect it from mechanical injury, and prevents magnetic interference with adjacent telephone apparatus.

The electrical effects of a retardation coil are, in general, exactly opposite to those of the condenser. For example, the condenser prevents the flow of direct current, while the retardation coil offers merely a slight resistance to direct current, such as would be offered by a similar amount of straight wire. The condenser allows alternating current to pass through it, and its impeding effect on the alternating current decreases as the frequency or rapidity of the alternations increases. The retardation coil, on the other hand, has a retarding effect or impedance on alternating current, which increases as the rapidity of the alternations increases, and becomes very high at frequencies corresponding to those of the human voice. In short, the retardation coil provides a path for the flow of direct current, at the same time offering a very high impedance to the flow of alternating current. The various functions which the retardation coil performs in telephone circuits make use of both of these properties. A few typical applications of the retardation coil in telephone and telegraph circuits follow:

One of the principal uses of retardation coils is in connection with a central-office storage battery and charging generator. The current supplied by an ordinary direct-current generator is not absolutely continuous, but contains a small element of high-frequency current, which would produce noise if allowed to enter the battery. In this connection, therefore, the function of the retardation coil is to prevent these noise-producing currents from entering the battery.

The coil is also used to allow both telephone and telegraph currents to be sent over a single wire, with a return circuit through the ground. In such

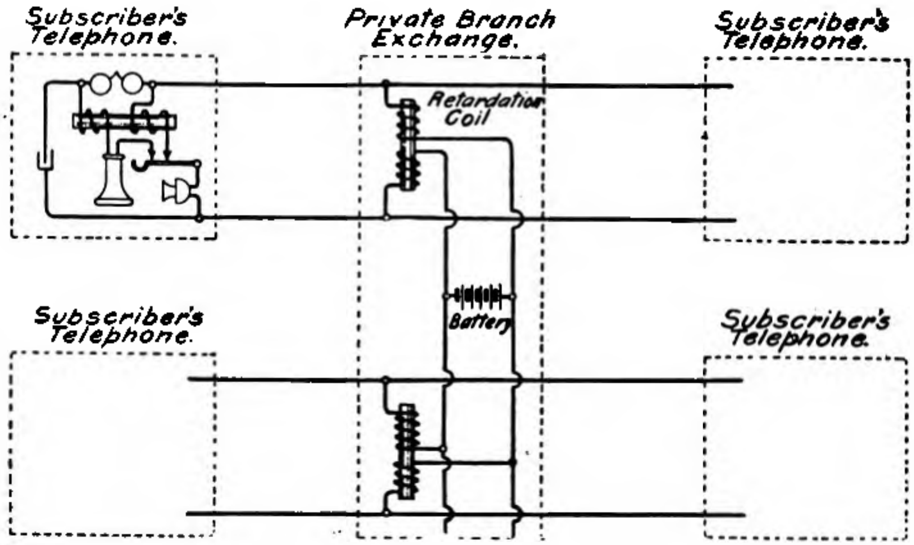


FIG. 1—PRIVATE BRANCH EXCHANGE CIRCUIT, SHOWING RETARDATION COIL USED AS BATTERY FEED COIL.

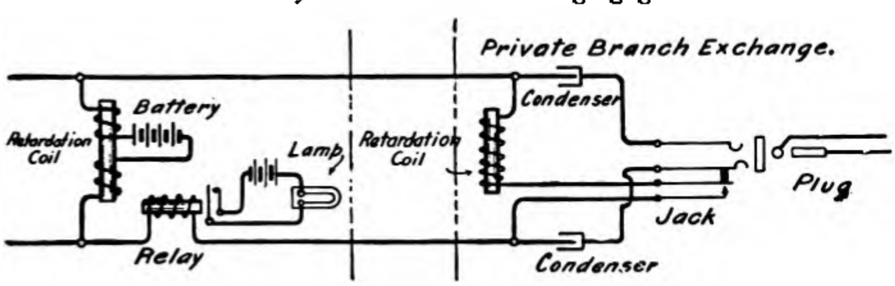


FIG. 2—PRIVATE BRANCH EXCHANGE CIRCUIT, SHOWING RETARDATION COIL USED AS RELAY-HOLDING COIL.

a circuit, a condenser is placed in series with each telephone instrument, and a retardation coil in series with each telegraph instrument. The condenser allows the high-frequency talking currents to flow freely through the telephone instrument, but

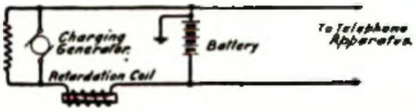


FIG. 3—CIRCUIT SHOWING RETARDATION COIL USED AS CHOKE COIL.

cuts off entirely the direct-current impulses of the telegraph instrument. The retardation coil, on the other hand, keeps the telephonic currents from being wasted by passing through the telegraph instrument, but, at the same time, permits a ready flow of the telegraph impulses.

A more common use of the retardation coil is in private-branch exchanges, as a battery feed coil, where it may be that a number of different conversations are being carried on at the same time by means of transmitter current supplied from a common battery. For this purpose a double-wound coil is used. It allows direct current to pass to the several transmitters, but prevents the talking current from being wasted by passing through the battery. By keeping the talking currents out of the battery, the retardation coil also prevents one pair of subscribers from overhearing the conversation of other subscribers who are talking on the same common battery.

Another function of the retardation coil, and one which necessitates a more complicated circuit, is its use as the holding coil for a relay. This is to notify the central-office operator that the circuit, with which the retardation coils is associated, has been connected to another line by means of the plug shown at the right of the diagram, Fig. 2. When this plug is inserted in the jack it closes a contact which connects the retardation coil across the line. This allows current to flow from the central-office battery through the relay, causing the latter to pull up and open the local circuit through the lamp. The extinguishing of the light indicates that the connection has been properly completed. In this case, the retardation coil prevents the waste of talking current passing over the line, and, at the same time, allows a flow of direct current sufficient to hold up the relay. The central-office battery is also cut off by means of condensers from the apparatus attached to the plug.

By various combinations of retardation coils and condensers, the telephone engineer is able to operate the very complicated signaling system made necessary by the development of the modern telephone exchange.

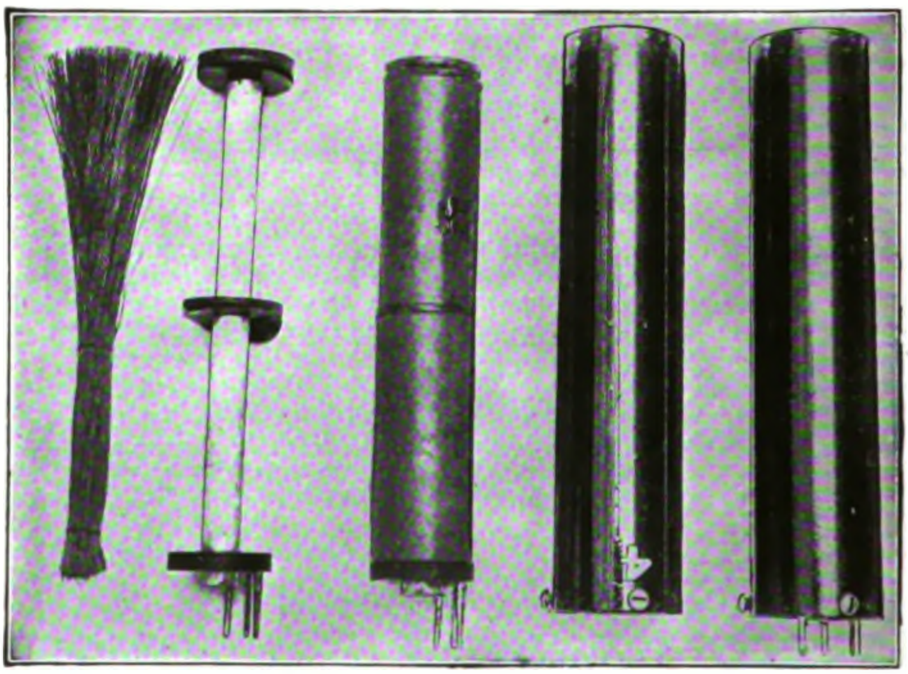


FIG. 4—PARTS AND ASSEMBLED RETARDATION COIL.

Appreciative Messengers.—Miss Will Ellen Dromgoole, a poetess and writer on the Nashville, Tenn., *Banner*, was tendered a birthday reception and banquet recently. Among the incidents was the presentation to Miss Dromgoole of a magnificent floral tribute by the messengers of the Western Union Telegraph Company in that city.

Mortality Among Telegraph Employes.—According to statistics prepared by Dr. Jacques Bertillon, of Paris, France, mortality among telegraph employes is near the lowest.

Mr. F. B. Bradley, manager of the Western Union Telegraph Company, at Terre Haute, Ind., writes: "Thank you very much for renewing my subscription to your valuable and interesting paper. I feel that it is a wonderful help to me and would be to all men connected with a telegraph, telephone or railroad company."

A New Telegraph System.

BY GEORGE E. HINES, NEW YORK.

There have recently come to me a number of requests for a fuller explanation of the fundamental principles of the new telegraph system which was disclosed in a pamphlet and reviewed in TELEGRAPH AND TELEPHONE AGE, April 1 and April 16, 1911.

The work has proved practical, but its theory and purposes, as seen from the inventor's standpoint, appear to be hard to understand, but this is not true.

There are two principles in this work differing from the old; namely, the matter of grounding the circuit and insulating the battery, and the matter of differentiating the main line and the artificial line in direct multiple through the home relays instead of in series-multiple, as is now done.

It is to avoid the use of high potentials, entailing objectionable and sometimes obstructive reactances on the one hand, and to eliminate the effects of leakage during changing weather conditions on the other, that these changes are designed.

I shall show how the effects of leakage are eliminated by connecting the main line and the artificial line in direct-multiple through the relays. This can be successfully accomplished only by grounding the lines or circuits and insulating the battery.

For illustration, simple theoretic diagrams are shown of the present method of series-multiple differentiation used in all telegraph systems where batteries are grounded, and similar diagrams, showing the rearrangement of the battery and the main and artificial lines in direct-multiple, as proposed under the new method.

Let our circuit represent the following electrical dimensions: E. M. F., 160 volts; series resistance, 600 ohms; line and artificial line, 2,000 ohms, respectively.

The resistance being—

$$= r + \frac{r'\,r''}{r'+r''} = 600 + \frac{2000 \times 2000}{2000 + 2000} = 1600 = \frac{160}{1600} = .100 \text{ amp.}$$

Now, with reference to the old method (Fig. 1), when M, the main line, becomes leaky, in order to maintain differentiation through the home relay it

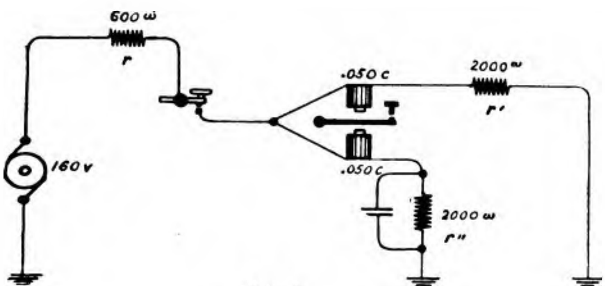


FIG. 1.

becomes necessary to change the conductivity of the artificial line, A. If the leakage along M equals half the conductivity of M then A must be reduced to 1,000 ohms, or to twice the conductivity of M. Before this balancing became necessary we had .100 ampere of current equally dividing between M and A, but now we have .100 ampere of current, .066 2/3 of which is shunted through twice the conductivity of M, while M can receive only .033 1/3 ampere, and of this only a part reaches the distant relay, because the leakage still continues.

It should be understood that a differential relay, with its artificial line, is similar both in theory and usage to a differential galvanometer and its shunt. The galvanometer shunt increases or decreases the range of the instrument, the artificial line limits the range of the relay. The mathematical formula for calculating the resistance of the galvanometer shunt is equally applicable to the effects produced on the relay by changing the resistance of the artificial line, when the circuit is balanced; or, in plain terms, the current in the main line, when the circuit is balanced, is equal to the joint current in the circuit, divided by the ratio of resistances M and A, plus one, or may be written:—

$$C_m = \frac{C}{\frac{M}{A} + 1}$$

This formula may be deduced as follows:—

The total current in the circuit $= C = C_m + C_a$ (1)

Let n = the ratio resistance $\frac{R_m}{R_a} = n$, or $R_m = R_a\,n$ (2)

The drop in potential $= C_a\,R_a = C_m\,R_m$ when the circuit is balanced (3)

Combining (2) and (3) $C_a\,R_a = C_m\,n\,R_a = C_a = C_m\,n$ (4)

Combining (4) and (1) $C = C_m\,n + C_m$

$$C = C_m\,(n + 1) = C_m = \frac{C}{n + 1}$$

Now, let us apply this formula to the two conditions which have been shown. In the diagram of the present method, Fig. 1, under the first condition we have:—

$$E = 160 \text{ volts}, \; R = 1000 \text{ ohms}.$$

$$\frac{160}{1600} = .100 \text{ amp.}$$

which divides equally through M and A, or applying the formula $C_m = \frac{C}{n + 1}$ where n represents the ratio of main and artificial resistances $Cm = \frac{.100}{\frac{2000}{2000} + 1} = 0.50$ amp. The second condition would work out, $Cm = \frac{100}{\frac{2000}{1000} + 1} = .033\ 1/3$ amp. actually conducting through the main-line circuit. A third condition, where the leakage forces the artificial line resistance down to 600 ohms, would put the circuit practically out of business, $Cm = \frac{.100}{\frac{2000}{600} + 1} = .023$ amp. But the leakage is now greater than the conductivity of m. This loss of current does not, by any means represent a loss by leakage, but it represents a loss of electrical conductivity, due to shunting the potential E. M. F. at the home end, made necessary in order to differentiate the artificial line with the main line. The main line, because of leakage, has become a multiple circuit, with the earth the whole length of the distance between the two stations on account of the battery being grounded directly and the conductivity circuit in series, with a resistance that limits its output.

To make the argument still more convincing—say, we have an electric light circuit, as shown in Fig. 3.

Turning on or off one light will greatly affect the other. Should you short circuit one light you ex-

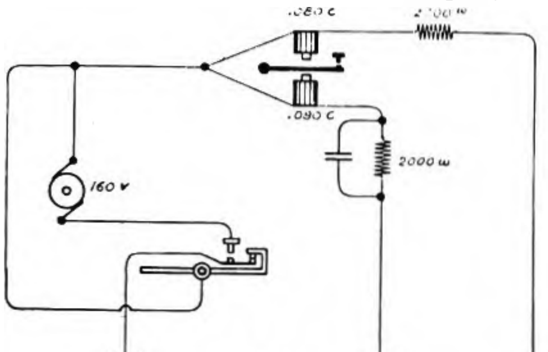


FIG. 2.

tinguish the other. Connect the two lights directly across the mains, and any change made in either circuit will in no wise affect the other.

Suppose we use the old water analogy: If we were delivering water through two pipes of equal lengths and sectional area, connected to another pipe leading from the tank (Fig. 4), and should one pipe spring a leak, it would be very unwise to increase the sectional area of the other pipe in order to stop the effects of the leak. But that is just what is being done under the present system.

The present method is based upon a defective principle, making the arrangement of introducing resistance between the key or pole-changer and battery absolutely necessary, both for protection and economy.

Now, with reference to the theoretic sketch of the new method (Fig. 2), it will be noticed that the line is directly connected to the ground and to

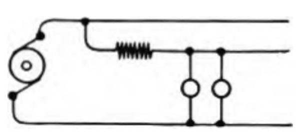


FIG. 3.

the battery and through the relay, no resistance interposing. The opposite side of the battery is open and free from any ground connections, hence the line has no battery or current on it, nor is there any convection or leakage. When the circuit is closed around the battery, however, by closing the transmitter, the ground connection is removed from the home end of the wire and is applied simultaneously to the side of the battery, opposite to the line, completing the circuit through the battery to ground. The battery now finds a conductive circuit for itself through the main and artificial lines, which are arranged to have equal conductance. The quantity of current passing through the differential relay now is controlled by the electrical conductivity of the joint circuit in multiple, but independently of each other, being directly connected between the E. M. F. and earth. No more current can be conducted to earth through the circuit than that of the opposite potential delivered to the earth at the home station. The quantity delivered to earth depends entirely upon the conductive facilities through the joint conductivities of the main and artificial lines directly connected in multiple between earth and E. M. F., but separate from each other.

The telegraph signal can truthfully be said to be made through the earth. The circuit in multiple will receive, on each section, an equal share of current during the time constant after contact is made. No discharge by convection or leakage can influence one circuit to the detriment of the other, because both circuits receive an equal amount of current, and are practically two separate and distinct circuits, used merely to produce differentiation in the home relay.

The quantitative analysis of the electric current can in no wise be better shown and proven than in this practical way. It is hoped that the foregoing has made plain, also, why the new method will be economical and why it will work well under wet weather conditions.

While the work appears to be revolutionary, turning, as it does, the whole system of telegraph up-

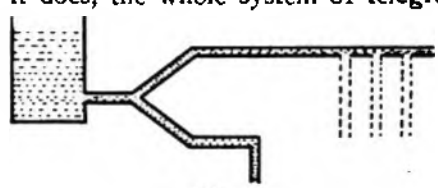


FIG. 4.

side down, yet its adoption and the changing from one system to the other can be made gradually and economically. Very slight mechanical changes are required to be made in the apparatus now in use. The gain, however, is great, because the electrical reactances and leakages which have retarded the proper development of the present methods and systems are shaken out.

Ratio of Attractive Force to Distance.

It is stated in many text-books that the attractive force exerted by an electromagnet upon its armature varies inversely as the square of the distance between them. This proposition, known as Coulomb's law, would be true, if it were true that the magnetic forces are concentrated at a focal point in each pole, and that this disposition of it remains unchanged by the movement of the parts in response to the magnetic attraction. But, in fact, there is not, and, from the nature of the case, cannot be, any one law which correctly expresses this relation under all conditions. It necessarily differs with every alteration in the form of magnet and armature, and with every change in their positions with reference to each other.

The Telegraph at World's Series Ball Game at Philadelphia.

The accompanying illustration is of the "Press Box" at Shibe Park, Philadelphia, Pa., on the occasion of the final event of the recent world's series of baseball games. Extraordinary preparations were made by the commercial, plant and traffic forces of the Western Union Telegraph Company, to provide facilities for the transmission of the enormous volume of press matter. For weeks the three departments worked tirelessly and in perfect harmony until everything was in readiness for the umpire's "play ball." There were seating accommodations in the press box for 242 press correspondents and fifty-three telegraph operators. Each operator was a baseball expert, thus insuring correct transmission of the technical phraseology of the game. He was flanked by a reporter, and each event of importance during the progress of the game was instantly transmitted to the most remote hamlet in the country, to Canada and to Cuba. There were nine newspaper correspondents from Havana, and they had the use of three direct wires to the cable office on Broad street, New York, where their dispatches were instantly relayed to the Cuban capital.

THE TELEGRAPH AND PRESS BOX AT BASE BALL GAME, PHILADELPHIA, PA.

Interesting Portraits of Telegraph Officials.

We are in receipt from Mr. Charles Gallagher, chief clerk to District Commercial Superintendent A. B. Cowan, Chicago, Ill., of a large group portrait of the officials of the Eastern Division of the Western Union Telegraph Company in 1873 or 1874. The officials shown are: Thos. T. Eckert, general superintendent, New York, and the following superintendents: Albert B. Chandler, New York; Chas. F. Wood, Boston, Mass.; Wm. J. Holmes, New York; Geo. W. Gates, White River Junction, Vt.; A. G. Davis, Baltimore, Md.; Sidney B. Gifford, Syracuse, N. Y.; R. T. Clinch, St. John, N. B.; J. S. Bedlow, Portland, Me.; John C. Hinchman, New York; David H. Bates, Philadelphia, and Dennis Doran, general superintendent of construction, New York.

The faces of the individual portraits remain strong and clear notwithstanding the lapse of years, and the features are readily recognizable by those who know the subjects and still know the survivors. Only three of the group are now alive, viz.: D. H. Bates, S. B. Gifford and A. B. Chandler.

The photograph is an excellent one and was taken from a group made up from original photographs.

Organization of the Military Telegraph Service During the Civil War.

BY DAVID HOMER BATES, NEW YORK.

The October 1 issue of TELEGRAPH AND TELEPHONE AGE contained an item headed as above, which, we are advised, was taken from James D. Reid's "Telegraph in America," and which contained a number of inaccuracies.

Our dear friend Reid was so lovely in character, and his name is so revered by his telegraph contemporaries, that one hesitates to criticize any statements made by him, and I should not now do so but for the fact of your having revived the subject.

The number of those who entered the military telegraph service in 1861, and later, is growing smaller more rapidly each year, and therefore it seems right that while we may, the real facts concerning the organization of our beloved corps be authoritatively recorded in contravention of erroneous statements on the subject.

Reid's account is incorrect in the following particulars.

1st—Anson Stager did not establish the first field system of telegraphs during the Civil War.

2nd—He was not called to Washington by General McClellan to organize the military telegraph, because it was already organized several months before Stager came to Washington.

3rd—Edwin M. Stanton was not Secretary of War in November, 1861; Simon Cameron was Secretary of War at that time, and until January 15, 1862.

4th—Stager was not placed in charge of the cipher correspondence of the Secretary of War, except to the limited extent hereinafter shown.

With the foregoing explanation before you, the following is submitted for publication.

Fort Sumter fell on Saturday, April 13, 1861. The first call for Federal troops was prepared the next day, and on Monday, April 14, Simon Cameron, Secretary of War, appointed Thomas A. Scott, vice-president of the Pennsylvania Railroad Company, General Manager of Military Railroads and Telegraphs, and he, in turn, appointed Andrew Carnegie his assistant.

On April 22, 1861, Mr. Carnegie telegraphed to David McCargo, superintendent, Pennsylvania Railroad Company, Altoona, Pa.:

"Send four of your best operators to Washington at once, prepared to enter Government telegraph service for the war."

David Strouse, Samuel Brown, Richard O'Brien and David Homer Bates reached Washington in response to this request on April 25, 1861.

William Bender Wilson with Jesse W. Crouse (and four others since deceased) followed a week later. Wilson had previously (April 17) opened the first military telegraph office on the continent.

In May, June and July, Strouse, our first superintendent, opened offices in the District of Columbia and near by in Maryland and Virginia. Additional offices were established by his successor, James R. Gilmore, in August, September and October. Strouse, who was not strong physically, overworked himself and died in November.

General McClellan was in command of the Federal forces in Ohio and West Virginia, and came to Washington in the autumn of 1861. Anson Stager, general superintendent of the Western Union Telegraph Company, reached Washington in October and submitted a plan for a military telegraph service which was referred by Assistant Secretary of War, Thomas A. Scott, to the President, who returned it on the same day with this endorsement:—

"Washington, D. C., Oct. 28, 1861.

"I have not sufficient time to study and mature an opinion of this plan. If the Secretary of War has confidence in it and is satisfied to adopt it, I have no objections.

A. Lincoln."

Two weeks later Stager was appointed Captain and Assistant Quartermaster and on November 25, Special Orders 313 assigned him to duty as general manager of military-telegraph lines. These orders must have been lost in the hurry and excitement of war preparations, for on February 25, 1862, Stager was appointed "Military superintendent of all telegraph lines and offices in the United States." and on April 8, 1862, General Order 38 appointed him military superintendent of telegraph lines.

Stager from time to time appointed assistants, who were also given commissions as assistant quartermasters, to enable them to handle government property and cash. His principal assistant, Thomas T. Eckert, Chief of the War Department Telegraph Staff, was under the immediate direction of Edwin M. Stanton, Secretary of War. Stager visited Washington occasionally, but resided in Cleveland, and after October, 1863, made that place his permanent headquarters, giving special attention to matters in the West and Southwest, his chief assistant in that section being Robert C. Clowry, who was stationed first at Little Rock and afterward at St. Louis.

Stager was the author of the first Federal cipher, which he devised for General McClellan's use in the summer of 1861. They were very simple, consisting of small cards, on which were printed key-words and arbitraries, the former indicating the number of lines and columns and the route or order in which the messages might be written and the latter representing proper names.

This somewhat crude but really effective method was improved upon from time to time by the War Department staff of cipher-operators.

These War Department cipher books were issued in series numbered 1 to 13 with two "specials," one to Charles A. Dana, Assistant Secretary of War, for his correspondence while accompanying General Grant in his Vicksburg and Chattanooga campaigns and "Battles of the Wilderness," and one to the wife of General Burnside while he was on his campaign in East Tennessee, this being the only military cipher key entrusted to the use of a woman during the Civil War.

The regular series (1 to 13) were issued from the War Department telegraph office direct to specially selected cipher telegraph operators stationed at various military headquarters or accompanying the several corps and division commanders in the field for intercommunication and with Washington, as more particularly specified by General Grant in his Memoirs, Vol. 2, pages 205-207.

Mr. William R. Plum in his history, "The Military Telegraph," Vol. 1, page 60, says:

"The cipher system, originated by Anson Stager, and developed mainly by him, but in no small degree by others, more particularly T. T. Eckert, A. B. Chandler, D. Homer Bates and Charles A. Tinker, was eminently successful. Copies of cipher messages quite often reached the enemy, and some were published in their newspapers with a general request for translation, but all to no purpose. To the statement that in no case did an enemy ever succeed in deciphering such messages, let us add that neither did any Federal cipher-operator ever prove recreant to his sacred trust, and we have, in a sentence, two facts that reflect infinite credit upon the Corps."

A few words concerning the War Department office and staff may not seem out of place.

William Bender Wilson was our first manager from May 2, 1861, until March 15, 1862, at which latter date he was ordered to the front. He was succeeded by the writer, who continued to serve as manager and cipher-operator until August, 1866.

Major Thomas T. Eckert had charge of the office at General McClellan's headquarters from September, 1861, until February, 1862, on which latter date he was transferred to the War Department, where he remained as chief until he resigned in July, 1866.

Albert B. Chandler served as cashier and cipher-operator in the War Department from June, 1863, to July, 1866.

Charles Almerin Tinker was one of the arrivals in Washington in October, 1861, and opened the office at Edwards Ferry on the Potomac a few weeks later, immediately after the battle of Balls Bluff. Tinker was with the army of the Potomac in front of Richmond until July, 1862, when he was transferred to the War Department, and by direction of Major Eckert took charge of the preparation and copying of all the War Department series of cipher books. He was aided from time to time by Albert B. Chandler and the writer. When I resigned in August, 1866, Tinker became manager of the War Department telegraph office, which position he held until October, 1869. For nearly two years before that date Tinker was also in charge of the Washington office of the Western Union Telegraph Company, his sole assistants in the War Department office being Bennett R. Bates (deceased 1888), and Frank H. Evans (deceased 1911).

Those three, Tinker, my brother and Evans, were the last employes of the United States Military Telegraph Corps, which was an invaluable integer of our army during the Civil War, rendering an exceptional service which contributed in no small measure to the success of the country's cause.

It is to be deeply regretted that while Congress has under the Act of January 26, 1897, graciously allowed our members finely engraved Certificates of Honorable Service in the United States Army, the Act expressly provided there should be no pensions.

It is hoped that the present Congress at its December session will pass the bills now in the respective House and Senate Committees which contain a provision for placing the members of our corps on the pension rolls of the Government, on an equality with those who served in other arms of the service.

The foregoing account may seem to be unnecessarily long and not exactly in response to your October 1 article, but as herein explained, I thought it worth while to traverse the ground somewhat fully as a matter of record.

"I cordially concur in the foregoing statement of facts, which are in accord with my records and recollection."

Signed, Chas. A. Tinker.

"And so do I." Signed, A. B. Chandler.

"And I." Signed, William Bender Wilson.

Future Meetings of Associations, Societies, etc.

Association of Railway Telegraph Superintendents, at New Orleans, La., May 19, 1914. Secretary, P. W. Drew, superintendent of telegraph, Minneapolis, St. Paul and Sault Ste. Marie Railway, Chicago, Ill.

Old-Time Telegraphers' and Historical Association and Society of the United States Military Telegraph Corps, at Kansas City, Mo., September 15, 16 and 17, 1914. Secretary of Old-Timers, F. J. Scherrer, 30 Church street, New York. Secretary Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

Operators' Wireless Handbook.

Operators' Wireless Telegraph and Telephone Handbook, by Victor H. Laughter, is an excellent work for those who wish to obtain a general knowledge of what wireless telegraphy and wireless telephony are, and how the systems work. It describes the various pieces of apparatus employed in wireless communication, and their uses, also the various wireless telegraph systems.

A short history of early wireless methods prepares the reader to better understand the later improved systems. The book contains many illustrations, the diagrams being especially clear, which makes them easily understood. The various systems and connections are thus portrayed.

The volume is devoid of mathematics to confuse the beginner. The price is $1.00 per copy. For sale by Telegraph and Telephone Age, 253 Broadway, New York.

Mr. J. H. Baughman, of Bellefontaine, Ohio, writes: "I certainly get my money's worth out of the paper in reading some of the articles written by those who have been through the mill."

The Joint Use of Wires for Telephone and Telegraph Service.*

BY H. S. WARREN, AMERICAN TELEGRAPH & TELEPHONE COMPANY, NEW YORK.

It is a fortunate circumstance that telephone currents and the commonly employed kind of telegraph currents are of such character and relation that under favorable conditions both can be transmitted simultaneously over a circuit without either one interfering with the other. For several years it has been commercially possible for certain classes of telephone circuits to be utilized also for telegraphic communication without interfering with their regular use for telephone purposes. The telegraph service thus afforded is of very high grade; in fact, simultaneous telephone and telegraph operation is of itself a guarantee that the lines will be kept in first-class condition.

TELEPHONE CURRENTS.

The wave forms of telephonic voice currents are exceedingly diversified and complex. Every sound in a telephone transmitter produces its own peculiar train of electric waves which distinguishes it from every other sound. Even the same word or syllable spoken by different persons produces telephone waves of different characteristics whereby the voices of different individuals may be recognized. An efficient telephone circuit must transmit telephone waves at approximately the same velocity and with approximately the same attenuation, otherwise the sounds will be distorted and, as heard at the receiving end of the line, will not correspond accurately to the waves sent out by the transmitter. The normal range of the human voice for pure tones is approximately from 80 to 800 periods per second. The fundamental tones employed in talking fall within much narrower limits. In order, however, to take care of overtones, a telephone circuit should transmit waves up to at least 2,000 periods per second, otherwise quality of transmission will be impaired. It is also desirable to be able to transmit the lower periodicities within the compass of the voice.

TELEGRAPH CURRENTS.

While several alternating-current telegraph systems have been devised, direct current is ordinarily used in telegraphy in this country. The current is caused to flow for a longer or shorter time to register a dash or dot respectively, the intervals between successive dashes and dots representing periods when the flow of current is interrupted or reversed. The actual length of time during which the current flows in one direction may vary from approximately one-thirtieth of a second to one second or more, depending on the speed of sending. This refers only to manual sending, as high speed machine sending is not ordinarily used in connection with the telephone circuits.

SIGNALING CIRCUITS.

Besides the currents described it is usually also necessary, on a joint telephone and telegraph circuit, to employ a current for telephone signaling purposes, but as this signaling current is not on the wires at times when the circuit is in use for talking, it is customary to operate the signals by alternating current of a periodicity within the telephonic range.

PREVENTION OF INTERFERENCE.

The prevention of interference between the telephone and telegraph currents is a problem not of the line itself, but of the arrangement of transmitting and receiving devices at the terminals. The currents do not interfere with each other in their propagation over the line. The conditions essential to non-interference are:—

1—That the telegraph transmitting devices may impress Morse currents on the line without disturbing the telephone transmitting or receiving stations, and conversely.

2—That the telephone transmitting devices may impress telephone currents on the line without having these shunted into the telegraph instruments to a harmful extent. The last named condition is set up, not because of fear that the telephone currents would interfere with the operation of the telegraph instruments, but in order to minimize impairment of telephonic transmission efficiency.

COMBINATIONS.

The two most common forms of combining telephone and telegraph operation are the simplex and the composite. The simplex affords one Morse circuit, the composite two Morse circuits per telephone circuit, i. e., per pair of wires.

Simplex—In the simplex system, shown diagrammatically in Fig. 1, the telephone circuit is

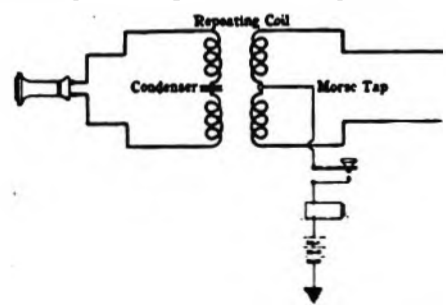


FIG. 1—STANDARD SIMPLEX.

kept balanced and symmetrical so that the midpoint of the line winding of the repeating coil, where the Morse tap is connected, is always a point of zero potential in respect to telephone currents. Thus there is no tendency for the telephone currents to flow into the Morse tap. The telegraph currents in flowing from the Morse tap to the line, or *vice versa,* divide equally between the two symmetrical halves of the repeating coil winding and the two opposing voltages induced in the telephone circuit exactly neutralize each other. The effect on telephone transmission of adding the simplex repeating coils is too small to be detected by the ear, the energy losses in these coils having been minimized by refinements in design and construction. The simplex furnishes a highly efficient telegraph circuit, and is often employed where there are enough line wires available to permit the use of

*From *The Electric Journal.*

two wires for each telegraph circuit. A simplex circuit may be operated by any of the standard telegraph methods—single line, duplex or quadruplex. Duplex and quadruplex telegraph circuits are circuits arranged for sending simultaneously two and four telegraph messages, respectively, over one circuit.

Composite—The purpose of the composite is to prevent telegraph currents from interfering with the telephone currents, also to prevent the telephone currents from leaving their own circuit and getting into the telegraph apparatus. The method which has been found by experience to accomplish these purposes most satisfactorily is that shown diagrammatically in Fig. 2. Interference is

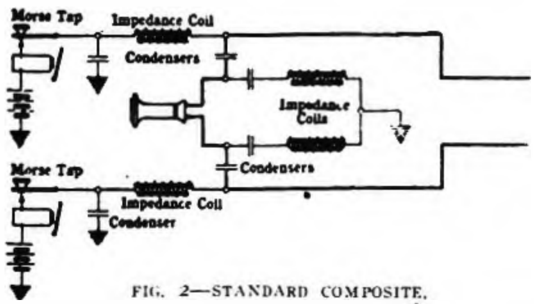


FIG. 2—STANDARD COMPOSITE.

avoided by a somewhat elaborate scheme of balancing with condensers and impedance coils. The exact proportions giving best results have been determined by experience rather than by theory. This arrangement is a compromise between that which would most effectually keep the Morse thump out of the telephone circuit and that which would least impair the telephonic transmission efficiency. The

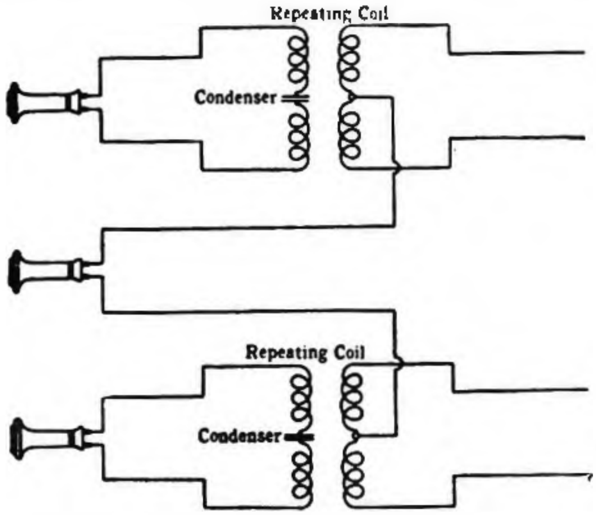


FIG. 3—TELEPHONE CIRCUITS WITH PHANTOM SUPERPOSED.

standard composite accomplishes both of these objects very well, the effect on the talking efficiency being about the same as with the simplex, and the Morse thump is so thoroughly eliminated as to be inaudible in the telephone under ordinary working conditions. Short lengths of composited line may be worked quadruplex, but in general composited circuits are restricted commercially to single line or duplex operation.

Phantom Circuits—The best examples of economical use of wires are those involving phantom telephone circuits. By means of suitable repeating

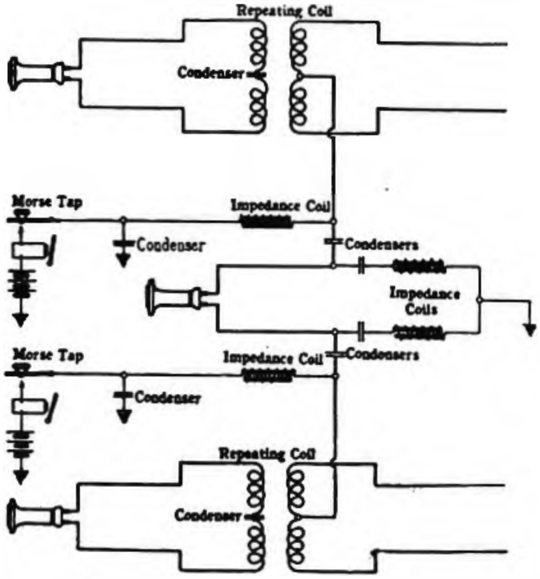


FIG. 4—PHANTOM TELEPHONE ON SIMPLEXED CIRCUITS WITH COMPOSITE ON PHANTOM.

coils two telephone circuits (four wires) can be made to afford three metallic telephone circuits. The manner of accomplishing this result is shown schematically in Fig. 3. Each side of the phantom

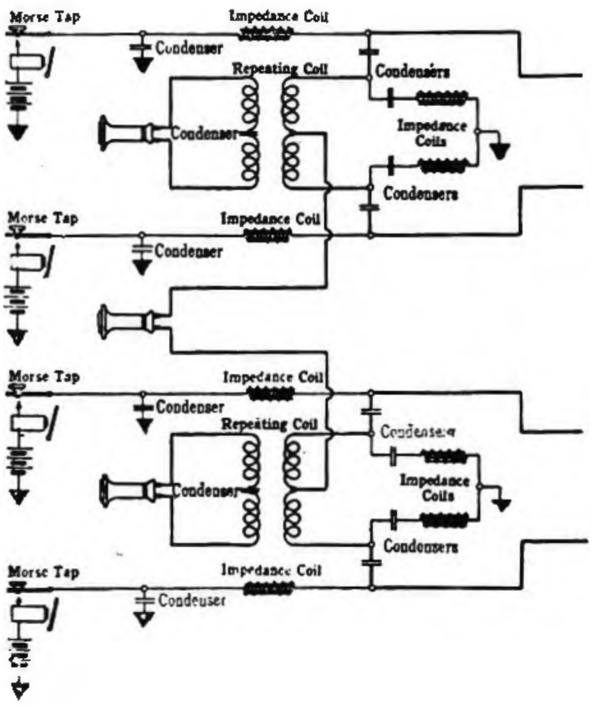


FIG. 5—PHANTOM TELEPHONE ON COMPOSITED CIRCUITS.

circuit is formed in the same way as a simplex telegraph circuit. However, it must not be inferred that the phantom telephone circuit is as easily applied as the simplex. It was many years after the simplex was invented and in use before repeating coils were developed which were sufficiently well balanced and efficient to make "phantoming" possible.

Morse on Phantoms—Given a pair of phantomed telephone circuits, there are two methods of superposed Morse in use. One of these methods, shown in Fig. 4, consists in applying the standard composite to the phantom circuit. The two Morse circuits thereby obtained may be worked duplex, in which case four telegraph messages may be transmitted simultaneously with three telephonic messages. In the second method, which is somewhat superior to the foregoing, is shown in Fig. 5. In this case each wire is composited so that from the four wires are obtained three telephone circuits and four telegraph circuits. As each telegraph circuit may be duplexed, a total of eleven independent simultaneous messages is possible.

Circuit Combinations—These three devices, the simplex, the composite and the phantom, offer opportunity for a wide variety of circuit combinations. Circuits to cover great distances may be built up by connecting together lines working independently between intermediate points.

Transcontinental Telephone Lines.*

BY G. E. MCCARN, GENERAL PLANT SUPERINTENDENT, MOUNTAIN STATES TELEPHONE AND TELEGRAPH COMPANY, DENVER, COL.

Step by step human ingenuity overtakes and masters the obstacle just ahead, thus clearing the way for the advance of practical development. By such a process have the long distance telephone circuits of the Bell System been from time to time extended, until to-day it is quite generally known by telephone people, and probably to some extent by the general public, that telephone conversations between New York and San Francisco will be a reality with the opening of the Panama Exposition in 1915.

The lines from New York to Chicago and from New York to St. Louis were looked upon less than five years ago as representing the feasible limits of long distance transmission. Two years later, however, the American Telephone and Telegraph Company's engineers had wrought advances in the art (notably the loading and phantoming of No. 8 copper circuits and the loading of the phantom), and another step forward had been taken, a step which added more than one thousand miles to the distance the human voice could travel, and which put Denver in direct telephonic communication with New York City.

Unceasing study and experimental work on the part of the engineers since the completion of the New York-Denver line have developed the art of long distance transmission to a point that permits of the final and longest step in spanning the American continent with telephone circuits, and it has now become the responsibility of the plant forces of the Pacific Telephone and Telegraph Company and the Mountain States Telephone and Telegraph Company to construct the lines between Denver and San Francisco.

When completed, the transcontinental lines will comprise four No. 8 B. W. G. copper wires, so arranged as to create a "phantom group" of two physical circuits and one phantom circuit, all of which will be loaded.

Six million pounds of copper wire, supported on one hundred and forty thousand poles, will form this great highway for ocean-to-ocean conversation, but the intricacies of these talking circuits demand far more than the mere stringing of wire on a succession of cross-arms, and their operation will not be successful unless the construction work is executed with skill and precision.

In the Mountain States territory the first field work was a replacement inspection of the existing pole lines which are to form a part of the through line; close upon the heels of these inspectors came measuring gangs, chaining the exact pole-to-pole distances. These precise measurements are indispensable to the engineers in working out the scheme of transpositions, which, with the proper vertical and horizontal separation of wires and many other details of construction, must be specified and executed with exactness when applied to this highly efficient, but decidedly sensitive, circuit arrangement.

While these operations were in progress, surveyors were laying out the new lines which must be constructed to complete the system between Denver and Salt Lake. Orders for construction material were being rushed to the manufacturers and the superintendent of construction was making up crews, arranging camp outfits and organizing generally for active operations in the field. To-day a dozen construction crews are at work between Denver and Salt Lake, doing all in their power to push to completion the lines in that section of territory where exposure to early storms is considered probable.

The Pacific Telephone and Telegraph Company is doubtless fully as actively engaged in extending its lines eastward to meet us at the Nevada state line, where the final tying in of the wires of our respective companies will mark the completion of the world's longest telephone line.

* *The Mountain States Monitor.*

PUBLIC UTILITIES.—In a report submitted to the National Municipal League at its meeting in Toronto, Ont., November 15, the committee on franchises condemned the regulation of telephones, street railways and other city utilities, exclusively by the State. The committee pointed out that public utilities were primarily urban in character and that, on general principles, the control of public functions should be localized as much as possible, in order to secure the interest and effective co-operation of citizens.

MR. A. W. DANIELS, of Amarillo, Tex., writes: "Can't possibly do without this magazine in my line of work. Wish to congratulate you for being able to obtain so much valuable information and hope that you will be able to secure much more."


KERITE
DAYS KERITE
KERITE is time-proof. Installations, of which records extend back over thirty years, show no impairment in its reliability, and no variation in efficiency
KERITE INSULATED WIRE & CABLE COMPANY
INCORPORATED BY W. R. BRIXEY
General Offices, Hudson Terminal, 30 Church St., New York — Western Office, People's Gas Building, Chicago.

THE RAILROAD.

Mr. W. G. Danley has been appointed chief train dispatcher for the Missouri Pacific Railway at Jefferson City, Mo., vice W. J. Henry, resigned.

Telautograph in Handling Railroad Trains at Stations.—The Gray telautograph is meeting with extended use in railroad work and is proving very serviceable. Notices of arrivals and departure of trains, giving train numbers, track numbers and time, are written by the tower men and dispatchers on the telautograph, which transmits the messages simultaneously to various parts of the stations where the information is needed. The Pennsylvana Railroad is using these instruments at its stations in New York, Philadelphia, Pittsburgh (Union and Fort Wayne stations) Washington, Baltimore and Wilmington, Del.

Wireless on Lackawanna Train.—The Lackawanna Limited has been equipped with wireless telegraph apparatus and tests are now being made of the system in connection with the wireless equipment at Scranton, Pa., and Binghamton, N. Y., on that road. Mr. L. B. Foley, superintendent of telegraph of the Lackawanna Railroad, and Mr. David Sarnoff, general inspector of the Marconi Wireless Telegraph Company, conducted the experiments from the train, and are said to have been satisfactory. On each trip new things and possibilities were revealed and all difficulties are being overcome. Wireless messages have been successfully exchanged between the train and Binghamton and Scranton. The train was always in communication with one or the other of the two stations, according to its position between the two points. The generator which supplies current for the lighting of the train also supplies the power for the wireless, and it is stated that there is no perceptible effect on the train lights. Each car of the train is fitted with posts at each corner, eighteen inches high, which support the rectangular antennae. During the trip on November 22, messages were easily transmitted and received.

Meeting of Eastern Division, Association of Railway Telegraph Superintendents.

The regular meeting of the Eastern Division of the Association of Railway Telegraph Superintendents was held at the Washington Terminal Building, Washington, D. C., November 13. The attendance was not as large as usual on account of the enforced absence of some of the members as a result of the recent storms, which necessitated their presence at their headquarters.

In the afternoon, Mr. Theo. N. Vail, president of the Western Union Telegraph and the American Telephone and Telegraph Companies, and Mr. N. C. Kingsbury, vice-president of the American Telephone and Telegraph Company, who were in Washington on their way to New York, honored the meeting with their presence and met the members in attendance.

During the proceedings of the meeting Mr. Charles Selden, superintendent of telegraph, Baltimore and Ohio Railroad, Baltimore, Md., discussed the method employed on his road to clear the lines when there was trouble, or a complete prostration of the telephone system.

Mr. L. B. Foley, superintendent of telegraph, Lackawanna Railroad, New York, gave some interesting information regarding the operation of the Cardwell printer between New York and Scranton, Pa., and of the wireless telegraph system which has recently been installed on the Lackawanna road between Scranton, Pa., and Binghamton, N. Y.

New Orleans Convention of Railway Telegraph Superintendents.

The next annual convention of the Association of Railway Telegraph Superintendents will be held in New Orleans, La., May 19, 1914, and it is expected that it will be one of extraordinary importance and interest. Some excellent and valuable papers pertaining to the telephone in practical railroad operation, and on other subjects relating to railroad work, will be presented by well-known authorities. Wireless telegraphy in relation to railroad operation will probably receive some attention.

The officers of the association for this year are: President, Wm. Bennett, of the Chicago and Northwestern, Chicago; vice-presidents, A. B. Taylor, of the New York Central Lines, New York, and W. C. Walstrum, of the Norfolk and Western, Roanoke, Va.; secretary and treasurer, P. W. Drew, of the Minneapolis, St. Paul and Sault Ste. Marie, Chicago, Ill.

Mr. B. Weeks, superintendent of telegraph, Illinois Central Railroad, Memphis, Tenn., is chairman of the entertainment committee. The membership of this committee includes Messrs. W. A. Porteous, manager of the Western Union Telegraph Company at New Orleans, and Mr. C. A. Stair, division commercial superintendent, Cumberland Telephone and Telegraph Company, New Orleans. Both of these gentlemen will look after the local arrangements for the convention, and their appointment as members of the committee is a guarantee that their duties will be well performed.

OBITUARY.

George E. Dunning, aged fifty-four years, for many years connected with the Chicago office of the Western Union Telegraph Company, died November 15.

Dr. Z. T. Miller, aged sixty-six years, a well-known medical practitioner in Pittsburgh, Pa., and an old-time telegrapher, died in that city, November 14. Dr. Miller was a frequent attendant at the old timers' reunions.

INDUSTRIAL.

Carbo Steel Post Company.—The main sales office of the Carbo Steel Post Company, Chicago Heights, Ill., will, from December 1, be located in the Rand McNally Building, Chicago, Ill.

Electrolysis of Lead-Covered Cables.—The article under the heading "Prevention of Electrolytic Corrosion of Lead-Covered Telephone Cables," by B. C. Groh, printed in our issue dated November 16, was erroneously credited to *Telephony*. The article originally came from a bulletin issued by the Automatic Electric Company, Chicago, Ill.

Wire Rope at Panama.—The John A Roebling's Sons Company, Trenton, N. J., has issued an attractive pamphlet describing and illustrating the uses of wire rope in connection with the construction and operation of the Panama Canal. The illustrations show various features of the work where wire rope was used. Roebling wire ropes are to be used for towing lines at the canal locks.

Mr. H. E. Gifford, jr., has been appointed sales manager for the National Electric Specialty Company, Toledo, Ohio, with headquarters in Chicago. He has been in the signal business since 1905 and has had a wide experience in this line of work, having been connected with the New York Central Railroad's electrification and other enterprises of like nature. In his new position Mr. Gifford will handle principally the "Vac-M" lightning arresters. These devices are vacuum arresters which are adaptable for all kinds of electrical, electric light, telephone, signal and power supply installations.

Duplex and Quadruplex Currents.

BY C. G. ALLEN, CHIEF OPERATOR WESTERN UNION TELEGRAPH COMPANY, BOISE, IDAHO.

The incoming current in the main-line wire of a bridge duplex or bridge quadruplex can be measured by the milli-ammeter in the bridge, by use of the following table and methods.

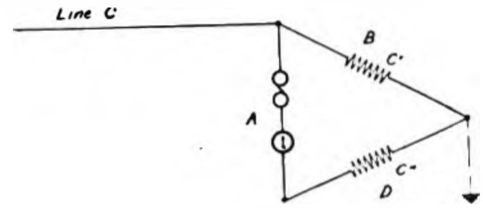
Ground the home set and open the artificial line by placing the rheostat at open; multiply the milli-ammeter reading by the coefficient, taken from the accompanying table, set opposite the resistance of the polar relay used in the bridge. The product will give the value of the main line current in milli-amperes.

TABLE OF COEFFICIENTS.

400 ohm relay in series	2.8
400 " " " parallel	2.4
500 " " " series	3.
500 " " " parallel	2.5
600 " " " series	3.2
600 " " " parallel	2.6
700 " " " series	3.4
700 " " " parallel	2.7
800 " " " series	3.6
800 " " " parallel	2.8

It will be noted the coefficients consist of a whole number and a decimal, hence we are able to perform the multiplication mentally. The results arrived at by this means, will, of course, not be absolutely correct, because it will be impossible to read the milli-ammeter, with any degree of accuracy, to less than one one-thousandth of an ampere; therefore the results will be correct to one one-thousandth only. This, however, is close enough for practical purposes.

The coefficients were deduced in the following manner, which may be used to tabulate others in which the resistances of the polar relay differ from those shown in the table. By opening the artificial line and placing the set to ground, we get a circuit as shown in the illustration, in which the polar relay, milli-ammeter and one of the bridge arms are in series and form a joint circuit with the other bridge arm. According to the law of divided circuits the current C in the main line will divide between these two branches in inverse proportion to their respective resistances. If the ratio of the resistance between the B arm and the D arm is two



DUPLEX AND QUADRUPLEX CURRENTS.

to one, the ratio of the current between the D arm and the B arm will be inversely two to one, and the current in D plus the current in B will be equal to the current in the main line.

If we consider the 500 ohm bridge arm B as unity, then the current in the D branch may be considered as unity; and if the current be multiplied by the units in the two branches, the product will be equal to all the units flowing to the branches.

The table may be used for measuring outgoing currents by simply opening the main-line wire, leaving the artificial line and ground switch undisturbed.

Hand-Writing by Wire.—It has just been reported from Stockholm, says the London *Electrical Review*, that the Swedish engineer, Widgreen, has invented a new method for the transmission of ordinary hand-writing and of pictures by wire. By means of the new apparatus ordinary hand-writing, as well as ordinary type, may be transmitted directly and reproduced at the receiving station with photographic accuracy. The apparatus can also be employed in connection with telephone wires. It is connected with an ordinary telephone instrument, which can be used for telegraphic purposes or for telephoning alternatively.

The Reid Memorial.—As stated in our issue of November 16, the trustees of the Reid Memorial Fund hope to receive in the near future subscriptions sufficient to enable them to close the lists and proceed with the construction of the proposed monument. As a result of the announcement, subscriptions have already been received from a number of intending subscribers. In order that the matter may not be overlooked by those who wish to contribute, the trustees of the fund desire to remind all who desire to assist in the movement that they hope to be able to close the subscription list not later than December 31 if possible. As previously stated, the committee is not attempting to erect a very costly memorial, but merely to put up such a monument, suitably inscribed, as will properly identify Mr. Reid's grave as that of a pioneer of the telegraph, whose character and service to the fraternity entitle his memory to perpetuation.

PHILLIPS CODE.

The popularity of Phillips' Code, by Walter P. Phillips, was never more apparent than at the present time. Its acceptance by the telegraphic fraternity, as a standard work of the kind, dates from its first publication, and the constantly increasing demand for this unique and thoroughly tested method of shorthand arranged for telegraphic purposes has necessitated from time to time the issuance of several editions. The present edition was carefully gone over, a few revisions made, and a number of contractions added, until now this "staunch friend of the telegrapher" is strictly up-to-date in every particular. It has been declared that an essential qualification of a "first-class operator" is a thorough understanding of Phillips' Code.

The use of this system promotes rapid transmission, and for press reports especially was long since declared to be the best ever devised. By common consent it is recognized as standard, and everywhere is regarded in the profession as indispensable in contributing to the operator's fund of practical knowledge. In fact, not to understand Phillips' Code acts as a distinct embarrassment to the operator.

The price of the book is $1 per copy. Address J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Important and Valuable Electrical Books for Study.

"Electrical Instruments and Testing," by Norman H. Schneider, is the latest work on this important subject, and has been brought up to date. It is an extremely practical book, and every telegrapher who is preparing himself to fill positions in the engineering branch of the service should make a copy of this work his text-book in testing. It is thoroughly reliable, and was written by a practical engineer. The section on the testing of telegraph wires and cables was written by Mr. Jesse Hargrave, a well-known telegraph engineer, and the illustrations, of which there are many, are very clear and understandable. The price of this book is $1.15 per copy.

"American Telegraph Practice," by Donald McNicol, is the other book to which we desire to call especial attention. This book contains the latest information and descriptions of telegraph apparatus and systems, and it constitutes a complete course in telegraph engineering. It is well illustrated and a careful study of its contents will give the student an immense advantage in the line of promotion. The more a man knows of it, the more will he be sought when a vacancy occurs. The book deals with every detail of the telegraph engineering and construction services and is written in so clear English that anyone with average intelligence can readily grasp the facts set forth. The telephone in its relation to telegraph operation is also covered to a liberal extent. It is a book that gives one a desire to know it from beginning to end, and, with patient effort, this result can be easily attained. The price of this book is $4.00.

"Handy Electrical Dictionary," by W. L. Weber. This little book, which is of vest-pocket size, is a necessary companion of the two books referred to, as it supplies the key which unlocks the meaning of the technical terms met with in these volumes. To the beginner this little dictionary is really indispensable. It will remove all doubt as to the meaning of technical words and phrases and is a guide post in the study of electricity. Progress in study is much more satisfactory and really enjoyable when one knows that he is on the right road and thoroughly understands what he is reading. This book is a library in itself, and is complete, concise and convenient. The price is 25 cents per copy for cloth binding, and 50 cents for leather binding.

Wireless Telegraphy and Telephony.

Although there are many books on the subject of wireless telegraphy, one of the most comprehensive and practical is Mr. A. Frederick Collins' "Manual of Wireless Telegraphy and Telephony," the third edition of which is now on the market. Mr. Collins is a well-known wireless expert, inventor and author, and has kept ahead of wireless development from its earliest days; he is, therefore, qualified to write intelligently and clearly on this interesting subject.

In his latest book Mr. Collins treats wireless telegraphy and wireless telephony in considerable detail, and by the aid of clearly drawn illustrations and views of apparatus, he has succeeded in treating the subject in so clear a manner that the novice will readily grasp the information and the expert receive new light.

The contents by chapters are: A Simple Wireless Telegraph System; Elementary Theory; Apparatus of a Commercial Station; The Aerial Wire System; Wiring Diagrams for Transmitters; Wiring Diagrams for Receptors; The Apparatus in Action; Adjusting and Operating the Instruments; Different Makes of Equipment; Suggestion to Operators; Wireless Telephony. The appendix gives a list of books on wireless and a glossary of terms, words and phrases. The book covers much ground and will be of great value as a text-book in study and for reference. The price is $1.50 per copy.

Telegraphers of Today.

An excellent opportunity is offered to telegraph people in general to become acquainted with over 600 prominent telegraph officials and others identified with the telegraph, the railroad, the submarine cable and press associations of the past generation, through their portraits and sketches of their careers as published in "Telegraphers of Today."

This work was issued in 1894 and includes photographic engravings and biographical sketches of all the individuals connected with the interests mentioned at that period, many of whom have passed away from their earthly labors. The younger generation, however, will find much of interest in looking upon their portraits and reading of their achievements in life. Many of them are still alive and in harness in the telegraph and other fields of activity.

Mr. J. J. Ghegan, president of J. H. Bunnell & Co., New York, who recently received a copy, expresses his appreciation of the work as follows: "Copy of 'Telegraphers of Today' received. I casually saw a copy of the book when first published, but never had I an idea that it was so beautiful, interesting and historically accurate. It should be of great interest to telegraphers with any sentiment in their make-up. It is magnificent, unique, and I truly pity those of the fraternity who fail to secure a copy before the edition is exhausted. Kindly send me five additional copies. I can use them to good advantage."

This book, which is 11½ x 14 inches in size, was originally published at $5 per copy, but in order to close out the remaining copies we offer them at $1 per copy by express, charges collect.

Address orders to J. B. Taltavall, Publisher, Telegraph and Telephone Age, 253 Broadway, New York.

MUNICIPAL ELECTRICIANS.

JOHN W. KELLY, SR., aged 90 years, father of Mr. J. W. Kelly, jr., chief of the electrical bureau, Camden, N. J., died at his home in Pitman Grove, N. J., November 17, from a fractured skull received by falling out of a window.

RENUMBERING FIRE ALARM BOXES IN BOSTON.—The fire alarm boxes in Boston, Mass., are to be renumbered systematically according to zones. Boxes, the first number of which commences with one, are to be in one zone, and so on up to the nines.

BOSTON FIRE ALARM TELEGRAPH.—Mayor Fitzgerald, of Boston, has asked for an appropriation of $225,000 for the construction of a fire alarm telegraph headquarters in that city, to be located underground between the Public Garden and the Common, on Charles street.

FIRE ALARM TELEGRAPH IN BROOKLYN.—A new fire alarm telegraph system is being installed in Brooklyn and a new building for the headquarters of the service is being erected. The new boxes which are being put into position bear a red signal light. The system now in use was installed in 1892.

Entertainment of the New York Telegraphers' Aid Society.

The annual entertainment and reception of the New York Telegraphers' Aid Society, for the benefit of the relief fund, took place on the evening of November 18 at the Lexingon Avenue Opera House, New York, 1,500 to 2,000 telegraphers and their friends being present. Everyone appeared to have a most enjoyable time. These annual occasions afford an opportunity for the officials and the employes to get together and enjoy themselves. The programme was arranged with excellent taste, and consisted of eight parts of vaudeville entertainment, which was of the highest class. At the conclusion of the vaudeville programme, dancing was indulged in, and the floor presented an animated appearance for several hours.

Great credit is due Mr. A. M. Lewis, president of the society, and his able associates for the great success of the affair. Mr. E. E. Brannin, chairman of the reception committee, assisted by Messrs. W. C. Morris and J. F. E. Hopkins; Floor Director Mr. J. Williams and his assistants, Messrs. F. J. Sheridan and A. F. Kavanaugh; Mr. R. J. Marrin, chairman of the entertainment committee, assisted by twenty-eight members, also performed their exacting duties with honor to themselves and the society they represent. The officers of the association are:

A. M. Lewis, president; J. F. Zeiss, vice-president; T. M. Brennan, treasurer; C. A. Kilfoyle, financial secretary; Mary E. Saunders, recording secretary.

Executive Committee—W. W. Price, E. E. Brannin, E. Mesler, J. J. Keefe, Miss S. Dougherty, H. M. Heffner, D. H. DeBaun, A. J. Fancell, E. F. Howell, J. V. Riddick, F. J. Sheridan, A. J. Gillman.

Relief Fund—E. F. Howell, Miss S. Dougherty, E. E. Brannin.

Auditing Committee—F. J. Nurnberg, J. F. E. Hopkins, H. M. Heffner.

Trustees—T. M. Brennan, J. C. Robinson, Gardner Irving.

Among the telegraph officials present was Mr. Newcomb Carlton, vice-president of the Western Union Telegraph Company. Mr. Carlton was introduced to a large number of the operating staff and he expressed himself as highly pleased at being present to greet so many telegraph people.

The relief fund, which this annual entertainment is to benefit, provides funds for defraying the expenses incident to the sickness and deaths of members of the telegraphic profession in New York, who are not qualified for membership in any of the existing organizations. It is gratifying to note that the society is receiving very liberal moral and financial support from the telegraph companies as well as from the telegraph fraternity in and about New York.

As a result of this year's entertainment a substantial sum will be added to the relief fund.

Mr. A. M. Lewis, president of the society, in a letter printed on the programme, generously thanked those who had aided him in making this entertainment one of the most successful in its history.

Mr. Charles A. Kilfoyle, 195 Broadway, New York, is financial secretary of the society. All remittances should be made to him.

T. & T. L. A. ASSESSMENTS.—Assessment No. 560 has been levied by the Telegraph and Telephone Life Insurance Association to meet the claims arising from the deaths of Charles E. McManus at Maitland, Ont.; William McK. Foulks at Vincennes, Ind.; Millard F. Griffin at Brooklyn, N. Y.; George W. Waite at Winchester, Va., and Frank M. Crittenton at Harvey, Ill.

LETTERS FROM OUR AGENTS.

NEW YORK POSTAL.

Thos. E. Heffren, aged forty-one years, for many years manager of the 49 West Thirtieth street office, died suddenly at his home in New York on Sunday night, November 23. The cause of his death was apoplexy. Mr. Heffren began his telegraphic career as a messenger about twenty-six years ago and entered the service of this company in 1892. He was regarded as one of the ablest of branch office managers. His wife and four children survive him.

PHILADELPHIA POSTAL.

Among recent visitors at this office were Messrs. C. F. Leonard, superintendent, and H. W. Hetzel, auditor, New York, and J. E. Zecher, manager, Atlantic City, N. J.

The announcement has just been made of the marriage last April of Miss E. G. Trice, manager of the Seaford, Del., office and Mr. E. M. Carpenter of this office. Mr. and Mrs. Carpenter will be at home after December 1.

PITTSBURGH WESTERN UNION.

Mr. R. O. Walters of the office of Mr. A. C. Terry, district commercial superintendent, will take up new duties with the Central District Telephone Company at Du Bois, Pa. Mr. George S. Walters, district commercial manager, of the same office, has changed his headquarters from Parkersburg, W. Va., to Pittsburgh.

The Commercial Efficiency Promoting Association held its first annual barn dance at Coraopolis Heights, Pa., Saturday, November 22. A large crowd attended. The Commercial Orchestra of the Western Union, Third District, furnished the music.

ST. LOUIS WESTERN UNION

Mr. G. C. Kinsman, formerly superintendent of telegraph, Wabash Railroad, Decatur, Ill., but now residing in California, paid this office a visit on November 20.

Mr. R. L. Holden, assistant wire chief, is spending two weeks with relatives in Warrenton, Mo., and it is stated that he will attend the wedding of his oldest daughter before his return.

Mr. H. V. Crain, formerly assistant quadruplex chief, was recently transferred to the district wire chief's office to assist Mr. P. D. Herrin. Mr. Crain visited Kansas City on official business.

Mr. E. L. Frey has been permanently assigned to the position of assistant quadruplex chief, formerly held Mr. Crain.

An Athearn pattern, single line repeaters, using gravity battery local, has been installed in this office and is doing trial duty on the Chicago-St. Louis-Kansas City Bell wire with satisfactory results.

Mr. Roy Powers is preparing himself to become an assistant quadruplex chief.

The seven-year old daughter of Night Wire Chief Geo. A. Littell died on the evening of November 19.

Telegraph and Telephone Age

No. 24 NEW YORK, DECEMBER 16, 1913 Thirty-first Year.

CONTENTS.

SOME POINTS ON ELECTRICITY.

BY WILLIS H. JONES.

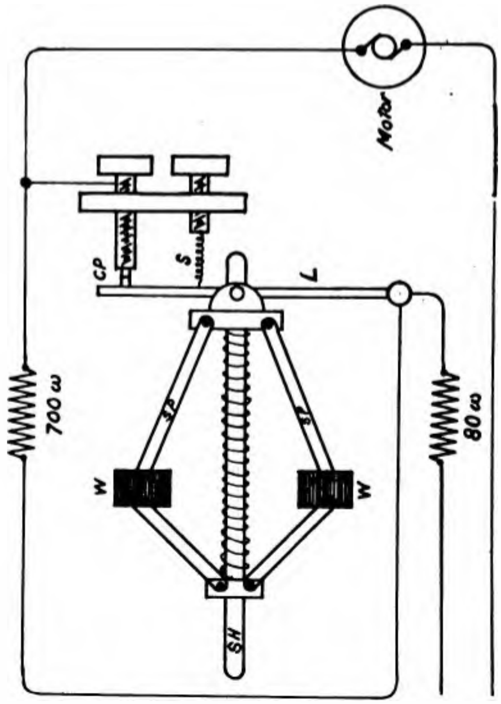
Speed Regulators.

In nearly all automatic systems of telegraphy, one of the essential requirements is the maintenance of a constant rate of speed in the motors which drive the transmitters and other apparatus.

As a uniform speed depends upon a uniform current flowing through the motor coils, one would naturally suppose that, as such motors are usually operated in local circuits and supplied with current from a constant-potential electric light circuit, the speed should not vary. Unfortunately, however, such is not always the case. One reason is that the E. M. F. of the supply often varies a few volts, and, consequently, reduces or increases the current, as the case may be. Another reason is that, after a motor has been running some time the coils become heated, thus reducing the resistance in the circuit. The result of this is more current and greater speed of the motor.

Various means are employed for regulating the speed of motors used for the purpose indicated, but the general method involved is practically the same in most arrangements, vibrating contacts being used to introduce a variable resistance in the motor circuit. In some systems the contact points are broken by means of a vibrating tuning-fork, or a reed. In the Wheatstone automatic and printer systems the motors used by the Western Union Telegraph Company for the transmitters and receivers are automatically regulated by the method theoretically shown in the accompanying illustration.

The contact points of lever L are held closed by a light-tension retractile spring when the motor is not running; hence, the maximum current will flow through the coils of the motor at such times, on account of the 700-ohm coil being shunted out. When the motor starts running, by means of gearing not shown in the diagram, it rotates the shaft S H, on which is mounted the governor. The motion causes the lever to rest somewhat loosely on the contact points, with the result that it is always more or less in a vibratory state and thus intermittently



AUTOMATIC SPEED REGULATOR FOR WHEATSTONE.

introduces the 700-ohm coil in the motor circuit on each break of the contact points. The insertion of this resistance diminishes the supply of current to the motor, and causes the latter to slow down. The wider the contact points the greater period of time will the 700-ohms added resistance remain in circuit to aid the slowing down of the motor. The width of the air-gap between the contact points, therefore, governs the speed of the motor; hence, after the points have been initially adjusted for a given rate of speed, that average width will be maintained by the weights W, which are hinged to four steel spring arms in such a manner that an acceleration of speed causes them to fly further apart and thus shorten the length of the governor. The contracted governor draws the lever with it, and thereby widens the gap between the contact points. On the other hand, when the speed of the motor is retarded, the weights close in toward the shaft and lengthen the governor, thus diminishing the gap.

Telegraph and Telephone Patents.

ISSUED NOVEMBER 18.

1,078,577. Telephone Bracket. To F. Fox, New York.

1,078,620. Printing-Telegraph Receiver. To G. S. Hiltz, New York.

1,078,653. Ship's Telegraph. To F. W. Wood, New York.

1,078,685. Telephone-Exchange Trunking System. To A. E. Keith, Hinsdale, Ill.

1,078,690. Automatic Telephone System. To F. Newforth, jr., Chicago, Ill.

1,078,746. Amplifying Case for Microtelephones. To W. B. Oliver, Collingswood, N. J.

1,078,899. Selective Telegraph System. To E. A. Burlingame, Boston, Mass.

1,079,156. Telephone Exchange System. To W. Aitken, Liverpool, Eng.

ISSUED NOVEMBER 25.

1,079,533. Telephone Switching System. To W. Aitken, Liverpool, Eng.

1,079,538. Automatic Disinfectant Holder for Telephone Mouthpieces. To A. B. Buckland, Rochester, N. Y.

1.079,760. Answering and Recording Telephone. To C. J. Gustafson, Aberdeen, N. D.

Telegraph and Telephone Stock Quotations.

Following are the closing quotations of telegraph and telephone stocks on the New York Stock Exchange, December 10:

American Telephone and Telegraph Co.	118
Mackay Companies	79
Mackay Companies, preferred	66⅛
Marconi Wireless Tel. Co. of Am.	3⅞
Western Union Telegraph Co.	62

PERSONAL.

MR. JULES GUTHRIDGE, an old-time telegrapher of Washington, D. C., representing the Panama Exposition, was in New York on business recently.

MR. J. E. WRIGHT, of Swissvale, Pa., the well-known old-time telegrapher and inventor of the Wright printing telegraph system, was a recent New York visitor.

MR. P. B. DELANY, the well-known electrical engineer, who spends six months of the year at Nantucket, Mass., has located in South Orange, N. J., for the winter.

MRS. JOHN BRANDT, wife of the late John Brandt, for many years secretary of the Old Time Telegraphers' and Historical Association, has returned from Europe, after a two-years' absence.

MR. J. FRANK HOWELL, a well-known New York broker and an old-time telegrapher, is the subject of an article in the *New York Press* of November 23. Mr. Howell reviews at length his telegraph career, and the story is an interesting one. An excellent pen sketch of Mr. Howell accompanies the article.

MR. J. E. LATTA, for the past two years an associate editor of the *Electrical Review and Western Electrician*, Chicago, has resigned that position and joined the staff of the Underwriters' Laboratories as special agent, with headquarters in Chicago.

MR. T. F. CLOHESEY, a well-known old-time telegrapher, for many years past identified with a vacuum-cleaning company, with headquarters at Buffalo, N. Y., will be located for a few months at Utica, N. Y., in the interests of his business.

MR. ALEXANDER GRANT, assistant engineer for telegraphs, Melbourne, Australia, who has been in this country investigating telegraph conditions for the benefit of the Australian telegraph department, sailed for home from Vancouver, B. C., on the steamer "Niagara," on November 26.

MR. FRANK B. KNIGHT, JR., of the contract department of the Southwestern Telegraph and Telephone Company, Dallas, Tex., and son of Mr. Frank B. Knight, special agent for the same company at Dallas, was married to Miss Dorothy Higby on November 6. Miss Higby was a member of the force of the Dallas manager's office.

MR. GEORGE M. DODGE, manager of the Western Union Telegraph office, and president of Dodge's Telegraph, Railway Accounting and Radio Institute, Valparaiso, Ind., was a recent New York visitor. Mr. Dodge on December 11 completed twenty-five years of his managership of the Valparaiso office. Mr. Dodge was accompanied by Mr. M. E. Packman, dean of the radio department of the Dodge Institute.

MR. SIDNEY FAIRCHILD, son of the late Sidney Fairchild, a former wire chief for the Western Union Telegraph Company at St. Louis, Mo., now living in Monterey, Mex., recently had a thrilling experience when the warring Federals and Carranzistas engaged in battle in the streets of that place. Mr. Fairchild and his family were imprisoned in their home for three days under the fire of the opposing forces. He and his two children nailed an American flag on the front door while the battle was raging. The flag was respected by both belligerants and firing upon the Fairchild home ceased. Much damage to property was done, but the houses of foreigners were spared.

A MUCH-MARRIED OPERATOR.—A telegrapher was sentenced to prison at Jackson, Mich., recently, on the charge of bigamy. It was developed at the trial that he was married to seven women.

MR. D. C. DONOHUE, an old-time telegrapher, for many years past identified with the Fire Alarm Bureau of the City of New York, writes: "My subscription dates from 1883 and it has never been permitted to lapse. It is time I was put on your pension list."

Postal Telegraph-Cable Company.

EXECUTIVE OFFICES.

MESSRS. C. C. ADAMS, vice-president, and R. H. Overbaugh, of the legal department, left New York on December 14 for South Carolina on a business trip.

MISS MIRIAM JOY LEWIS, daughter of Mr. Charles L. Lewis, superintendent for this company at Los Angeles, Cal., was married to Mr. E. L. Duff on November 24.

MRS. PORTER, of the executive offices, New York, who has acted as treasurer of the Christmas Savings Fund, has distributed upwards of $4,000 to its members.

MR. P. A. HICKEY, formerly chief operator at the Cotton Exchange office of this company, has been appointed manager at 49 West Thirtieth street, *vice* T. E. Heffren, deceased. Mr. E. J. Rahtes, assistant chief operator, takes Mr. Hickey's place as chief operator of the Cotton Exchange office.

THE MISSES M. WILLIAMS and A. STANLEY, at New York, and Miss N. Wallenstein and Mrs. George Kramer, at Philadelphia, on November 24 handled 1,270 messages upon the Morkrum printer duplex during day hours.

MANAGERS APPOINTED.—The following appointments of managers have been made: F. M. Woodard at Rawlins, Wyo., R. A. Woodard at Cripple Creek, Col., B. O. Woods at Victor, Col., M. Klepper at 1397 Broadway, L. Schwartz at 1572 Broadway, E. T. Flanagan at 1775 Broadway, W. Redlefsen at 1947 Broadway, C. Barnett at 344 East Forty-fifth street, H. E. Wilson at 45 Broadway, W. Commerce at 184 Franklin street, J. Pinto at 14 Desbrosses street, New York. J. F. Shugrue, manager, at 45 Broadway, has resigned.

MR. W. O. GAFFNEY, manager of the Postal Telegraph-Cable Company's office at Charlotte, N. C., contributed to the *Charlotte News*, of November 24, an interesting article on the promotion of farming interests around Charlotte for the benefit of that city's prosperity. "In my opinion," says Mr. Gaffney, "the surest way to increase Charlotte pay-rolls and attract more industries is for our more substantial citizens and successful capitalists in Charlotte and contiguous territory to use a larger share of their investments for the development of the products of the farm, rather than in so much real estate for purely speculative purposes."

J. C. BISHOP, aged fifty-five years, chief operator for this company at Birmingham, Ala., died on November 23.

EDWARD G. WOOD, aged forty-eight years, an operator in the main office, at 253 Broadway, New York, died on November 29.

THE MUTUAL INVESTMENT ASSOCIATION of New York has had a very successful and prosperous year, and the work has been greatly appreciated by the staff.

Western Union Telegraph Company.

EXECUTIVE OFFICES.

MR. BELVIDERE BROOKS, vice-president, returned to New York December 5, after an absence of four weeks on company business in the Southwest.

MESSRS. THEO. P. COOK, general manager, and M. T. Cook, assistant general manager, Western Division, Chicago, and Wm. Bennett, superintendent of telegraph, Chicago and Northwestern Railway, Chicago, and president of the Association of Railway Telegraph Superintendents, were executive office visitors last week.

MR. C. H. GAUNT, general manager, Pacific Division, San Francisco, Cal., was in New York during the past week on a business trip.

MR. M. C. RORTY, manager joint telephone arrangements, New York, has returned to his office after a business trip through the West.

MR. W. A. PORTEOUS, manager at New Orleans, La., was in New York December 5 and 6 on company business. Mr. Porteous was one of the delegates to the Rivers and Harbors Congress, which met at Washington last week.

MR. J. A. SWEENEY has been appointed division auditor of the Gulf Division, with headquarters at Dallas, Tex., vice J. O. Pipkin, assigned to other duties.

EMPLOYES TO RETIRE.—Quite a number of employes of this company, having reached the age limit of seventy years, will retire on January 1, 1914, under the provision of the pension rule.

MR. FRED COLBY, who has charge of the multiplex department of the Louisville, Ky., office of this company, was a recent New York visitor on company business.

NEW BUFFALO OFFICE.—This company moved into its new offices in the New York Telephone Building, in Buffalo, N. Y., on December 14. The operating room is situated on the second floor and the equipment is modern throughout.

MR. H. M. BUCKLEY, assistant chief operator of the Western Union Telegraph Company at Sioux City, Iowa, has resigned and will leave for South America at the end of the year to engage in other business.

MR. BEN C. WILKINS, for the past twenty-six years manager of the Western Union Telegraph office at Ashland, Wis., has retired on account of failing health. He has been succeeded by Mrs. Wilkins, who has been chief operator for her husband all through his managership period. Mr. Wilkins, who has a farm on the shore of Lake Superior, near Ashland, will henceforth devote his time to agriculture and fruit growing. He has been in the Western Union service forty-five years. Mr. Wilkins is a poet of wide renown and has given much time to song writing. His poems show uncommon literary ability and a wide understanding of human life in all its phases.

C. B. BAUER, aged forty-eight years, chief operator at Albany, N. Y., died on December 6.

GEORGE JUDKINS, aged 72 years, manager for more than twenty-five years at Claremont, N. H., died on November 28. He retired in February, 1912. He served as an assistant surgeon in the navy during the Civil War.

L. C. HALL, manager at Norfolk, Va., died on December 3 at St. Petersburg, Fla., whither he had gone for the benefit of his health. He was stricken with apoplexy and died within forty minutes. Mr. Hall was one of the most widely known and efficient telegraph men in the country. He was a man of considerable literary attainments, and it is believed by those who knew him that had he turned his natural talent toward literary pursuits he would have achieved distinction. He was one of the best-informed men on general subjects. He had the happy faculty of making sincere and lasting friends, and he was most considerate of his subordinates. Deceased was in his fifty-second year at the time of his death, and was in the service of this company about thirty-three years. Resolutions of regret were passed at a special meeting of the Norfolk and Portsmouth Cotton Exchange. The funeral services were held at the late residence of the deceased in Norfolk on December 7, there being a large attendance of officials and associates. A feature was a delegation of Western Union messengers.

THE WESTERN UNION CHAPTER of the Telephone and Telegraph Society of New England, Boston, Mass., held its semi-annual dinner in the evening of December 8. There were over 200 persons present. Mr. F. W. Barth, manager of the Boston office, made an address. Mr. Stephen Fitzgibbon acted as master of ceremonies.

Visiting Telegraph Officials Entertained.

Messrs. C. H. Gaunt, general manager, accompanied by Mrs. Gaunt, and H. F. Dodge, assistant general manager, San Francisco, Cal., and Hugh McPhee, district commercial superintendent, Los Angeles, Cal., accompanied by Mrs. McPhee, while in Tucson, Ariz., on an inspection trip, were entertained at a dinner and dance on November 18, by Mr. and Mrs. John H. Wright.

The dance programme was a very unique affair, the order of dancing being printed on Western Union blanks. The titles of the dances were: "Western Union Waddle," "The Night Letter Rag," "What Father Forgot to Wire," "Electric Ecstasies," "The Cablegram Glide," "Wireless Ravings," "Wherever the Heart is, There's a Telegraph Office Close By," "Ticking the Ticker," "Morse Code Wiggle," "Messenger Boy Drag," "The Operator's Dream," "The Guys that Put the 'West' in "Western Union."

On November 19, Mrs. W. H. Tyrell, wife of Manager W. H. Tyrell, of Tucson, and her daughter, Mrs. Sam Hughes III., entertained Mrs. C. H. Gaunt and Mrs. McPhee at luncheon. In the same afternoon the gentlemen of the party were entertained at a luncheon by Mr. Wait Talcott, at which many prominent citizens of Tucson were present.

THE CABLE.

MR. OSCAR MOLL, general manager of the German Atlantic Cable Company, Cologne, Germany, and Mr. William Ruhmkorf, electrical engineer of the same company at Emden, Germany, spent several days in New York on business. Mr. Moll returned to Germany on the steamer "Kaiserin Auguste Victoria" on December 11. Mr. Ruhmkorf will go to the Azores Islands on a tour of inspection.

MR. W. J. KEALY, who entered the employ of the Commercial Pacific Cable Company on April 15, 1903, and who served that company at its Manila station for three years and then at its Guam station in the Ladrone Islands, in the Pacific Ocean, for seven years, has been spending a five-months holiday in New York. Mr. Kealy is a native of New York. He has returned to the Pacific Coast to resume his occupation in the Commercial Pacific Company's service.

MR. EDWARD DESNOUEE, for ten years superintendent of the Commercial Pacific Cable Company at Manila, P. I., is in New York for a few days. He left Manila six months ago on a holiday. He went via Suez and spent his vacation in Europe. He will not return to Manila, but will take charge of the company's station at Honolulu. Mr. Desnouee is a native of the Island of St. Pierre, Miquelon. He was with the original French company, and has served with the Western Union and Commercial companies. His administration of the company's affairs at Manila was highly satisfactory.

LUNCHEON TO MESSRS. MOLL AND RUHMKORF.—Mr Oscar Moll, managing director of the German Atlantic Cable Company of Cologne, Germany, and Mr. William Ruhmkorf, the company's electrical engineer, were entertained at luncheon at the Hardware Club, in the Postal Telegraph Building, New York, by the officers of the Commercial Cable and Postal Telegraph-Cable companies on December 8. Those present were George G. Ward, F. B. Gerrard, S. C. Platt, A. Beck, S. F. Austin, C. E. Merritt, C. Priest and J. Goldhammer, representing the Commercial Cable Company, and E. Reynolds, C. C. Adams, C. P. Bruch and W. I. Capen, representing the Postal Telegraph-Cable Company.

CANADIAN NOTES.

NEW CANADIAN TELEGRAPH LINE.—The Canadian Government's new telegraph line connecting Vancouver with Newport, the terminus of the Pacific & Great Eastern Railway, is open for commercial business at ten words for 25 cents, night-letter rates also applying.

MR. P. G. GALBRAITH, formerly chief clerk to Mr. W. Marshall, superintendent of telegraph, Canadian Pacific Railway, Toronto, Ont., has been appointed inspector of the Ontario division of that road. He will take up part of the duties previously performed by the assistant superintendent of the Ontario division, which office was recently abolished.

MR. NORMAN W. BETHUNE, former manager of the Great North Western Telegraph Company's office at Ottawa, Can., now retired, and said to be the oldest telegrapher in that country, celebrated his eighty-fifth birthday on November 19. Several Ottawa and Canadian prominent business men, who were formerly telegraphers, learned telegraphy under Mr. Bethune. Mr. Bethune is a fine type of the old school and a very lovable character.

MONTREAL ELECTRICAL SOCIETY.—At the meeting of the Montreal Electrical Society, Montreal, Que., December 1, Mr. W. J. Camp, assistant manager Canadian Pacific Railway Company's telegraph, gave a description of the ordinary Morse circuit, the construction of the instruments and explained the operation of the duplex. Mr. Camp then touched on the diplex, which enables the transmission of two messages in the same direction on one line, in order to obtain a quadruplex. "If we could get six messages in one direction," he said, "we could double that back and get six in the other direction. As a matter of fact, the greatest number we have had was by the Rowland printing system, by which we got four messages in each direction, or eight in all at the one time." Automatic repeaters and other matters associated with the telegraph were also referred to. The meeting favored the idea of having a banquet some time in March, and a social meeting on some date previous to that. A committee of arrangements was appointed for the purpose.

THE TELEPHONE.

MR. CHARLES R. TRUEX, for many years general contract agent of the American Telephone and Telegraph Company, New York, will retire on January 1, 1914, and will make his residence most of the time with his son at Hendersonville, N. C. Mr. Truex was originally connected with the Home Sewing Machine Company and later with the American Bell Telephone Company as special agent. He was afterward general manager of the Electric Accumulator Company, but returned to the telephone service later. Mr. Treux was interested with Mr. H. W. Pope in promoting and organizing the Telephone Pioneers of America and served two years as a member of its executive committee.

THOMAS M. CARTER, aged forty-nine years, connected with the New York Telephone Company, and a Telephone Pioneer, died November 7.

HIRAM E. THOMPSON, aged sixty-four years, a former telegrapher, and latterly superintendent of cable maintenance for the Northwestern Telephone Exchange Company in Minneapolis, Minn., died in that city recently. He was a Telephone Pioneer.

FRANCIS M. EPPLEY, aged sixty-eight years, a well-known electric railway man, of Orange, N. J., died in that place October 17. He was associated with Mr. H. W. Pope, secretary of the Telephone Pioneers, in the building of the crosstown street railway in Orange, and in establishing at Carbondale, Pa., one of the first Westinghouse (alternating-current) electric-light plants.

TELEPHONE SUPPLIES FOR SIGNAL CORPS.—Major W. L. Clarke, disbursing officer of the U. S. Army Signal Corps, Washington, D. C., is advertising for bids on a large quantity of telephone supplies. Proposals will be received until January 5, 1914.

CHAPTER OFFICES.—The New Bedford Chapter, Telephone and Telegraph Society of New England, has elected officers as follows: President, William L. Fitzgerald; vice-president, Everett W. Cole, secretary, Caleb B. Tyler; treasurer, William A. Cushman.

ENJOINED FROM USING THE NAME METROPOLITAN TELEPHONE AND TELEGRAPH COMPANY.—Messrs. H. Lee Sellers and R. H. Sellers, who are promoting the Metropolitan Telephone and Telegraph Company, had been enjoined by the Court of Chancery, in New Jersey, from using that name, because it is the title of a former company which still has valuable bonds outstanding.

TELEPHONING NEWS DIRECT TO TYPE-SETTER.—A demonstration of the practicability of transmitting news dispatches by long-distance telephone directly to the operator of a type-setting machine was made at Columbia, S. C., November 18. A news item was transmitted by telephone from the office of the *News and Courier*, Charleston, S. C., by Mr. E. J. Wehrley, of the American Telephone and Telegraph Company, New York, to the office of the *State*, at Columbia, where it was received by a linotype operator, and set directly into type. The test was considered very successful, as showing the possibility of quick transmission and handling of important news matter.

Automatic Telephones in Buffalo.

The Federal Telephone and Telegraph Company, Buffalo, N. Y., is offering to investors of Buffalo and western New York $160,000 of the issue of $290,000 seven per cent preferred stock recently authorized by the Public Service Commission. The purpose of this plan is to interest small investors and to increase the company's circle of interest and support. The company is installing an automatic telephone system which will handle over 500,000 connections per day. When the automatic switchboard is completed the manual system now operated by the company will be discontinued. The change from the present manual system to the automatic will not be noticed by the subscribers. The cost of the automatic apparatus is said to be $550,000, and the total investment will be fully $1,000,000.

The Telephone During the Waco, Tex., Flood.

In an address before the managers of the Texas Independent Telephone System, Waco, Tex., Mr. P. Kerr Higgins, general manager of that system, described the work performed by the Waco company during the recent floods in that city and vicinity. The long-distance lines were used to considerable advantage in keeping the city officials of Waco posted in regard to the rise of the river to the north, so that it was possible to notify the people in advance and permit the salvage of much merchandise and the saving of many lives, which might have been jeopardized, if not lost. Practically all of the stores in East Waco had time to move their goods away from the threatened district, or have them removed to upper stories where the water did not reach.

At the Waco exchange there are twenty-five local positions, each equipped with fifteen pairs of cords. During the flood each position on the board during the peak of the load carried an average of 500 calls per hour. This rate of calling lasted for seven hours and required the services of ten extra operators, besides the regular staff. Both the toll and local chief operators were on continuous duty all night and the next day, as were also many of the line operators, and the service rendered was very satisfactory, and complaints very few. The traffic department, from the superintendent down, together with the operating department, rendered excellent service. The local plant did not suffer much damage, but toll lines were washed out in many places. The company was warmly congratulated by the telegraph companies for being able to give them simplex service over the toll lines, when the telegraph lines were down.

RADIO TELEGRAPHY.

Mr. E. J. Nally, vice-president and general manager Marconi Wireless Telegraph Company of America, New York, on December 9 attended a meeting in Montreal, Que., of the board of directors of the Marconi Wireless Telegraph Company of Canada.

Wireless Tower Damaged by Storm.—The 800-foot wireless tower at Neustadt-am-Ruebemberge, near Hanover, Germany, was badly damaged by a storm on December 4.

Steamer Captain Fined for Violating Radio Act.—The Collector of Customs, at Baltimore, Md., on December 6, fined Captain Ghakoenneman, of the North German Lloyd steamer "Frankfort" $100 for failing to maintain a radio wireless operator on duty at all hours, while the vessel was en route from Philadelphia to Baltimore. The decision is the first under the new Federal radio inspection act.

Multiplex Radiotelegraphy.

Ricardo Moretto has recently patented a system of multiplex radiotelegraphy depending on selective resonance. A number of transmitters are arranged at the sending station, so that variations of definite frequencies can be set up in the high-frequency current supplied to an oscillating circuit coupled directly or inductively to a single aerial. At the receiving station, there are connected in the circuit of a single wave detector, telephone receivers, each of which responds only to a tone of predetermined pitch. Transmission proceeds exactly as in wireless telephony, in that there are radiated from the antenna high-frequency oscillations which are changed in pitch by a microphone or other means. In one arrangement Moretti uses a number (say, three) of sound pipes, each emitting a characteristic note when supplied with compressed air (under the control of switch keys). To permit of separation of the individual tones at the receiving station, a "monophone" is substituted for the ordinary telephone receiver. A monophone is, as its name indicates, a telephone receiver, the diaphragm of which is set in vibration only by a certain definite frequency of stimuli. Each monophone at the receiving station reproduces only the signals sent out at corresponding frequency from the transmitting station, and thus as many messages can be sent simultaneously from, and received simultaneously by, a single aerial, as there are sound pipes and monophones.

In an alternative arrangement, Moretti replaces the sound pipe by electromagnetically operated tuning-forks, which, under the control of the several sending keys, set up intermittent currents of definite frequencies in the windings of a single iron core which actuates the diaphragm of a microphone in the antenna circuit. This arrangement is essentially that of a telephone relay, except that a number of relay windings are employed instead of a single winding. At the receiving station, the antenna is coupled inductively to a resonant circuit containing a thermo-electric detector, across which are shunted the three monophones. The latter analyze the complex oscillations received, as in the previous case. Either of the systems described above is applicable to the simultaneous reception in one station of signals emitted by a number of station.—*London Electrical Review.*

Mr. E. J. Nally's Successful Career.

In our issue dated October 16, we presented our readers with a fine art engraving of Mr. E. J. Nally, vice-president and general manager of the Marconi Wireless Telegraph Company, of America, together with a biographical sketch of that gentleman. The excellence of the engraving has been widely commented on, and Mr. Nally has been the recipient of congratulations and complimentary notices of his many friends in the telegraph service and from the electrical press in general.

In announcing Mr. Nally's appointment, *The Electrical Review and Western Electrician*, says:

"In the development of any great enterprise, vision and imagination are generally the elemental factors that shape into consciousness the original conception of what is to follow. Courage and aggressive attention to mechanical details and executive requirements go hand in hand with vision and imagination in making staple the development of the enterprise. The individuals possessing all these attributes are hard to find, and the organization is indeed fortunate, if, among a large number, the characteristics are available in some degree or other. When, however, one individual possesses not only vision and imagination, but the ability to undertake the working out of the practical details of the enterprise and the experience and talent to manage the executive departments as well, the organization is not only fortunate—it is lifted into an extraordinary position.

"So, with the election of Mr. Edward J. Nally, on October 1, as vice-president and general manager, director and member of the executive board, the Marconi Wireless Telegraph Company of America is to be congratulated.

"Mr. Nally's whole life has been one of persistent endeavor in the maintenance of high ideals of service—service to the employer to whom he has been directly responsible in the first instance, and service in the second instance to the great public which the corporation, with which he has been connected, have served. Mr. Nally has been connected with the telegraph service for thirty-eight years, and is really a pioneer in the telephone industry, having had charge of the first Edison telephone in St. Louis before he had attained his majority. In the telegraph service he has risen from every grade from messenger-boy to the vice-presidency and general managership of one of the great telegraph corporations."

Measurement of the Resistance of Grounds.

The Western Union Telegraph Company has issued specifications for the measurement of the resistance of grounds. They describe methods for measuring the resistance of ground connections such as are used for battery grounds, for grounding protector apparatus at offices and cable boxes, for grounds in compensating transformer systems and for grounds at crossings with high potential lines.

When the resistance of grounds should be measured. In order to determine whether a newly installed ground has a resistance low enough to meet the requirements for this particular installation, its resistance should be measured immediately after the ground is completed. When it is obvious from the condition of the soil that the resistance of a ground will not exceed the maximum requirement, immediate measurement of the ground is not necessary.

After the ground has been in existence two or three months and has a resistance within the desired limit, its resistance should be measured periodically to make sure that it does not increase beyond the maximum allowable value. Morse battery, lightning arrester and compensating transformer grounds should be measured at least once a year.

Due to variations in the amount of moisture contained in the earth, there will often be considerable difference in the results obtained from measurements made at different times. For instance, a ground may be established after prolonged dry weather or just following a rain storm; it may collect moisture; or measurements made some time after its installation may be preceded by dry weather or by wet weather. Consequently, the resistance of grounds should be measured after there has been no rain for several days, and when the results will accord with the average conditions as far as possible.

Allowable resistances. In general, the resistance of various classes of grounds should not exceed the following values:

Central office battery grounds.........	0.1 ohm
Small office and test station grounds...	5. ohms
Compensating transformer grounds ...	5. "
Lightning arrester grounds	15. "
High-potential protection (screen or guard-rope type) grounds	25. "
High-potential protection grounds.....	100. "

The foregoing are maximum values and, of course, resistances lower than these are desirable. On account of soil conditions in some localities, however, it will be impracticable to obtain grounds whose resistances are within these values. In such cases, the ground resistance shall be made a low as practicable with standard methods, and then the matter should be reported to the proper authorities for instructions.

Inspection of ground wire. The value of any ground may be seriously impaired by poor connections in the ground-wire circuit. Therefore, before measuring the resistance of a ground, it is important that a careful inspection be made to insure that all joints in it are secure and well made, and that there are no loose connections between the ground and the ground terminals.

(To be Continued.)

OBITUARY.

James E. Barnum, aged sixty-four years, a well-known old Associated Press operator in New York, died in Jersey City, N. J., recently. He was, for many years, connected with the *New York Herald* and the *Evening Telegram*.

Dr. Henri Simon, chief of the radio-telegraphic service in Geneva, Switzerland, and one of the earliest to use X-rays in surgery, died in Berne, Switzerland, on December 10. He was a victim of X-ray burns, and had lost one arm and part of the other through this cause.

John M. Crowley, age seventy-seven years, superintendent of telegraph at Richmond, Va., during the Civil War, and for many years afterward manager of the Western Union Telegraph Company at Augusta, Ga., but who for some years has lived in retirement, died at the latter place on October 2.

George F. Truell, aged sixty-five years, well known in the early days of telephony, died in New York, November 19. Deceased was actively engaged, under the late Charles H. Sewall, in the promotion and organization of the Albany and Troy exchanges. He was also associated in the district telegraph service in New York for many years.

John A. McGlinchy, aged fifty-four years, a well-known telegraph operator in New England, died at Boston, Mass., on November 27. For several years he was Boston representative of this publication. Mr. McGlinchy lived in Charlestown the greater part of his life. He was solicitor for the Postal Telegraph-Cable Company at the time of his death.

W. L. Dorsey, aged 75 years, died at the home of Mr. B. F. Lally, chief operator of the Western Union Telegraph Company at Fort Worth, Tex., on November 9. Mr. Dorsey was well known to the older members of the telegraph profession. He was once private secretary to General Hoxey, president of the Missouri-Pacific System at St. Louis. He also held many other official positions with various railroad companies. Mr. Dorsey learned telegraphy in the late forties in Baltimore on the first telegraph line ever erected.

Government Ownership of the Telegraph from a Telegrapher's Standpoint.

BY W. B. PATTERSON, LOS ANGELES, CAL.

I have been very much interested in the articles appearing in several magazines concerning government ownership of the telegraph and telephone systems of this country.

I note that one of the senators representing an Eastern state, who was largely instrumental in putting the parcel-post law through, is at present gathering statistics before introducing a bill recommending that all the telegraph and telephone systems be taken over by the United States Government. If this bill is successful, I believe it will result not only in killing the ambition of the progressive telegrapher, but will result in a stagnation of the service, since the average Government employe has nothing to encourage him to put forth his best efforts to better his condition and acquire additional knowledge. Under the system at present in vogue by the telegraph and telephone companies there is no limit to which a man may rise if he will only apply himself. This, I am glad to say, many of the men are now doing. Only a few years ago one of the large commercial telegraph companies came out of a trance, and the changes that have occurred in that period are wonderful. The attitude of the men has not only changed from one of indifference to real interest in their work, but the average operator is showing as much interest in keeping the cost per message down as are the higher officials, and endeavoring to get the business off within the time limit and turn out a perfect copy.

Telegraph books are now more numerous and TELEGRAPH AND TELEPHONE AGE is doing marvels in helping us gather knowledge by publishing articles on technical telegraphy and the talks by Mr. Willis H. Jones.

In my opinion, under Government ownership all this would be changed. The higher positions would be filled by incompetent politicians; changes would be made with every change of administration; there would be nothing to encourage competition, which is at persent very keen. There would, no doubt, be a deficit annually such as is being experienced in Europe on telegraph administrations. Our only salvation is to put forth our utmost efforts and give the people of America the best telegraph service that we can, fighting Government ownership with that best of all weapons—efficient and prompt service.

Mr. Carnegie's Birthday.

Mr. Andrew Carnegie celebrated his seventy-eighth birthday on November 25, and he was particularly remembered and congratulated by his old-time telegraph associates. Mr. David Homer Bates, secretary of the Society of the United States Military Telegraph Corps, New York, sent the following letter to Mr. Carnegie:

"My dear Mr. Carnegie:

"On behalf of your surviving comrades of the United States Military Telegraph Corps, and particularly for myself, I offer you sincere congratulations upon this, another anniversary of your birth.

"May you have many more, is my hope and prayer.

"Meantime, the recipients of your military telegraph fund, and their dependents, located at various points throughout the country, from Vermont to California, are reminded of your special kindness to them once every month by the receipt of the equivalent of a private soldier's pension denied them by the government they helped to save."

"Very truly yours,
"(Signed) D. H. BATES,
Secretary."

Impregnation of Wood to Resist Insect Attack.

Dr. A. D. Hopkins, who is in charge of the forest insect branch of the Bureau of Entomology of the Department of Agriculture, Washington, D. C., has been conducting a series of experiments with woods treated by various methods to determine how they may be protected from injury by white ants. A report has been submitted on the treated and untreated woods, which have been subject to attack by white ants from five to twelve months. Yellow pine stakes, which were charred by burning for about five minutes, were attacked by the white ants at the end of twelve months, and it was shown that this method of treating the wood only delays the attack. Other yellow pine stakes were impregnated by the "open-tank" method, with coal tar and wood creosote; other stakes were treated by dipping and brushing with wood and coal-tar creosotes, and stakes were treated by cylinder-pressure processes, with several different creosote compounds, and were not attacked at the end of a year. Untreated alternating stakes were attacked by the white ants. According to the bulletin, an examination of test blocks showed that after being buried in the ground with infested logs for nearly six months, some of the blocks impregnated with paraffine wax were attacked by white ants, while wood treated with chlorinated naphthalene were not attacked.

TELEGRAPHIC COMMUNICATION WITH SPIRITS.—Mr. Robert McGrane, a New York lawyer, who was formerly a telegraph operator at Bradford, Pa., tells a story of a communication by telegraph one night with the spirit of a departed friend, who had also been an operator during his earthly career. A short telegraphic conversation took place between the two. The spirit of the deceased friend stated that it was not enjoying existence in the other world. It did not state, however, what other world was referred to.

WIRE TAPPING NOT A CRIME IN WASHINGTON.—The supreme court of the State of Washington has decided that there is no State law against wire tapping, and dismissed the charges against A. A. Nordskog, of Seattle, charged with tapping a wire of the Pacific Telephone and Telegraph Company.

Telegraph and Telephone Age

Entered as second-class matter, December 27, 1909, at the Post-Office at New York, N. Y., under the act of March 3, 1879.

Published on the 1st and 16th of every month.

TERMS OF SUBSCRIPTION.

One Copy, One Year, in the United States, Mexico, Cuba, Porto Rico and the Philippine Islands	$2.00
Canada	2.50
Other Foreign Countries	3.00

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J. B. TALTAVALL, - - - - *Publisher*

253 BROADWAY, NEW YORK.

T. R. TALTAVALL, Editor.

CABLE ADDRESS: "Telegage," New York.

Telephone: 6657 Barclay

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REMITTANCES to Telegraph and Telephone Age should be made invariably by draft on New York, postal or express money-order, and never by cash loosely enclosed in an envelope. By the latter method money is liable to be lost, and if so remitted is at the risk of the sender.

NEW YORK, DECEMBER 16, 1913.

Electrical Clubs.

A significant sign of the times in the telegraph and telephone fields is the rapid increase in the number of electrical societies throughout the country, organized for the two-fold purpose of encouraging technical study and bringing the body of co-workers into closer social relations. In many of the larger cities such organizations have recently been formed, and, from all reports, they seem to receive enthusiastic and appreciative support.

There is a strong desire in the telegraphic ranks of to-day for more technical knowledge, and this desire is readily met by the organization of such societies in large centers, where lectures can be given by authorities on the various subjects included in the word "telegraphy," and study encouraged. The social feature of these bodies is one too important to be regarded lightly. It brings the members and their families into closer social relations, and, in this way, tends to promote a more harmonious sentiment among them.

The telegraph and telephone companies are liberal in their encouragement and support of these employe's clubs, and it is to their advantage to do so. What they need, above all things, is a higher order of technical knowledge and a more deep-seated *esprit de corps* among their employes. These clubs and societies will bring about these desirable conditions if they are conducted wisely. They offer a common ground upon which officials and employes may meet on an equality, and thus become better acquainted with each other. Everything that tends to promote a better understanding between the companies and employes should certainly be encouraged.

News by Telephone Direct to the Type-Setter.

An interesting application of the telephone to newspaper work is recorded on another page in this issue. A news item was telephoned from Charleston to Columbia, S. C., and received at the latter place by the linotype operator, who set the matter directly into type. The test, it is said, was very satisfactory. Indeed, there is no reason why it should not have been.

This experiment opens up a new line of application for the telephone and suggests the practicability of sending news by this means direct to the type-setter in cases of emergency, and on such occasions where a piece of news is offered just before going to press, etc. This method of handling news implies, of course, that the editing must be done at the transmitting station, and all the type-setter has to do is to set the matter just as it comes to him. Much time could undoubtedly be saved by transmitting "rush" news in this way, as it eliminates two handlings.

In the up-to-date newspaper office of the future it may become common to see the type-setters equipped with head telephones and breast transmitters, setting from invisible copy. The application of the idea is fraught with possibilities, and it will be interesting to note how readily progressive newspapers will avail of the opportunities thus offered.

Prolonging the Life of Poles.

The life of poles is a matter of the utmost importance to telegraph, telephone and other wire-operating companies, and, owing to the growing scarcity of suitable timber for this purpose, much attention has been given, in late years, to methods of artificial preservation.

A peculiar fact in connection with the life of standing poles is the tendency to deteriorate most rapidly at the point where the pole enters the ground. This is due to the collection of moisture around the pole at that point most of the time. It is a well-known fact that continued immersion in water or ice, or, on the other hand, freedom from moisture, is favorable to the preservation of the timber from decay, and where such circumstances prevail, as in the case of bridge piles sunk in river-beds, or of the roofs of well-ventilated buildings, centuries may elapse without any noticeable change taking place.

On poles planted in the ground, the zone of vulnerability is practically restricted to that portion between the ground-line and two feet below it. This fact having been observed, tests are being made by placing concrete collars around the poles to a distance of about one foot below the surface of the ground and about the same distance above. It is thought that this expedient will lengthen the life of the pole, and, at the same time, add to its strength, and thus enable it to withstand to a greater degree the winter gales and other stresses placed upon poles lines.

The Pennsylvania Railroad is said to be testing this method, and the results will be watched with much interest, since poles constitute a large item of expense to the operating companies.

QUESTIONS TO BE ANSWERED.

[One of the most effective means of imparting information is to ask and answer questions, the value and power of this method being due to the fact that the information given in an answer is specific and direct. Asking questions for the student to answer for himself has proved to be an excellent means of education, as it promotes and encourages concentration of thought and investigation in order to arrive at the correct answer. "The Electric Telegraph," by F. L. Pope, is one of the most excellent books on the telegraph ever published and is a standard work of reference. It covers the entire field of telegraphy and is scientific in its treatment. For this reason, and the fact that it is thoroughly exact and reliable, we have chosen this work as our present text-book for the "Questions to be Answered" column. We cannot urge the student too strongly to follow the lessons from this book closely and with diligence. In order to do this and understand the subjects of the questions it will be necessary, of course, for him to have a copy of the book at hand in order to arrive at the correct answers to the questions. The numbers in parentheses refer to paragraph numbers in the text-book and are given for easy reference.]

What is a galvanometer shunt, and how is it connected to the galvanometer?

What is meant by the "multiplying power" of a shunt?

What kind of wire is used in making galvanometer shunts?

What is the deflection method of making measurements?

How is the resistance of insulators measured?

If the joint resistance of ten insulators is 500,000 ohms and their mean individual resistance 5,000,000 ohms, what is the resistance of one insulator?

How is the internal resistance of a battery measured?

If the resistance of a given circuit is doubled, what is the effect on the current?

In Fig. 181, page 208, how may the resistance of the galvanometer be measured, if the positions of the battery and galvanometer are reversed?

(366). What is the use of a differential galvanometer?

How are the coils of a differential galvanometer wound, and what is the purpose of using two wires equal in length and resistance for the winding?

Is there any effect upon the galvanometer needle when two equal currents flow through the separate wires in opposite directions?

What will be the effect on the needle if one current be stronger than the other?

In such a case, what would the electromagnetic force be equal to?

Is the differential galvanometer much used at the present time?

What is the name of the instrument that has superseded it?

(368) What are the advantages over galvanometers of voltmeters and ammeters in testing telegraph lines?

What is the constructional difference between a voltmeter and an ammeter?

How is a portable direct reading millimeter constructed?

Is a special current necessary for making tests with voltmeters and ammeters?

(370) How should conductivity and insulation tests be recorded?

(371) By whom was the Morse code of signals devised, and when?

Enumerate the elements employed in the construction of the Morse alphabet.

In the formation of characters, what element is used as the unit of time?

Machine Telegraphy.

BY A TELEGRAPH ENGINEER.

The reference in the December 1 issue of your publication, covering the remarks made by Mr. L. De Goll, of Baltimore, Md., on the subject of machine telegraphy, is interesting to those who have given multiplex and machine telegraphy consideration. Mr. Patrick B. Delany, the well-known telegraph engineer and inventor, himself a strong advocate of automatic telegraphy, has several times gone on record as declaring that the most efficient system of automatic or machine telegraphy to-day is a polar duplex and four first-class typewriting operators.

Mr. De Goll should not overlook the fact that simplicity is the first requirement demanded by telegraph companies in an automatic system. Such a system must be simple in construction, simple in operation and simple in maintenance. Many of the automatic systems are extremely complicated, as compared with the simple Morse, and require the constant supervision of experts.

The reason why the Morse key and sounder have been held in favor for so many years by business men, telegraph administrations and operators is the simplicity of the system. Many foreign telegraph administrations could not be pursuaded to abandon the tape-printing telegraph system for page printing systems. The reason is obvious. It requires complicated machinery to operate page printing apparatus, and telegraph managers have, therefore, avoided adopting any system that requires expert mechanics and electricians in its management.

Most of the automatic systems are monuments to ingenuity and skill, and the inventors are, naturally, enthusiastic over their inventions, but their enthusiasm tends to blind them to the most important requirement of all, namely, simplicity. They accomplish results, it cannot be denied, but in a manner that does not strongly appeal to the business end of telegraph administrations.

Report of Old Timers' Reunion.

The report of the proceedings of the thirty-second reunion of the Old Time Telegraphers and Historical Association, held at Detroit, Mich., August 26, 27 and 28, is now being distributed. It is a handsomely printed and artistically designed book and will form a much-appreciated souvenir of the meeting. The report is very complete and forms interesting reading. The booklet contains 100 pages, and the design of the front cover is symbolic of the character of the association. Secretary Frank J. Scherrer is to be congratulated on the excellence of his work in preparing this interesting addition to the association's records.

Course of Instruction in the Elements of Technical Telegraphy—LIII.

(Copyrighted.)

(Continued from page 708, December 1.)

[The Course of Instruction in the Elements of Technical Telegraphy, which has been running regularly in this journal since October 16, 1911, has met with wide-spread favor and is being studied diligently by thousands of telegraphers and others throughout the world. It is being translated into Spanish, and printed in South American electrical journals, and has attracted universal attention for its clearness of expression and its practicability. It has been endorsed by the officials of telegraph, telephone, cable and railroad companies, many of whom have acknowledged the improvement in the technical standing of their progressive employes, and they commend the course as being of the most practical kind of instruction.

This course was originally prepared by Mr. J. H. Penman, an eminent and well-known telegraph engineer, and is being published now for the benefit of those of our readers who desire to fit themselves for higher positions in the engineering branch of telegraphy, and it has been a valuable aid in this direction. It is elementary, and devoid of higher mathematics, yet it is fundamental in character and extremely easy to learn.

Each chapter is complete in itself, and the chapters are arranged in natural order so that the student acquires the knowledge step by step, in logical sequence. Each chapter is followed by test questions on the subject of the chapter, thus enabling the student to review his progress from time to time.

Back numbers containing these valuable lessons can be obtained at 10 cents per copy.]

The Quadruplex.

A method of sending messages simultaneously in opposite directions having been perfected by the duplex arrangement, it only remained to contrive a plan of sending two in the same direction at the same time, and to combine both into a single system, to make it practically possible to send four messages simultaneously on a single wire.

This is effected by using two relays, connected as in the duplex system, one of which works by a change in the direction of the current, irrespective of alterations in its strength, and the other is worked by an increase in strength irrespective of direction; the two relays are independent of each other, they actuate different sounders, and are separately under the control of their own receiving operators.

Fig. 73 illustrates the theoretical arrangement of the apparatus.

The neutral relay, a modification of the neutral relay of the Stearns duplex, is actuated by currents in either direction, so long as they are up to the required standard of strength, while the polar relay, being the more sensitive instrument, responds to the reversals of a current which is not sufficiently strong to operate the neutral relay. With the same polarity, an increased current, which will energize the neutral relay, will have no visible effect on the polar relay, for, as long as the current continues in the same direction, the latter remains under the influence of the current polarity, and its armature is simply attracted more strongly than before.

Both relays are wound differentially, so as to fulfill the principal requirements of a quadruplex circuit, viz.: that the receiving apparatus at each end shall only be worked by the signals sent from the other end, to accomplish which, such a balance must be secured at each station as will render the receiving instruments insensible to the outgoing signals.

When this condition of neutrality has been duly established, each relay will be in a position to be separately and independently controlled by its own particular class of current, for the transmission of which two distinct sets of transmitters are employed at each station, one, a pole-changer, for changing the direction of the current, and the other, a transmitter, for increasing the strength of the current.

When the transmitter is open, three-quarters of the battery, or the "long end," as it is termed, is cut out of the circuit, owing to the transmitter spring being removed from its upper contact, and the "short end" of the battery is to line. With the

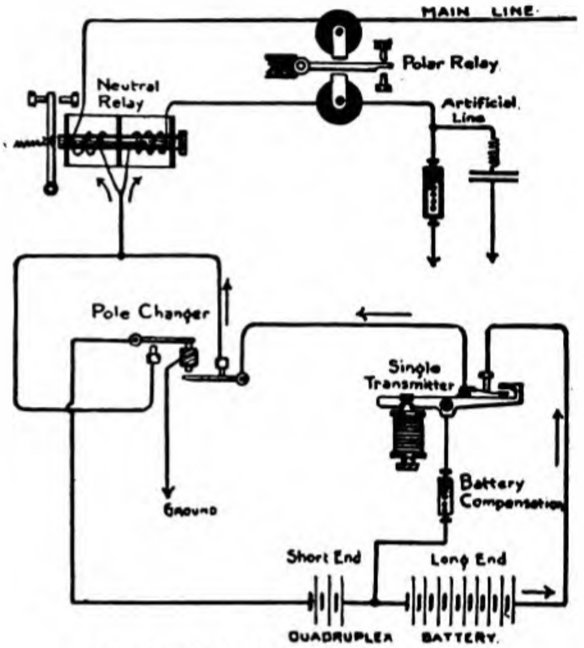


FIG. 73—DIAGRAM OF THE QUADRUPLEX.

home and distant transmitters open, the circuit is worked by the small battery at each station, and, since the comparatively small currents from these batteries are too weak to overcome the opposing springs of the neutral relay armatures, the circuit becomes simply a duplex, the polar relays being operated by the distant pole-changers in the manner previously described. If, now, the home transmitter be closed, as shown in the figure, the "tap," as the lead from the junction of the short and long ends of the battery to the transmitter is called, is disconnected, and the full battery put to line through the pole-changer. The home relays are unaffected by this change, since the increased current still divides equally between the main and artificial lines, but the distant neutral relay is now energized by the full battery from the home station, and its armature is attracted. This increase of current has no visible effect on the distant polar relay, which still responds to the working of the home pole-changer, but is attracted to either side more strongly than it was under the pre-existent duplex conditions.

(To be Continued.)

Telephone Transmission.*

BY BANCROFT GHERARDI, ENGINEER OF PLANT, AMERICAN TELEPHONE AND TELEGRAPH COMPANY, NEW YORK.

Transmission is ordinarily stated as being equivalent to the transmission obtained over a given number of miles of No. 19 B. & S. gauge cable having defined constants and with given terminal conditions. In other words, we use No. 19 gauge cable as our measuring rod. The type of No. 19 gauge cable used is not the No. 19 gauge cable which we are now employing so extensively, but is the No. 19 gauge cable which was used a number of years ago when the standards were established, and which is of somewhat lower capacity than the cables now employed. The transmission efficiency of our present No. 19 gauge cables is about 90 per cent of the standard No. 19 gauge cable used for measuring purposes, that is, nine miles of the present cable are equivalent to ten miles of the standard.

The reason for making the change to the present higher capacity cable was that it was found, as a result of careful cost studies, that it would be economical to use the higher capacity cable, which permitted of placing a large number of pairs in a standard-sized sheath and in a standard duct, and, where necessary, compensating elsewhere in the plant for the loss of transmission resulting from the higher capacity. In other words, at this particular point we were paying too much for the transmission resulting from the low capacity. We could get it cheaper elsewhere in the plant.

When we speak of service which from a transmission standpoint has an efficiency of equal to eighteen miles, what we mean is that the talk is equal to that obtained over a circuit consisting of eighteen miles of the standard low capacity No. 19 gauge cable already referred to when there is connected at each end of it a standard common battery sub-station set supplied with current from 24-volt storage batteries through No. 25A repeating coils over zero subscribers' loops. The standard of transmission usually adopted for local service is eighteen miles. One of the combinations which would give this standard which might occur in service would be, two subscribers, each having subscribers' loops of No. 22 gauge wire three-fourths of a mile long, connected together at the two ends by the standard "A" and "B" cord circuits and a trunk line between the two offices of seven miles of No. 22 gauge cable or ten miles of No. 19 gauge cable or twenty-two miles of medium loaded No. 19 gauge cable. When the subscribers' loops are longer than the figures assumed, the trunk line must be shorter in order to give the same transmission. For example, if the subscribers' loops are each equivalent to two miles of No. 22 gauge cable, the limiting lengths for the trunk lines to give eighteen-mile transmission are about three miles for No. 22 gauge cable, four miles for No. 19 gauge cable unloaded, and eight miles for No. 19 gauge cable medium loaded.

The standards of transmission very generally used are:

For local service ....18 miles
For suburban toll service ......25 miles
For long-haul toll service ......30 miles

It is not practicable to plan the lines and equipment so that the transmission between each station in the exchange and every other station is equal to any one of the standards given above. Many stations located close to each other obtain much better transmission than the standard, and it is usual to plan so that a few of the stations most widely separated obtain transmission somewhat below the standard.

DIFFERENT SETS OF STANDARDS.

It is interesting to note that there are several different sets of standards for different classes of service. This arises from two factors, both tending in the same direction.

The first of these is that subscribers instinctively recognize the fact that it should be easier for them to get a good telephone talk over a short distance than over a long distance, and hence that they do not expect as much and are not as critical about long-haul talks as they are about short ones. Transmission which would be considered unsatisfactory by subscribers and would serve as a deterrent to the use of the telephone if given on a talk between two points ten or fifteen miles apart, which service would in general be frequently used by the subscribers, might be considered altogether satisfactory if given between points, say, 1,000 miles apart.

The second point, which also makes for a lower standard of transmission on the long-haul talks, is that in general it usually costs relatively more to improve the standard of transmission on long-haul talks than it does to make a corresponding improvement on short-haul talks. In a short-haul talk it may only mean changing a few miles of No. 22 gauge underground conductor to No. 19 gauge conductor to make the desired improvement. On a long-haul talk it might mean using No. 8 gauge wire instead of No. 12 gauge wire. These two points may be summarized by saying that in the case of long-haul talks subscribers do not expect as good transmission; and, further, that we cannot afford to give nor would they be willing to pay for as good transmission as can be given in the case of the short-haul talks.

I do not know of any trustworthy data which is available at the present time which would enable us to predict with any degree of accuracy the increase in traffic which might be expected as a result of improved transmission between two points. I have looked up, however, the effect upon the traffic of the loading of the toll lines between New York and Chicago. This work made a substantial improvement in the transmission between these two points and was completed during April, 1911. Traffic statistics seem to indicate that since that time there has been a growth in the traffic in question of about 20 per cent, which was due to the improved transmission.

Large sums of money are being spent annually for the construction of plant. A considerable por-

* Extracts from address before the New York Telephone Society.

tion of this is spent to obtain good transmission, for if we were willing to be satisfied with a plant which did not talk so well we could plan so that the plant could be built more cheaply. We must not forget, therefore, that substantial expenditures have been made to get transmission and that all of the departments concerned in the design, construction, maintenance and use of the plant must contribute their part to the getting of the most economical results. This, therefore, at once involves not only the engineering department and headquarters, but also the commercial department, the engineering department, the plant department and the traffic department of the associate companies.

The engineering department of an associate company is vitally concerned in the matter of transmission in many ways. The engineering department in the design of the plan and the fixing of the standard types of construction, apparatus and circuits which shall be used for various purposes, must do all of this work, having due regard to transmission. Not only must they do this work themselves, but they must be prepared to teach all of the other departments concerned what the effects are on transmission of the various things which these other departments may do. The other departments cannot be expected to know about many of these things unless they are correctly advised by the engineers.

In connection with the construction work which the plant department is carrying on, and in the assignment of the plant for use when constructed, the plant department has many opportunities to affect the transmission, favorably or otherwise.

Plant engineers who are part of the plant department have responsibilities in planning the plant similar to those of the engineering department, and, in addition, in connection with their right-of-way work, they must see to it that rights are obtained which will permit of the construction of suitable plant from a transmission standpoint.

SOME PECULIAR FACTORS.

The telephone plant is perhaps the most difficult plant of any kind to design, construct and maintain so that the best results will be obtained therefrom. This arises not only from the multiplicity of its parts, but also from the fact that the relations of these parts to each other are changed from moment to moment. This latter factor, I believe, is peculiar to the telephone plant. At least I know of no other plant in which this constant change of the relations of its parts is present to any such degree as it is with our plant. For example, at one instant a given private branch exchange extension station in Boston may be talking to another private branch extension station in New York. At that time these stations will be connected together by eleven different elements. As soon as the conversation is completed, all of these elements are disassociated, and one minute afterward each of these elements may appear as parts of eleven other connections. When it is remembered that each of these elements is in itself made up of a large number of parts, the complexity of the arrangement is suggested. A substantial defect in any one of these eleven elements may very seriously or totally impair the transmission efficiency of the connection. Minor defects in one or more of these elements may deprive us of transmission efficiency for which we have paid real money. A defect in a single cord circuit that would be classed as negligible by some maintenance men will often make a difference in the transmission efficiency of a connection which will perhaps more than wipe out all the gain from loading toll lines several hundred miles long or all the gains that have been gotten in using No. 13 or No. 16 gauge cable for toll switching trunks instead of No. 19 or No. 22.

One of the difficulties which is met with at the present time in undertaking to maintain proper standards of transmission is that it is sometimes not appreciated that minor differences in transmission in individual pieces of apparatus or in individual parts of the system are serious matters. I have heard people say, in speaking about some piece of apparatus or circuit and comparing it with some other arrangement, "Oh, the transmission difference is only half a mile of cable and no one can notice this difference, so why bother with it?" It is quite true that no one except a few trained experts can notice a transmission difference as small as half a mile, but I would like to have you observe the fallacy which is involved in ignoring this difference because it cannot be detected by merely listening for it. To illustrate: Most of the toll lines between New York and Boston are of No. 12 loaded wire, weighing 173 pounds per mile, or a total of 346 pounds for the two sides of the circuit. The average transmission equivalent of these lines, including terminal cables, but excluding terminal reflection losses, is about eleven miles of standard cable. By reducing the weight of the copper in the open-wire portion so that only 157.5 pounds per miles is employed, and loading as before, the transmission efficiency of the lines would be reduced by exactly one-half mile. The saving in copper alone at the present price of 14 cents would be $865 for a line between New York and Boston. We have, therefore, in the lines between New York and Boston spent $865 for copper to obtain one-half mile of transmission. Is it a sensible proposition, then, to lose this transmission which has cost us a substantial sum of money, to save fifty cents in the cost of some relay or some condenser somewhere else in the circuit just because the difference in transmission is not sufficient so as to be noticeable in listening to it?

Much money is spent, and well spent, in the Bell system each year in making service tests to see that we are giving good service, to determine when the service is falling off in character, the nature of the defects and hence the remedies to be applied. Much money is being spent to see that we get the revenue which we should, that is, that the subscribers are billed for and pay for the service which they get. We must take corresponding precautions to determine that from day to day and week to week the subscribers are getting transmission which is satisfactory to them and as good as the character of plant which has been provided is capable of giving.

Specifications for Installation and Operation of Western Union Loop Switchboards.

The Western Union Telegraph Company has just issued complete specifications for the installation and operation of loop switchboards.

In our issues dated May 1, May 16, June 1 and June 16, of this year, we published the specifications for the Western Union Company's main switchboard, and in that article were used several illustrations which are reused in the present specifications, but which are not reprinted here on account of space limitations. Where these illustrations are called for in the present article the numbers of the pages on which they were used in the former article will be given so that the reader may readily refer to them.

Detailed instructions are given for the installation and wiring of loop switchboards. Under the head "Operation," patching cords are described and illustrated and this portion of the present specifications is exactly the same as the description and illustration used on page 287 of our issue dated May 1.

The new matter giving descriptions of the general operation and handling of loop switchboard circuits, is as follows:

"F"—Spare Battery Taps. These taps are used in testing single Morse circuits and loops. In such testing, one of the single-conductor plugs of the Morse testing set (Circuit L) is placed in the jack of a spare battery tap, and the other single-conductor plug connected to the loop or circuit to be tested (See Fig. 11, page 382, June 16 issue.) Very few of these circuits will be required on most loop switchboards.

"G"—Closed Group. This circuit provides a means of connecting a number of loops in series with any circuit when the jacks available in the latter are smaller in number than the loops required. For example, it is often necessary to make up a series combination of several newspaper loops and trunk them to the main switchboard; this would be done by running a regular patching cord from each loop jack to one of the jacks of a closed group, and then running another regular patching cord from an unoccupied jack of the group to the trunk jack connected to the main switchboard. (Circuits H, HB, or J.) (See Fig. 9, page 380, June 16.) When more than three loops are to be combined in this way, two or more closed groups are used and connected together by regular patching cords.

"H"—2-Wire Trunk Between Switchboard Sections. This trunk corresponds to the "Fly-Cord" of the old style loop switchboard, and furnishes means for connecting to the main switchboard, as required, those loops, repeaters and desk sets which terminate at the loop switchboard. When a single loop or set is to be connected to one of these trunks, a regular patching cord is used; for two loops a Y-cord may be used, or, for either two or more loops, a closed group (Circuit G) (see Fig. 9, page 380, June 16), may be used as described in the preceding paragraph. In a loop switchboard of one or two sections, this circuit would be used for extending loops or sets from one part of the board to another, in place of the "Flips" used in old style switchboards.

"HA"—1-Wire Trunk Between Switchboard Sections. Very few loop switchboards will require this trunk, but for special cases it may be found of value. Regular patching cords will be used in making connections with it, the two conductors of such a cord being treated as one in this case. (See Fig. 9, page 380, June 16.)

"HB"—2-Wire Trunk Between Main and Loop Switchboards, with two or more jacks in series at latter. This circuit is for use at offices having large loop switchboards and is a modification of Circuit H. It will be seen that two or more jacks per trunk, separated so as to ensure convenient connection with

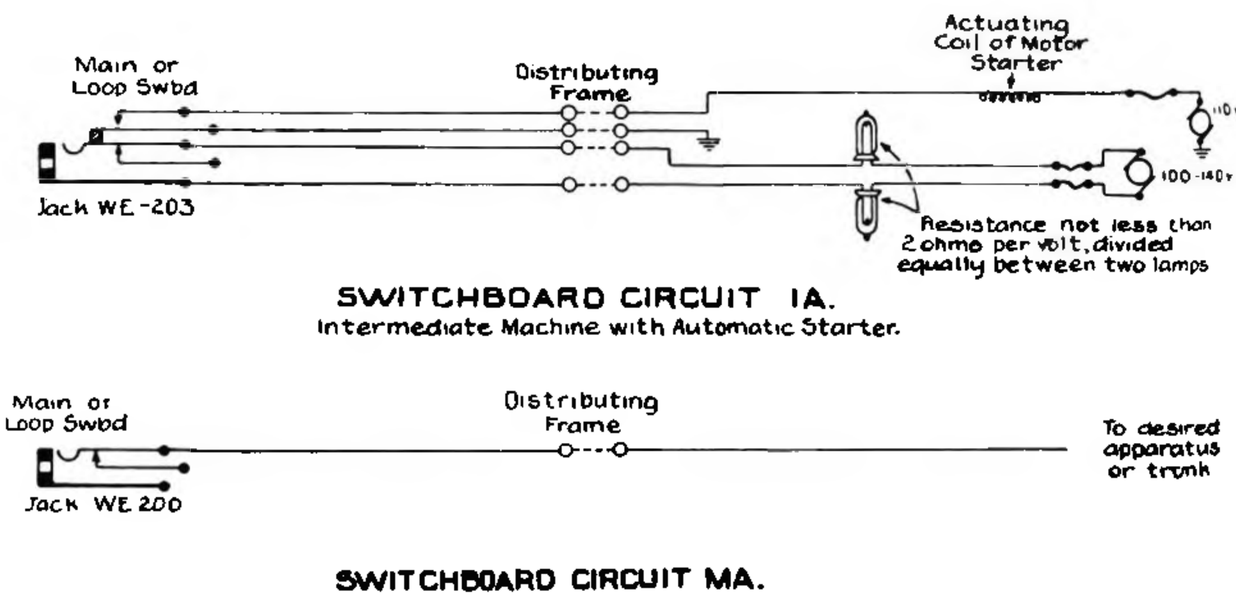
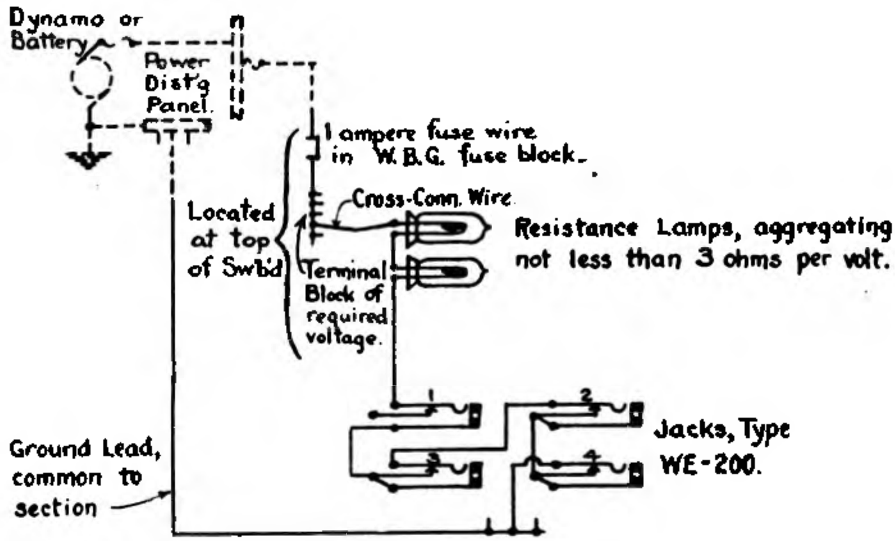
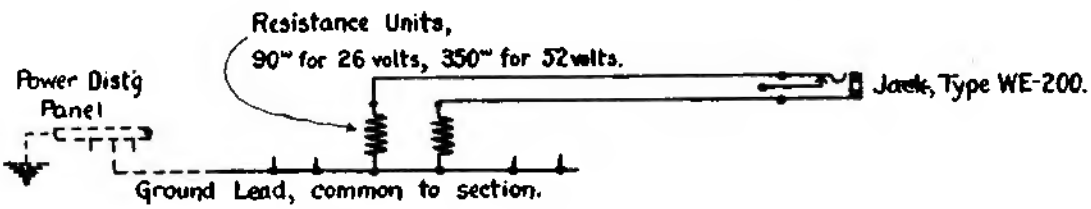


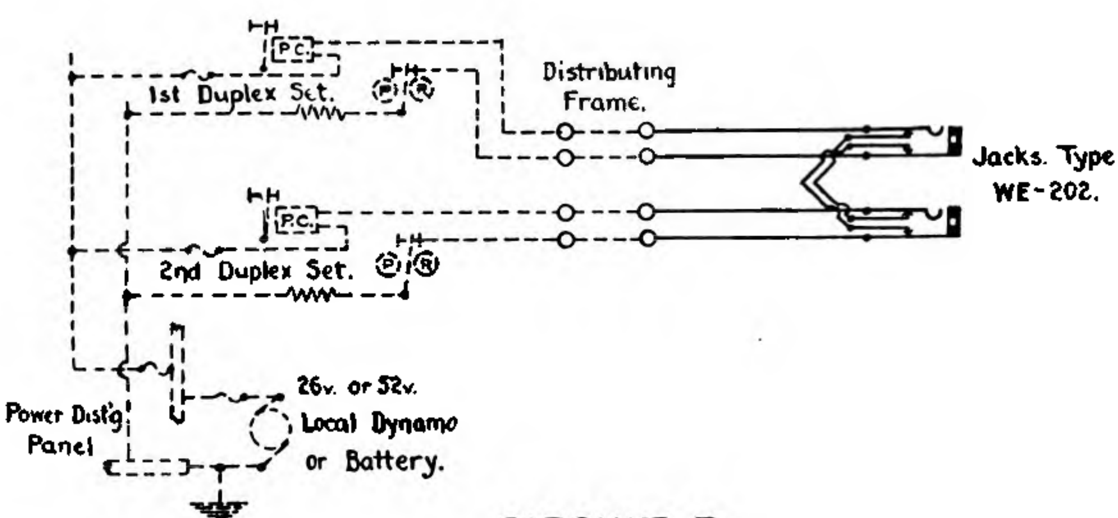
FIG. 1—SWITCHBOARD CIRCUITS IA AND MA.



CIRCUIT P
Battery Group.



CIRCUIT Q
90 or 350 ohm Ground Jack.



CIRCUIT R
Duplex or Half Quadruplex Repeater.

FIG. 2—SWITCHBOARD CIRCUITS P TO R.

any loop, are provided at the loop switchboard. (See Fig. 9, page 380, June 16.)

"I"—Intermediate Machine. In making up combinations of single Morse loops, it is sometimes advantageous to introduce an ungrounded source of current, particularly when two loops are leaky or grounded. Each intermediate machine or battery provided for this purpose is terminated in a jack, from which a regular patching cord may be run to the No. 2 jack of a closed group, Circuit G (see Fig. 9, page 380, June 16), in which the loops are connected by regular patching cords to the other jacks, Nos. 1, 3 and 4.

"IA"—Intermediate Machine with Automatic Starter. By the use of auxiliary contacts on the jack, this circuit provides for automatically starting the intermediate machine whenever it is connected into a circuit by means of a patching cord. Otherwise, the operation is the same as for Circuit I, Fig. 1.

"J"—2-Wire Multiple Trunk. Circuits of this type are used on switchboards having more than two sections to furnish a satisfactory and flexible means of extending loops, sets and other circuits from one section to another. They may also be used, in some cases between the loop switchboard and the main switchboard. It will be noted that each trunk appears at each section through which it passes in a Type WE-203 Jack and a Busy Test Knob. This makes it possible to use any trunk in extending a loop or other circuit from any section to any other section: *i. e.*, it is not necessary to select a trunk from a certain group in order to reach a given section, as in the case of the "Flips" used with old style switchboards. To avoid interference, however, it is necessary to determine that the trunk to be used is not already in use at some other section. For this purpose the busy-test knobs are provided, as shown in Fig. 10, page 381, June 16. These knobs are "clear" or "open" as long as there are no plugs in any of the jacks connected with that particular trunk, but the insertion of a plug in any trunk jack grounds all the busy-test knobs on that particular trunk by pressing into contact two auxiliary springs mounted on the jack. Before taking a trunk, therefore, the attendant shall tap the busy-test knob above the desired jack with a busy-test plug (Circuit K) (Fig. 10, page 381, June 16); if the trunk is in use the sounder associated with the busy-test plug will click, and another trunk must then be selected; if no click occurs, however, the trunk is then available and patching cords may be inserted in the jacks as required.

"JA"—1-Wire Multiple Trunk. This circuit will seldom be used at loop switchboard, as practically all connections there require two wires. (See Fig. 10, page 381, June 16.)

"JB"—2-Wire Series Multiple Trunk. For a group of not more than six switchboard sections, this type of trunk is sometimes desirable on account of the simplicity of the wiring. It has the disadvantage, however, that the jack connections are transposed at alternate sections. (See Fig. 10, page 381, June 16.)

"K"—Busy-Test Plug for Multiple Trunk. As shown in Fig. 10, page 381, June 16, the single conductor cord and plug of this circuit is connected through a sounder and resistance lamp to the grounded local battery or generator. The sounder will operate, therefore, whenever the plug is connected to a ground. This circuit is used as explained under the heading of Circuit J, to determine whether or not a multiple trunk (Circuit J, JA, or JB) is in use, by having an attendant touch the plug to the busy-test knob of any multiple trunk he desires to use. If the sounder clicks it is an indication that the trunk is being used at some other section, as under that condition all the busy-test knobs associated with the trunk become grounded. If the sounder does not respond, the busy-test knobs are not grounded and the trunk is evidently idle and available for use.

"L"—Morse Testing Set. This circuit is used for testing and listening in on single Morse circuits and loops. The use of the double-conductor plug is similar to that of the terminal wedge of a single Morse set on an old style switchboard. It may be inserted in any idle jack of a closed group (Circuit G) or a battery group (Circuit P) (Fig. 2) when it is desired to observe the operation of a loop or combination of loops set up therein; if one of the loops is in trouble, it may be identified by removing one patching cord at a time until the fault disappears. While there may be but little use at the loop switchboard for the two single-conductor plugs of this set, they will occasionally prove valuable. In using them one plug is connected to a spare battery tap and the other one to the loop, trunk or other circuit to be tested. The possibility of using different voltages and polarities of spare battery taps in tests of this kind is sometimes advantageous; for example, if one of the single-conductor testing plugs is inserted in the jack of a leaky loop, application of positive battery to the other plug may indicate but a very slight fault, but when that plug is changed to a negative battery jack a much heavier leakage may be found. (See Fig. 11, page 382, June 16.)

"M"—Miscellaneous Jacks. These jacks constitute the terminals of various circuits, which, in old style switchboards, terminate on cords and wedges, including loops, desk sets, full repeaters, half repeaters, and double loop repeaters. As previously explained, regular patching cords are used to connect these circuits to any other circuits as desired. (See Fig. 11, page 382, June 16.)

"MA"—One-Wire Trunk. This circuit may be used for miscellaneous purposes in which only one conductor, terminating in a jack, is required.

At many offices, trunks to nearby telephone exchanges are installed for the interchange of facilities between the telephone and telegraph companies. Circuit "MA" satisfactorily provides for terminating these trunks at a central point in the switchboards of the telegraph offices. In most cases, the loop switchboard is best adapted for this purpose because of its ample trunking facilities, (Circuits H, HA, HB, J, JA, and JB), to all parts of the switchboards. (See Figs. 9 and 10, June 16.)

(To be Continued.)

Cable Relays.

BY SAMUEL WEIN, NEW YORK.

The problem of repeating signals from long submarine cables into land lines has been the subject of much research.

In submarine telegraphy transmission is accomplished with both polarities of the battery; the positive polarity generally denoting a dot and the negative polarity a dash (normally, the receiving device is at zero). When the operator transmits two impulses of one polarity in succession the movable part (reflecting galvanometer or siphon recorder) of the receiving device does not return to the zero position between the two impulses, but the action is such that at the first impulse the movable element deflects to a certain degree, and, then, before it has returned to its normal position, the second impulse

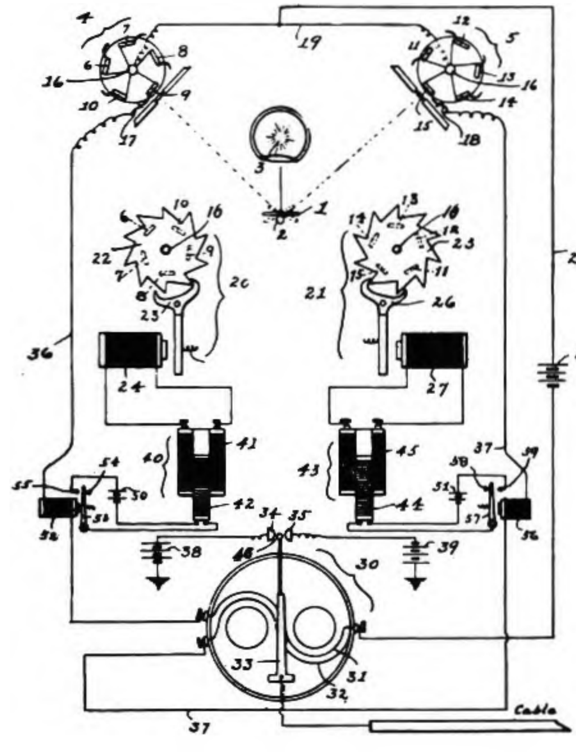


FIG. 1—KITSEE CABLE RELAY.

drives it to a greater deflection than the first. This movable mass has barred every attempt to actuate a local circuit containing a sounder. The devices about to be described have a source of light concentrated onto the mirror of the movable element, and the deflections to the right or left are allowed to fall on a selenium cell connected in series with a sounder.

This method of translating light impulses into sound impulses is shown in Fig. 1, which is reproduced from a patent issued to Dr. Isidor Kitsee, of Philadelphia.

Two sets of selenium cells are mounted, as shown in the diagram, as 6, 7, 8, 9, 10 and the other set as 11, 12, 13, 14 and 15 are carried by wheels 22 and 25, and have one set of terminals connected to the common rings 16, and the other terminals provided with spring contacts for engaging the fixed contacts 17 and 18, which are connected through the magnets 52 and 56, and the differential sounder, or relay 30, to the local battery 29.

When a positive impulse is received, the mirror 2 of the receiving instrument reflects light from the source 3 onto the selenium cell 15, thereby reducing its resistance to such an extent that the relays 56 and 30 are energized. The armature 33 of the relay 30 strikes the gong 35 and connects the battery 39 to the second cable. The relay 56 closes a circuit through the primary of an induction coil 43, and the impulses induced in its secondary, when this circuit is made, and again, when it is opened, cause the magnet 27 to turn the ratchet wheel 25 through two steps, thereby substituting the next selenium cell for the cell 15. In the same way, a negative impulse throws the light upon the cell 9,

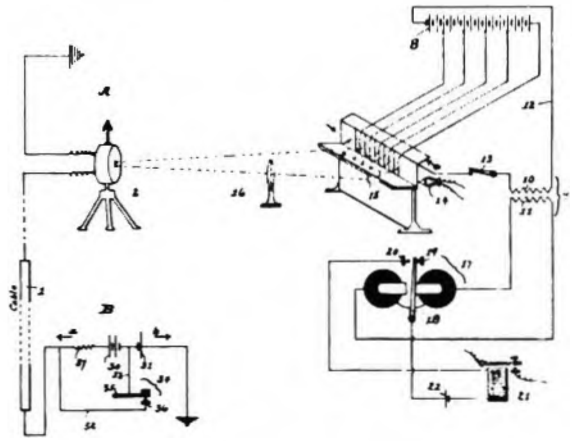


FIG. 2—ANOTHER KITSEE RELAY.

thereby energizing the relays 52 and 30, substituting the next selenium cell for the cell 9.

The object of substituting selenium cells in this invention is to overcome the "inertia" possessed by the cell, so as to give the cell a certain period to recover its ultimate resistance.

Another patent granted to Dr. Kitsee, shown in Fig. 2, operates as follows:

Normally, a current will flow over the line in the direction of the arrow *a*. Through the closing of the key, the shunt around the source 30 is established, and the current will flow in the direction of the arrow *b*. The time that the key is closed designates the kind of character the operator desires to transmit; the short closing of the key designating a dot and the longer closing designating a dash.

The operation at the receiving station is as follows:—It is supposed that the operator at the transmitting station has closed the key and that an impulse flows over the line in the direction of the arrow *b*, and that this impulse will, at the receiving station, actuate the movable part of the receiving device 2 in a manner so as to deflect the same in the direction of the unfeathered arrow. The rays of light, therefore, will travel also in this direction, and will make active one or more of the selenium cells. The rays of light, in their travel from the zero position, will first be impinged on the cell nearest the zero, here designated as cell 3, and will then, in their travel, sweep over a greater or lesser number of cells. When the operator at the transmitting station opens the key, then the movable parts of the receiving device are deflected in the opposite direction, that is, in the direction of the feathered arrow at the receiving station. The deflected rays of light, therefore, will, in their return to the former position, sweep again over that part of the organism which they swept when deflected in the direction of the unfeathered arrow. But whereas the rays of light in their travel from the zero position sweep successively over the selenium cells with successive high electromotive force, the same rays of light, in their return, will sweep successively over the selenium cells with successive lower electromotive force. When not impinged by the rays of light, all the selenium cells remain inactive. They offer such a high resistance to the flow of the electric current that the primary 10 of the induction coil 9 remains also inactive.

Normally, no current flows through the primary 10 of the converter 9. When, now, the rays of light, in their travel from the zero position, impinge first on the cell with the lowest electromotive force, this cell will become active and a current will flow through the primary 10; the farther the rays advance, the greater will be this flow. The commencement of the flow, as well as the increase of the flow, will result in the generating of a secondary impulse in 11 of a direction opposite to the direction of the current flowing in the primary 10, and no matter how much the increase of flow of the current in the primary 10, the direction of the impulse in the secondary 11 will always remain the same. When, now, the rays of light return toward their zero position, they will successively cease to impinge on successive cells of decreasing electromotive force till they have entirely ceased to impinge on any of the cells. The movement of the rays of light from a cell of higher electromotive force to a cell of lower electromotive force will reduce the flow of current in the primary 10, and this decrease in the flow of current will result in the generation of an impulse in the secondary 11 opposite to the first induced impulse; and when the rays of light, in their travel toward the zero position, entirely cease to impinge on the selenium cell, then the ceasing of the flow of the current in 10 will only intensify the second induced impulse, but this impulse will always be in one and the same direction; that is, opposite to the direction of the first impulse, because the starting of the flow of a current in the primary, or an increase in the flow of a current in the primary, always generates in the secondary an impulse of a direction opposite to the flow in the primary and the decrease in the flow of the current in the primary, or the entire ceasing of the flow in the primary, induces an impulse in the secondary in the same direction as the current formerly flowing in the primary.

Let us suppose that the impulse generated in the secondary 11, through the commencement or increase in the flow of a current in the primary 10, is of a nature so as to impel the armature 18 of relay 17 from its stop 19 toward and in contact with stop 20. This will close the circuit including the repeating sounder 21 and battery 22. The sounder, therefore, will become active, and will contact its armature with the lower stop, thereby producing the click denoting a dot or dash, as the case may be, and closing such circuits as are connected thereto for the purpose of translating the clicks into the required character. In this arrangement, it is immaterial if the rays of light, in their travel from the zero position, sweep the entire number of cells, or only part of same; and it is also immaterial if the rays of light, in their return movement to zero, travel backward the whole series of cells, or only part of same. In other words, every movement of the rays of light toward a cell with increasing electromotive force will produce in the secondary an impulse of one direction, and every movement of the rays of light from a cell of high electromotive force will produce in the secondary 11 an impulse of opposite direction, no matter how many cells were included in this forward or backward travel. In conjunction with this arrangement, it has to be stated that, usually, condensers are inserted in the cable, and that, there-

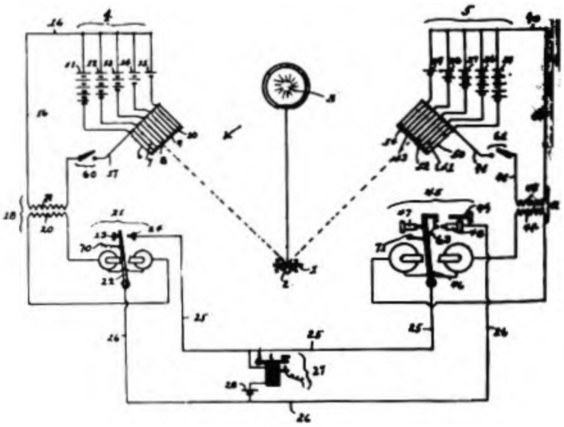


FIG. 3—KITSEE IMPROVED RELAY.

fore, the flow of the current from the source 30 or 31 will not be continuous and the device 2 will not be unduly deflected.

In this drawing, five selenium cells are illustrated; the number may be increased in accordance with requirements.

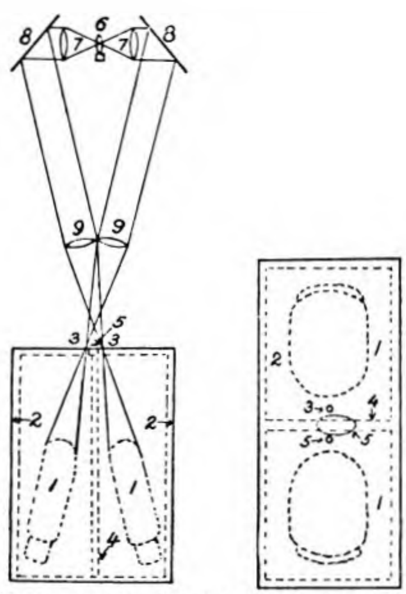
Another improvement in Dr. Kitsee's relay is shown in Fig. 3. The operation of this system is similar to that described in the foregoing.

Mr. William Sutcliff is the inventor of another system to accomplish the same results. Mr. Sutcliff employs two selenium cells, and preferably places them in dark chambers, into which light is admitted through two small and adjacent apertures. Each of these apertures coincides with the principal focus of an arrangement of mirrors and lenses, which serve to reflect and direct upon the selenium cells the light given from an acetylene lamp, or any other form of artificial light.

The arrangement of mirrors and lenses might be eliminated, in which case light from any suitable source would be directed through the apertures upon the selenium cells (which are highly sensitive), and are, preferably, in evacuated glass bulbs, like the Ruhmer cell, in order to secure constancy in value and operation during changing atmospheric and climatic conditions.

The light which affects the selenium cells and that passes through the aforementioned apertures is interrupted or controlled by a small opaque screen which is free to move to and fro, immediately above the apertures. This controlling screen may be attached to a tongue, or pointer, directly connected to a suspended coil in a permanent, or electromagnetic field, the coil being caused to oscillate about its longitudinal axis by means of the signaling currents; or, the screen may be caused to operate in a manner responsive to the signaling currents by any other suitable method. The selenium cells are connected in series through a suitable polarized relay and adjustable resistances, for balancing purposes, to the other wire connecting the two selenium cells. Or each selenium cell might have in circuit a local battery, and a relay so operating its tongue that contact could be made with minimum current and broken with maximum current.

It will be seen that when the suspended coil is in its zero position, *i. e.*, when no signaling currents are passing through its winding, the screen attached to the end of the tongue, or pointer, is situated midway between the two apertures admitting light to the selenium cells, and thus the local currents passing through the cells are equal, which results in



FIGS. 4 AND 5—DETAILS OF SUTCLIFF RELAY.

zero potential across the terminals of the polarized relay, provided this instrument be employed. When the screen passes over one of the apertures the current passing through the affected selenium cell is enormously reduced, resulting in the local battery sending a current through the relay, which causes it to operate in a certain direction. When the other aperture is covered by the screen, the relay is caused to operate in the reverse manner.

Fig. 4 is a diagram, showing the direction and concentration of the rays of light in the said form.

Fig. 5 is a view showing the relation of the shutter and orifices, as will be described later.

Fig. 6 is a diagram, showing the electrical connections which are found to be satisfactory.

Referring to Figs. 4 and 5, 1 and 1 are selenium cells of the Ruhmer type. They are enclosed in an opaque box, or casing, 2, which has two orifices 3 and 3, through which the rays of light penetrate to the selenium cells; 4 is an opaque partition, by means of which each selenium cell is enclosed and

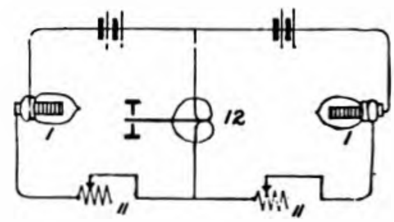


FIG. 6—CONNECTIONS OF SUTCLIFF RELAY.

protected from any light falling from the other. In immediate proximity to the two orifices is a shutter 5, consisting of some light material, such as aluminum or mica, coated with an opaque varnish, and attached in any convenient way to the movable part, say, the suspended coil of an instrument receiving signaling currents; 6 is the source of light, whose rays are transmitted to the selenium cells by the lenses 7, 7 reflectors 8, 8 and lenses 9, 9. The lines shown in connection with the source of light, lenses and reflectors indicate the sheaves of light rays which, it will be seen, are concentrated, at, or near, the orifces 3, 3, so that these rays are interrupted by the shutter at, or very near, to their foci.

Referring now to Fig. 6, 10 and 10 indicate two batteries, each having one of the selenium cells 1 in circuit, whilst in the middle lead (or between the split circuits), is a polarized relay 12, or its equivalent.

The action is as follows: Let us assume that no signaling currents are passing. In this case, the movable part of the instrument, with which the shutter is connected will be at zero position, and the shutter will be in an intermediate position between the two orifices, as shown in Fig. 5. Here it will be seen that, differing from the other devices of the kind, both orifices are exposed, and is passing through each on to a selenium cell. The local currents passing through these cells are, therefore, equal, so as to provide a zero potential across the normal position. When, however, the shutter is deflected by a signaling current, it will pass over one of the two apertures, depending upon the direction of the current, and the selenium cell corresponding with that aperture will have its resistance greatly increased, and, therefore, the current through it greatly reduced, the effect of which will be to send a current through the relay and cause it to operate in a certain direction. When the shutter is deflected in the other direction, the other selenium cell is cut off from the supply of light, and, by a similar series of operations to that just mentioned, the relay will be operated in the other direction.

The Character of an Office.

BY U. G. LIFE, DISTRICT COMMERCIAL SUPERINTENDENT, WESTERN UNION TELEGRAPH COMPANY, SALT LAKE CITY, UTAH.

[The subjoined matter was issued by Mr. Life for the benefit of the employes in his district.]

There is no denying the fact that every concern doing business with the public has a character, and is judged accordingly by its patrons; and the employes of the office are largely responsible for that character, whether it be good or bad. The man or woman who receives consideration and courtesy from an employe forms a favorable opinion of the company, and, likewise, the patron who receives scant courtesy and indifferent treatment will not fail to relate the fact to his or her friends.

Nor does the impression employes make end with his work in the office. He is giving character to the office by his habits while off duty. His conduct on the street, or at the club, his personal appearance and the appearance of his office, as to neatness and cleanliness is charged up to the institution that employs him. Modern methods are calling for good men and good women who will raise the standard of the company's character. System and salesmanship must reach beyond the counter or office. Business men realize this to-day more than ever, and they are searching for help that will add character to the business. They are teaching their clerks the importance of conduct in making a name for the business by which they are employed.

Every office has a character just the same as a human being, and every customer, or possible customer, sizes up that character, consciously or unconsciously, through every transaction he has with it, or hears of through some one else.

Every advertisement that you publish, every sale that you make, every remark and action you or your employes ever make in duty hours or out, are all finger marks of the character of your office, finger prints that, blending into one great composite print, stamp a character sketch impression on public opinion.

A man or woman meets you in your office, and is pleased with your service, and later sees you when you are off duty. He, or she, combines the two impressions of you into a composite one, until you are seen again. In his or her estimation you are continually changing to a higher or lower pedestal, according to your conduct, and you are an ever-changing advertisement for, or against, the interests of your business, just as your bookkeeping and routine methods are.

Do not think that your printed matter is the only advertising you do; every word you or your employes utter, every place you go, are advertising your business either favorably or unfavorably.

Your method of salesmanship, your collections, your courtesy, your efforts of helpfulness to your patrons, even your habits of living among your personal friends, all are blending into a great ever-changing advertisement that defines and makes a character sketch of the business on the public mind.

You never can tell what effect a little thing may have upon your business. You cannot afford to let lack of attention creep into your service to a single customer, no matter how unimportant their patronage may seem.

There is no place in the business world for the "grouch." The surly salesman who intimidates customers with sharp replies has been dropped from the list. In his place has come the man or woman who believes in the goods he or she is selling. Salesmanship is a science and the business man or woman who does not wake up to the fact is one who fails utterly.

The employe who satisfies a customer that he is getting his money's worth and creates in him a desire to call again is the fellow who eventually receives his reward in an advance in the service. The employe who makes no particular effort to satisfy a customer is the fellow who drops out when business gets dull.

And the matter of salesmanship does not stop at the counter. It extends to the telephone, which is one of our greatest methods, and one of the greatest conveniences that we have to offer to our customers, and the simple inflection of the voice, whether it be kindly or harsh, is far-reaching in its effect.

Recently, it has been said of the employes of this district that they are of an unusually high class, courteous and obliging. This is a compliment that each and every one of us should feel justly proud of, and a reputation up to which we should endeavor to live. We should also endeavor to make a greater reputation than has ever been attained along these lines in each and every office in the district.

There is another matter to which I might draw your attention, and that is the spirit of good fellowship and brotherly love that should prevail among the employes in all offices. This goes a long ways toward bringing about the results to which we are all aspiring.

Testing Insulators.

The Western Electric Company's engineering department at New York is conducting an interesting comparative study of pole-line insulators. Over 3,000 insulators, of different shapes and materials, are mounted on a low roof in one corner of the West Street building.

A special selective mechanism is mounted on a pole near the center of the insulator rack, which permits the insulation resistance of each group of insulators to be measured with instruments located in the physical laboratory. The laboratory is several hundred feet away, and only a few very heavily insulated wires connect the "selector" to the laboratory.

Dust from the street and smoke and soot from near-by factory chimneys gradually accumulate on the insulators, and their insulation resistance measured during wet weather decreases. The ability of the insulators to maintain high insulation under these severe conditions determines their relative merit for telegraph and telephone service.

On Old No. 4 East.

BY JEFF W. HAYES, PORTLAND, ORE.

Every operator who worked east of Cleveland, on the Lake Shore road, is familiar with No. 4 East, the wire that handled all the local business between Cleveland and Buffalo. It was on this wire that the writer, with many other telegraph men, obtained their first insight into the business, and it was this wire that Thomas A. Edison worked in his boyhood days. There was very little for a night operator at Ripley Station to do, the most arduous duty being to keep awake, which was doubly difficult for a youngster of fourteen.

Up the line, some twenty-five miles, at Brockton Junction, lived Frank Howell, aged about fourteen, who served as night operator at that point. Naturally enough, a friendship sprang up between us. The vineyards of Ripley were foraged for the choicest of grapes for the Brockton boy, who returned the courtesy by goodies selected from the gardens of that burg.

As our positions were in jeopardy if we were found napping on duty, resort to all devices to dispel sleep and woo watchfulness became necessary.

"I'll go you a game of chequers," came the challenge over the wire one night, after the Atlantic and the Steamboat Express had gone.

Howell admitted he was a novice at the game, which, however, was straightway started. It was agreed that the Brockton man would forfeit a watermelon borrowed from a friendly garden hard by and the Ripley operator would pay for his defeat in baskets of choice Ripley concords.

For a week or more the movement of watermelons from Brockton to Ripley might have occasioned a revulsion of feeling in the "friendly" gardener's heart had he known of it, but one evening luck, or practice, brought victory to Brockton and the produce market went east, instead of west.

Howell was full of good humor and jibes, taunting the Ripley operator with his defeats. It did not seem possible that young Howell could have learned the game so quickly, for he now did not allow his opponent to win a game.

"I say, young feller," said a train hand on the west-bound way freight to the Ripley representative. "I say, 'em fellers up thar at Brockton are stringin' yer. Yer see, dey have an old chap playin' chequers and that young operator does the telegraftin' and de whole town turns out at night to see de fun. Yer don't stand any chance wid 'em fellers, I tell yer."

This state of affairs was communicated to Peter Hume, a canny old Scotchman, who kept the Ripley hotel, and he was immediately filled with a patriotic desire to see Brockton go down under the prowess of his own home town. Hume was known far and near as the greatest chequer player in the state.

"I dinna ken this mon at Brockton, but we'll gang him home a-fluking," said Peter Hume, as he took his seat at the chequer board. The usual depot loungers hung around to witness the game, which was very interesting.

"Mon alive, I walloped him," exclaimed Hume, and No. 4 rang out with derisive epithets and taunts from both boys while another game was started.

Peter Hume won every game that evening, much to the dismay and chagrin of Brockton, whose entire population thronged the depot platform, interested, excited with whisperings of "Who is ahead?" But the Scotchman was not to be beaten.

A little old German, erstwhile a professor at Heidelberg, and who was known to be an adept at chequers, was induced to play a game.

"Germany can beat the world," yelled some enthusiast, but he, too, met ignominous defeat.

The local papers of both towns took the matter up and a purse was raised as a prize to win the honors back from Ripley. The superintendent of the road had No. 4 wire cut into his residence so that he and his friends could follow up the game as the moves were given out over the wire, but none could take the honors away from Peter Hume, who all this time was playing incognito.

How long this state of affairs would have lasted it would be difficult to say, but the game came to a speedy termination when young Howell fell asleep one night, thus rendering No. 7, Pacific Canonball, seventeen minutes late, causing his demotion.

These occurrences took place years ago, but in a recent visit to the dear old town, I found the incident was a part of the history of each place and J. Frank Howell, now a broker on Broadway, New York City, loves to tell of the time when "produce traveled westward."

Bound Volumes of Telegraph and Telephone Age.

For those of our readers who desire to have the past year's issue of TELEGRAPH AND TELEPHONE AGE in a form in which they can readily preserve all of the copies for future reference we would recommend a bound volume. We are now able to supply these containing the twenty-four issues of 1912 for the nominal price of $3.50. There are several features in one of these volumes, which comprises nearly 900 pages of reading matter, which are alone worth much more than the amount asked. The most important series of articles during the year was the "Course of Instruction in the Elements of Technical Telegraphy," which is widely studied and highly commended. These articles, together with the series by Mr. Willis H. Jones entitled, "Some Points on Electricity," are worth many times the price of the book. We have also published articles by the best-informed authors upon the developments in wireless telegraphy, and, in fact, there will be found recorded in this book all of the important improvements in the wireless art during the past year. The use of the telephone for train dispatching has largely increased since January, 1912, and we have kept pace with its development by presenting to our readers many articles upon this subject, written by some of the best-posted men in the railway and telephone world. Those interested in any branch of the telegraphic industry will find much valuable information in one of these bound volumes. A copy of this work will be sent to any address, upon receipt of price, $3.50, by J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

New York Telephone Society.

At the meeting of the New York Telephone Society, November 28, the general topic of discussion was, "Making the Service Popular." Five papers were read, illustrating the efforts that are being made to make the telephone and telegraph service popular, as follows:

"The Commercial Department," by G. G. Volkmar, district commercial manager; "The Plant Department," by J. F. Naylon, district plant superintendent; "The Traffic Department," by J. L. Turner, of the traffic rules committee; "The Advertising Department," by H. G. Stokes, supervisor of advertising copy, all of the New York Telephone Company, New York, and "The Western Union Telegraph Company," by Preston D. Callum, district commercial manager, Western Union Telegraph Company, New York.

"A service which comes into such intimate contact with so many of the varied interests of the people as does the service which we render," said Mr. Volkmar, "must be kept at a high level of efficiency; it must be so flexible that it can be made to respond not only to the needs, but to the convenience of a very exacting public. The true measure of popularity is secured only when one's customers use the service because they like to do so, and not because they must use it."

Mr. Naylon said, among other things: "The ways and means by which the plant department can help toward making the service popular are perhaps limited, but, if advantage is taken of all of our opportunities, there is no question that we can accomplish a great deal toward that end. The ways and means may be classified under five general headings: 1. Reduce trouble in the system to a minimum; 2. Clear what trouble we have as quickly as possible; 3. Install service as quickly as possible after the subscriber has decided that he wants it; 4 Make the station installation as sightly as possible; 5. Educate employes who have occasion to deal with the subscribers, either by telephone or in person, to accord them uniformly courteous treatment."

"Experience has shown," said Mr. Turner, for the traffic department, "that subscribers are highly appreciative of the service of operators who have been taught to use the proper voice expression. They are impressed with the sincerity, the intelligence, the willingness and the unfailing courtesy of such operators. Furthermore, this training has placed the operators upon a higher plane and has established a more friendly and sympathetic relationship between them and their subscribers."

For the advertising department, Mr. Stokes said: "Encouraging courtesy over the telephone by means of newspaper advertisements, circulars, placards, and other forms of publicity offers a field for making the service popular that is, perhaps, the most important of all. It is the kind of work that helps all departments of the system, because it has a real effect upon the attitude of all telephone users. Courtesy is like oil to machinery, and the lack of it may cause friction. The elimination, as far as possible, of friction between the subscribing public and ourselves in all of our dealings is a goal to be aimed at that is fully worth while."

Mr. Callum, representing the Western Union service, stated that, in order to popularize the telegraph, two important elements are to be considered: accessibility and reliability.

"The accessibility of the telegraph," he said, "means that the service must be easy to reach and easy to use. At the present time, practically every telephone subscriber may, upon request, be promptly connected with a telegraph center at all hours of the day and night, for the purpose of forwarding and receiving telegraphic communications, and, in addition thereto, public telephones may likewise be used by the general public for forwarding messages at all hours of the day or night. This innovation has, to a marked degree, made the telegraph more accessible and popular, and its popularity can be further augmented, as rapidly as we make more fully known the advantage and convenience accruing to the public by reason of such arrangements.

"The public comes in direct personal contact with the telegraph company through three channels, namely, the messenger, the telephone operator and the receiving clerk, and the importance of these employes properly performing their duties in handling our traffic is a large factor in making the telegraph popular.

"Reliable telegraph service is essential. It is the constant endeavor to have employes exercise alertness in the performance of their duties and to protect the service against unnecessary delays and errors.

"Once relations of confidence are established with the public regarding the reliability and quality of the service, popularity and increased use of the telegraph will likewise naturally follow. The telegraph is being further popularized by making a careful, analytical study of the needs of the public and adapting our service to meet such needs. It only remains to make more expansive the element of accessibility and reliability."

Prior to the meeting, the Blue Bell Orchestra gave a concert, and played selections during the reception after the meeting. The character and execution of the musical programme evoked much favorable comment.

There were 1,000 people in attendance, among them being Messrs. A. G. Saylor, general manager Eastern Division, Western Union Telegraph Company, New York; J. S. McCulloh, general commercial superintendent, and J. S. Wiley, general auditor of the New York Telephone Company, and other prominent officials.

Mr. R. S. Scarburgh, advertising manager for the New York Telephone Company, is secretary of the society.

N. T. Collette, Seattle, Wash., writes: "Although not in business any longer, I enjoy the AGE, as it keeps me in touch with my old Tillikums. Find enclosed $2.00 to cover another year's subscription.

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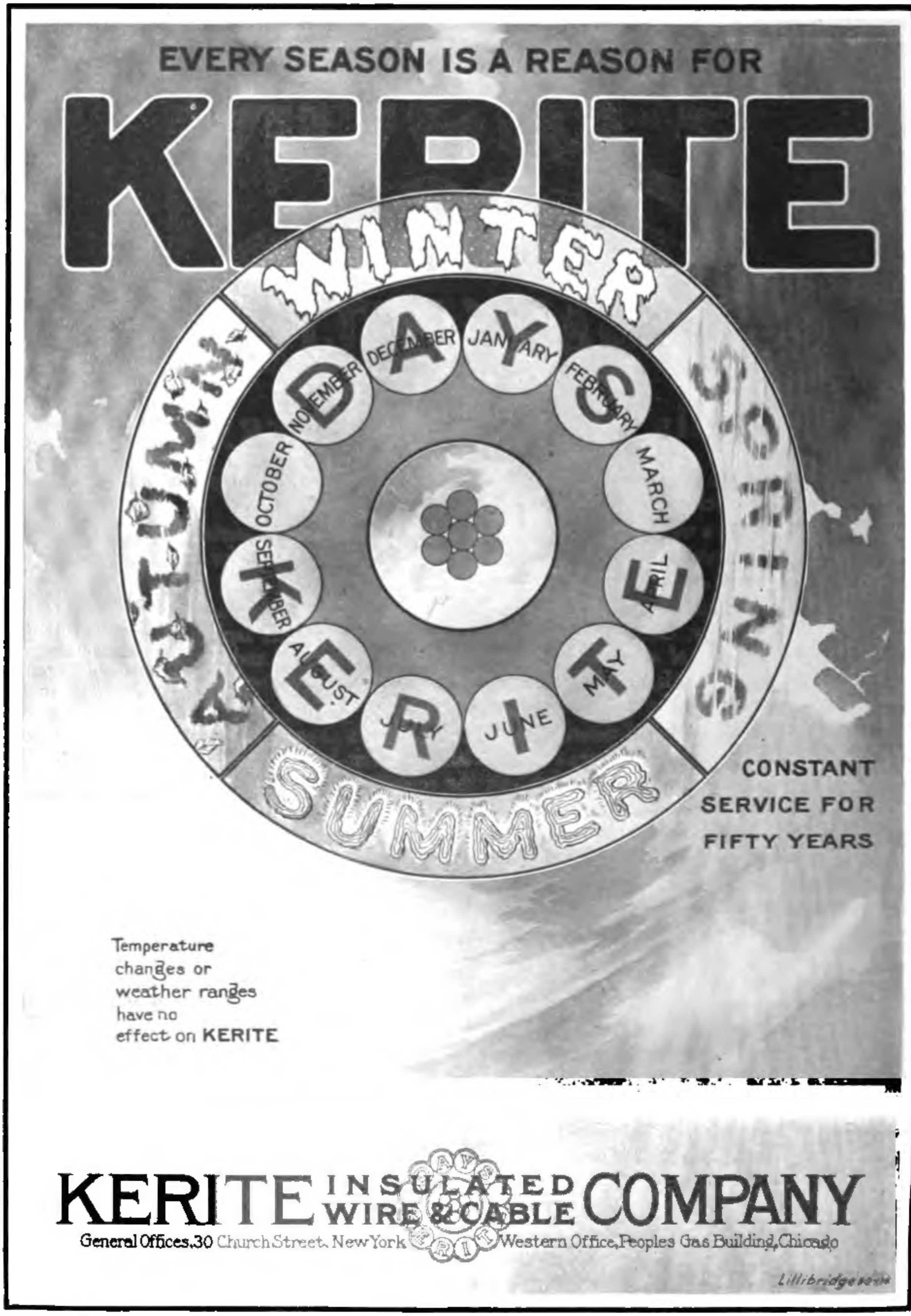

EVERY SEASON IS A REASON FOR
KERITE
WINTER
SPRING
SUMMER
AUTUMN
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DAYS
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CONSTANT SERVICE FOR FIFTY YEARS
Temperature changes or weather ranges have no effect on KERITE
KERITE INSULATED WIRE & CABLE COMPANY
General Offices, 30 Church Street, New York
Western Office, Peoples Gas Building, Chicago

THE RAILROAD.

MORKRUM PRINTERS ON ROCK ISLAND.—The Chicago, Rock Island and Pacific Railway has installed Morkrum printers on a circuit between Chicago, Topeka, Kan., and El Reno, Okla.

ISAAC VAN DUSEN, aged sixty-four years, for over forty years identified with the Pennsylvania Railroad Company, telegraph department, Jersey City, N. J., died at his home in Rahway, N. J., November 30, of acute indigestion.

TELEPHONE DISPATCHING ON THE RIO GRANDE.—Telephone train dispatching has been installed on the Denver and Rio Grande Railroad, between Salt Lake City, Utah, and Grand Junction, Col., a distance of 261 miles. Mr. J. M. Walker, Denver, Col., is superintendent of telegraph of the Denver and Rio Grande.

New Telephone Dispatching Circuits on the Erie.

Mr. J. P. Kreiter, of Susquehanna, Pa., telephone supervisor, Erie Railway, is at present engaged in supervising the installation of 248 miles of telephone train-dispatching circuits on the Chicago and Lima Division of the Erie Railway.

The installation is the Western Electric Company's bridging system. A test panel is installed in each way station, and the old telegraph message and train circuits are looped in the test panel, and used in patching the telephone circuits in case of trouble. Each office is also wired with an extension bell for beating standard time, which is repeated from a telegraph wire, sending time to a time-sending outfit.

The line is of copper, 210 pounds per mile, transposed according to the Western Union transposition scheme. There will be two circuits on the Chicago division and two on the Lima division, with a total of sixty-five way stations.

Safety on Railways.

Remembering what wireless telegraphy has already done in saving life and ships at sea, it is not unnaturally asked whether this remarkable invention cannot be employed in connection with our railways, and thus minimize the danger of accidents, says the *Wireless World*, London.

The advance which wireless telegraphy has made within a comparatively short period discourages any attempt to fix limits to its application. It has become a vital aid to the safety of shipping and an instrument of ever-increasing value to social and commercial life. Will equal success attend the efforts which are now being made to introduce it on railways? The matter is still in a more or less experimental stage, and it is impossible, therefore, to answer the question with absolute confidence.

Some guidance should be furnished by the trials which are now in progress on the Lackawanna Railroad. The problem there is being approached in a scientific manner, and from the advanced state of the art it is fair to presume that the element of chance in the attainment of results will be largely reduced, if not entirely eliminated. The distance to be covered by the wireless in this instance is comparatively short, and if the system proves to be as successful as it is hoped it will be, it will mean a great deal to the railway services.

The far-reaching effect of this undertaking is at once apparent, for comfort, convenience and increased safety must follow from the successful operation of this remarkable innovation. For instance, in approaching a station, a conductor of a train will be able to notify the agent there that he is in need of an extra car, and transmit similar information, which will enable the station authorities to be ready to make the necessary changes or repairs immediately upon the train's arrival. It would be possible, also, to transmit news and other items of interest to a train while in motion. While these advantages will be especially appreciated in North America, where railway journeys are often of several days' duration, travellers in this country, and on the long-distance railways of Europe, will not fail to note what remarkable possibilities are likely to be opened out by the successful accomplishment of the new application of wireless telegraphy. As a means of safety, the wireless service should prove of inestimable advantage, and, in combination with other precautionary measures, should still further diminish the danger of modern travel.

Institute of Radio Engineers.

The December meeting of the Institute of Radio Engineers was held at Columbia University, New York, December 3, with an attendance of over 100. Vice-president R. H. Marriott opened the meeting with a brief address concerning the arrangements which had been made for the transmission of signals on various wave lengths for the calibration of radio receiving stations in the vicinity of New York. Such uniform calibration will prove useful in determining infractions of the international and Federal laws regarding wave-length restrictions.

The paper of the evening, on "Dielectric Hysteresis at Radio Frequencies," was presented by Mr. E. F. W. Alexanderson, of the General Electric Company, Schenectady, N. Y. The novelty of design in the 100-kilovolt, 100,000-cycle transformer, and the difficulties encountered in its construction and use, as well as data regarding losses in various dielectrics at a number of voltages and high frequencies, proved to be of great interest to the members. A discussion, in which there were considered a number of the insulation problems peculiar to radio engineering, followed the paper.

The next meeting will be held on January 7, 1914, at Columbia University. There will be announced the results of the election of new officers, and papers on variation of signaling range throughout the year, by R. H. Marriott, of the Department of Commerce Radio Service, New York, and on a new rectifying conductor by Mr. C. Tissot, of the French Admirality, will be read. All interested in radio transmission are cordially invited to attend.

Wireless on the Lackawanna Railroad.

Much interest and attention has been given to the experiments now being conducted by the Lackawanna Railroad in utilizing wireless telegraphy as a means of intercommunication between moving passenger trains and fixed stations along the road. In this instance the Lackawanna road has a wireless station at Scranton, Pa., and one at Binghamton, N. Y., and one of the day express trains running between Hoboken, N. J., and Buffalo, is fitted with a standard Marconi 1-kw. equipment.

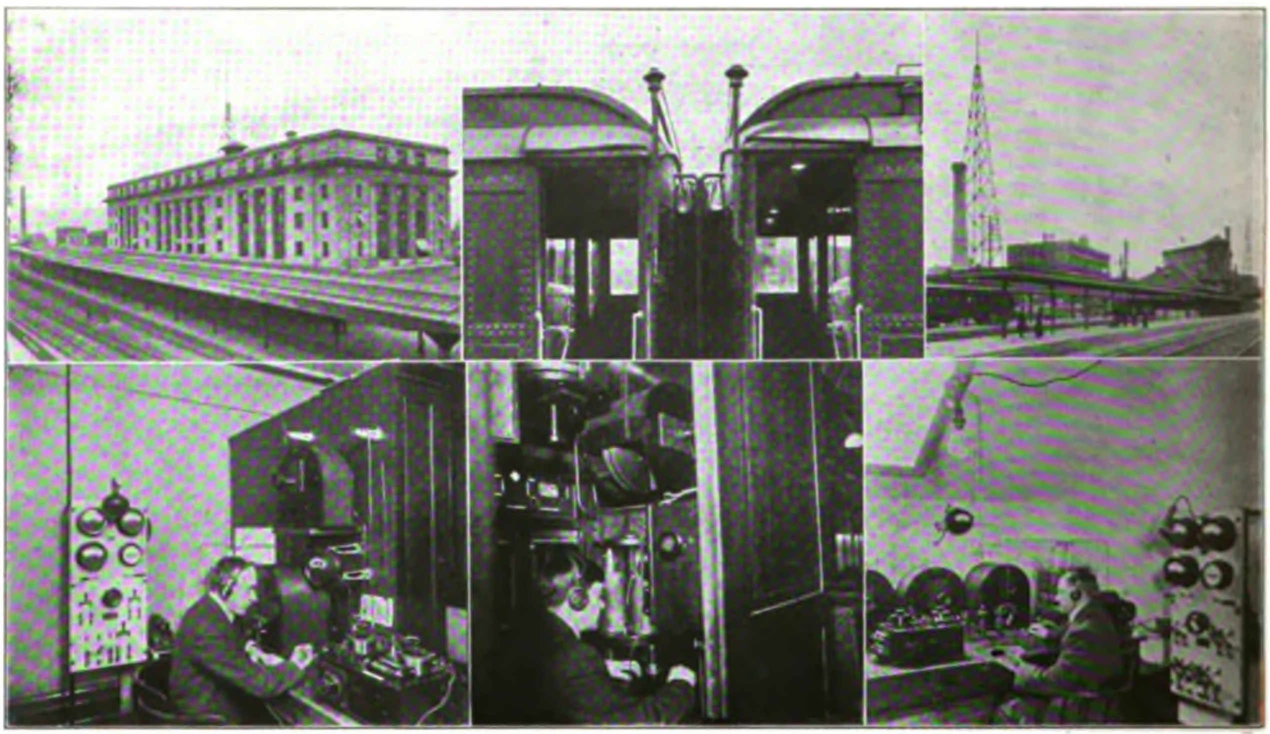
The tests were begun on November 21, and it is stated that they have given satisfactory results, the signals received on the train being very clear and distinct. Attention is now being directed to the adjustment of the apparatus for operation under all varying conditions, this adaptation of wireless being of a pioneer character.

The experiments thus far conducted have shown immense possibilities of safety and time saving by insuring that trains will always be in communication at any speed and at any distance from stations, regardless of "line breaks" from winter blizzards or from washouts, fog which obscures signals, and other extraordinary conditions.

The stations at Scranton and Binghamton have an operating radius of about 300 miles. The antenna at Binghamton is supported by two specially built towers shown in the illustration at the right-hand upper corner, and that at Scranton by a tower on the roof of the station and a tall chimney shown in the view at the upper left-hand corner.

The aerials on the train consist of a quadrangular closed loop on each car, supported at each corner by insulators on iron pipe attached to the corners of the car. They are raised 18 inches above the roof of the car, this being the maximum space allowable on account of bridges and tunnels. Four cars are thus equipped, the connection between cars being by means of a plug and socket. The aerial on each car is 65 feet long and is composed of a twisted cable of seven No. 18 silicon bronze wires. The car aerials are brought together at a point about the centre of the train and lead into the station, which is located in a small box-like compartment at one corner of one of the passenger cars.

The power for operating the train equipment is obtained from the generator and storage-battery lighting outfit, and about 2 kw. of energy is used for the wireless service. There is no appreciable effect upon the electric lights when the wireless is in operation.



SCRANTON PASSENGER STATION. SCRANTON OFFICE.
ANTENNA ON CARS. STATION ON TRAIN.
BINGHAMTON TOWER AND STATION. BINGHAMTON OFFICE.

The radius of train operation at the present time is approximately fifty miles, but this range will be extended after the equipment has been tuned up.

The ground connection on the train is obtained through the steel trucks and wheels of the cars and the rails.

The equipment on the train consists of a standard 1-kw. Marconi set of modern design, especially adapted to this service. The motor-generator is automatically controlled, the operator simply throwing on and off a switch, as necessary. A special feature of the installation is the limited amount of space available for it. The station takes up no more room than does the ordinary lavatory, and a view of it is shown in the middle lower picture.

(Continued on page 754.)

PHILLIPS CODE.

The popularity of Phillips' Code, by Walter P. Phillips, was never more apparent than at the present time. Its acceptance by the telegraphic fraternity, as a standard work of the kind, dates from its first publication, and the constantly increasing demand for this unique and thoroughly tested method of shorthand arranged for telegraphic purposes has necessitated from time to time the issuance of several editions. The present edition was carefully gone over, a few revisions made, and a number of contractions added, until now this "staunch friend of the telegrapher" is strictly up-to-date in every particular. It has been declared that an essential qualification of a "first-class operator" is a thorough understanding of Phillips' Code.

The use of this system promotes rapid transmission, and for press reports especially was long since declared to be the best ever devised. By common consent it is recognized as standard, and everywhere is regarded in the profession as indispensable in contributing to the operator's fund of practical knowledge. In fact, not to understand Phillips' Code acts as a distinct embarrassment to the operator.

The price of the book is $1 per copy. Address J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

(*Continued from page 752.*)

The distance between Scranton and Binghamton is about sixty-five miles, and in the experiments it is found possible to maintain communication from the train running at fifty-five miles per hour, part of the time direct from the train to the fixed station away from which the train was speeding; and when the train had proceeded to a point too far away for its short aerial to force signals through to this first station direct, the signals were delivered to the station by being picked up at the second station and relayed back. At no time during the tests is the train out of communication with both stations in this way.

The special usefulness of the system was indicated on one of the trips when the conductor of the train was taken ill, while his train was running at high speed, westbound. The next station at which a relief conductor could be obtained was Scranton, thirty miles away. Ordinarily, a delay would have been unavoidable—either a stop in order to send a telegram by wire asking for a relief conductor or a wait at Scranton after arrival at that point. By using the wireless-telegraph equipment there was no need to take either of these measures. Instead, the conductor notified the wireless operator on the train and the latter sent a message direct to Scranton, with the result that a relief conductor was on hand to take charge when the train pulled in. In the same way an extra car, needed to provide accommodations for an unusual crowd of passengers, was ordered to be in readiness. to be coupled on at Scranton, thus eliminating the delay that would ordinarily have been experienced in getting the car up from the yard.

There are many other ways that the wireless system will be useful in railroad work, which an experienced railroad man will readily see, and much time can be saved thereby.

On account of trouble on the wires between Scranton and Binghamton recently, all of the railroad business between the two points was transacted by wireless without any difficulty. This, of course, had no reference to the train service.

On one occasion two tramps were found stealing a ride on the front platform of the baggage car, next to the tender. The conductor telegraphed ahead to the next stopping point, and on the arrival of the train two detectives arrested the men.

When railroads can install reliably tuned equipment whereby dispatchers and train conductors are able to keep in direct touch, regardless of stops, it becomes possible to save no inconsiderable amount of time in routine train operation—possibly equivalent in some instances to the time saved by regradings, cut-offs and other improvements on the right-of-way that require large appropriation of capital.

The Marconi Wireless Telegraph Company's apparatus is used on the train and at the stations at Scranton and Binghamton. Mr. J. J. Graf, telephone engineer of the Lackawanna Railroad, has had charge of the station and train installations, under the supervision of Mr. David Sarnoff, chief inspector of the Marconi Company.

Damage to Pole Lines in Recent Ohio Storm.

BY C. S. RHOADS, JR., GARWOOD, N. J.

The description in your issue of December 1 of the recent storm havoc at Cleveland and vicinity reminds me of what I saw between Ashtabula and Toledo, Ohio, on November 12, and my idea about future prevention might interest you.

The pole lines were all down; only poles sheltered by buildings or woods withstood the side strain of the 70-mile wind after they were loaded with sleet, which, on the wires, averaged about one and one-half inches in diameter. If there had been some copper-clad wire on the poles no benefit would have been derived because the poles went down. The poles on one nice new stretch through Collinwood were spaced about 100 feet apart—short spans—and they were down like the rest. My idea is that to rebuild the lines as they were will allow the same thing to happen, perhaps again this winter. Reinforced-concrete poles, with about ten No. 9 copper-clad wires on the top arm for emergency, is my idea of an improvement of the situation and would give service under such conditions of sleet. Ashtabula was completely cut off the morning we were there. There would have been some chance had there been copper-clad wire to Cleveland or Buffalo.

These same lines have been down so many times that it is almost a continuous proposition to keep them up, and it would no doubt be economy to build them of concrete and steel.

Telegraph Service at Football Game.

During the Harvard-Yale football game at Cambridge, Mass., on November 22, about 50 operators were stationed on top of the Harvard Stadium, from which point connection was made with many of the principal eastern and western cities over the wires of the Western Union and Postal Telegraph companies and of the American Telephone and Telegraph Company. Direct wires connected with Chicago, New York, Philadelphia, Washington and other cities, the Western Union company operating 30 circuits. Two operators placed in the players' dugouts on each side of the field kept the press operators in touch with all changes in line-up. The New England Telephone & Telegraph Company operated a special talking circuit from the side lines to the Cambridge exchange, whence the scores were relayed to all offices in the Boston metropolitan district.

Rapid Transmission of Press Matter.—Mr. H. S. Muggeridge, chief operator for the Associated Press at Kansas City, Mo., on November 4 transmitted matter on a Missouri and Kansas press circuit at an average speed of 3,000 words per hour for the day. For the week ending November 8, Mr. Muggeridge sent 98,150 words in 2,110 minutes actual sending time, this being a little more than 2,800 words an hour, or forty-seven words per minute for the week.

MUNICIPAL ELECTRICIANS.

UNDERGROUND WIRES IN GRAND RAPIDS.—The wires of the fire-alarm system in Grand Rapids, Mich., are to be placed underground.

ELECTROLYSIS IN ATLANTA.—It is stated that the newly installed fire-alarm system in Atlanta, Ga., is threatened with damage by electrolysis. Mr. R. C. Turner is the city electrician.

NEW PATROL SIGNAL SYSTEM IN NEW YORK.—A flashlight and telephone system of police signaling is being tested in New York. Each street post is in direct telephone communication with police headquarters and is surmounted by a green glass globe. When it is desired to call a patrolman while on duty the green light is flashed at intervals until the call is answered.

NEW AUTOMATIC FIRE ALARM.—A new automatic fire alarm is described in the *Journal of the Franklin Institute,* Philadelphia, by Mr. F. A. J. Fitzgerald. It consists in the use of a thermoscope in which the active element is a substance called thermitite, a preparation of silver sulphide. If one of these thermoscopes is put in a circuit with a small six-volt tungsten lamp and three dry cells connected in series, the lamp will not light up; but if a lighted match is held under the thermitite the lamp almost instantly begins to glow with full candle-power. If the match is removed and the piece of thermitite cooled in any way, the lamp is extinguished. In the use of thermitite as a thermoscope an alternating current must be employed.

Chicago Morse Commercial Club.

The Morse Commercial Club of Chicago, composed of members of the commercial department of the Western Union Telegraph Company, was organized December 4, at the Sherman House, to perpetuate the memory and achievements of Professor Samuel F. B. Morse, the inventor of the telegraph, and to promote the social and material well-being of its members and the company they represent.

The organization of the club was preceded by a banquet, which was attended by fifty officials and heads of the commercial department.

A very interesting and instructive address, explaining the objects of the club and the work which it is expected to accomplish, was delivered by Mr. John FitzPatrick, district commercial superintendent. After a lengthy and animated discussion, the following officers were elected for the ensuing year: John FitzPatrick, president; Loren J. Mink, vice-president; James G. Dempsey, secretary, and Harry W. Baker, treasurer.

The Morse Commercial Club will hold monthly sessions to discuss matters of importance of a commercial nature, and provide a series of entertainments for the members and their wives and friends. The first social event of the new club will be given January 9, 1914.

Book on Wave Meters.

"Practical Uses of the Wave Meter in Wireless Telegraphy" is the title of a new book by Lieut. J. O. Mauborgne, of the United States Army, issued by the McGraw-Hill Book Company, New York. This work was first prepared as a pamphlet, published privately by Lieut. Mauborgne, for use at the army signal school at Fort Leavenworth, Kan. It was later adopted for use at that school, and the pamphlet has been revised and enlarged to the present book form to meet the needs of commercial operators and technical schools.

The type of wave meters in use in the United States Signal Corps and the use of wave meters are described, also measuring wave lengths and tuning the sending stations. Other chapters cover measurement of capacity and inductance, measurements of wave length of the receiving station, etc.

It is a book of practical value to all interested in wireless telegraphy, as it contains a description of the principles and practical uses of wave meters, a knowledge of which is not only of value to every operator, but essential under the present statutes.

The illustrations were especially prepared for this work, and are very clear.

The price of this book is $1.00 per copy. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Mr. T. E. Crosson, of the Central District and Printing Telegraph Company, Greenville, Pa., writes: 'I am enclosing check for another year. So long as I am in the telephone business I cannot get along without the AGE."

LETTERS FROM OUR AGENTS.

PHILADELPHIA POSTAL.

Mr. J. H. Wilson, who has for some time past been filling the joint position of cashier and assistant manager, has been relieved of the duties of cashier and will devote all his time to the position of assistant manager. Mr. Chas. F. Meyers, formerly of the superintendent's office, has been appointed cashier, Mr. John H. Hardy succeeding Mr. Meyers.

Mr. O. C. Balmer has returned after a short absence in Reading on company business.

Mr. A. J. Eaves, of the electrical engineer's office, New York, was a recent visitor.

PHILADELPHIA WESTERN UNION.

Joseph S. Slater, aged thirty-eight years, chief clerk to Mr. R. J. Meigs, former district plant superintendent in this city, died on December 2 of blood poison, after a week's illness. Deceased entered the service of this company in this city in September, 1890, as a clerk in the bookkeeping department. The funeral took place December 6 in Merchantville, N. J., and was largely attended by officials, office associates and friends. The pallbearers were F. R. Webb, P. E. Brown, J. W. Collins, J. W. Benckert, J. O. Edmondson and F. W. Klein.

Mr. E. P. Totman, of Boston, Mass., assumed the duties of district plant superintendent December 1, vice Mr. R. J. Meigs, transferred to New York. The Quaker City hand of good-fellowship is cordially extended to Mr. Totman, though its grasp on that of his predecessor is reluctantly relinquished.

Rubber Telegraph Key Knobs.

No operator who has had to use a hard key knob continuously should fail to possess one of these flexible rubber key caps, which fits snugly over the hard rubber key knob, forming an air cushion. They render the touch smooth and the manipulation of the key much easier. Price, fifteen cents. J. B. Taltavall, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Mr. Thomas P. Murphy has been appointed chief clerk to the district plant superintendent, made vacant by the death of Joseph S. Slater. Mr. Murphy has been with us since his boyhood, and is highly esteemed by his superiors as well as by his associates. His knowledge of the telegraph business is broad and thorough, and, being a perfect master of detail, his success in his new position is assured.

Messrs. E. B. Saylor and J. A. Hill, of New York, were among the recent visitors to this city last week.

ST. LOUIS WESTERN UNION.

The Western Union Electrical Club of St. Louis held its regular monthly meeting December 3, in its new room, in the Carnegie library building, on Olive Street, and we congratulated the committee on its wise selection of quarters. A number of the members were present to listen to the lecture on "Testing by the Wheatstone Bridge Method," by Mr. W. L. Rhodes, of the American Telephone and Telegraph Company. Questions were asked and replied to by the lecturer. At this meeting the question of a dance in the near future was taken up, and a committee was appointed by the president, consisting of Messrs. E. L. Frey, F. Meinholz, A. Templemeyer and J. Fallinger, to make arrangements for carrying the project into effect.

Mr. E. P. Powers, loop chief in this office, is absent from duty on account of the death of his mother-in-law, Mrs. V. Chevreaux, who died on December 3.

Mr. P. D. Herrin, district wire chief of this office, is spending a few days in Kansas City, Mo., on company business. He is accompanied by Mr. E. L. Morgan, wire chief. Mr. E. H. Moore is acting wire chief during the absence of Mr. Morgan.

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