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MODERN ELECTRICS

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"THE ELECTRICAL MAGAZINE FOR EVERYBODY"

MODERN ELECTRICS

Vol. I. FEBRUARY, 1909. No. 11.

The High Tension Transformer

By M. A. Deviny.

The high tension alternating current transformer for producing exceedingly high potentials from a low potential source of supply has been so perfected in recent years that it is now rivaling the induction coil for general experimental purposes, and, owing to the many marked advantages possessed by it over the ordinary type of induction coil, it is rapidly supplanting the latter in nearly all of the high powered long distance wireless telegraph stations. The reasons for this substitution are many; it being chiefly due to the extreme simplicity, high efficiency and the possibility of construction so as to obtain large outputs—three very important factors in connection with long distance commercial transmission—which are possessed by the transformer.

The principle upon which the device operates is, no doubt, familiar to the majority of the readers of Modern Electrics, but, as is the case of all electro-magnetic appliances, a thorough understanding of its action can only be obtained by a complete mathematical analysis of the considerations involved, but for the benefit of those who have not studied the subject, a brief summary of the general operating principles may be of interest.

The transformer in its simplest form consists primarily of two electrically independent coils of insulated wire, of any desired number of turns, which are wound upon a closed iron ring in the manner shown in Fig. 1. If a key and a battery be connected in circuit with the primary coil P, and the terminals of the secondary coil, S, be connected to a galvanometer, a momentary deflection of the galvanometer needle will be observed when the key K is depressed, while on releasing it and opening the circuit, a deflection in the opposite direction will be observed. This example of electro-magnetic induction may be explained as follows:

When the primary circuit is closed by depressing the key, the battery current in passing through the coil P strongly magnetizing the core C, setting up in it a magnetic flux which, in traversing the core, necessarily passes through the coil S. The sudden introduction of the magnetic lines of force into S induces in it an electro-motive force, which, when the circuit is closed through the galvanometer, gives rise to a momentary current in it, thus causing a deflection of the needle. When the key K is released, however, the primary current ceases to flow and the magnetism of the core vanishes; the sudden withdrawal of the lines of force from the secondary induces in it an electro-motive force which will be of opposite polarity to that produced when the circuit was closed, and hence the current produced will flow in the opposite direction through the galvanometer and thereby causing a reverse deflection

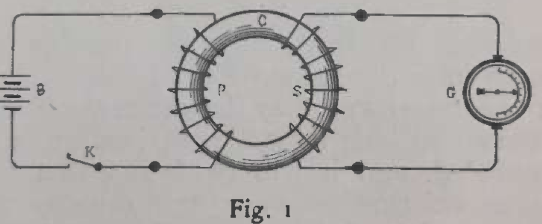


Fig. 1

From this it is evident that if some means were provided for continually making and breaking the primary circuit a sustained alternating current could be obtained from the secondary winding.

This is exactly the purpose of the interrupter in the primary circuit of the ordinary induction coil which, when no condenser is shunted across the vibrator terminals, delivers a true alternating current when the secondary circuit is closed. If instead of employing an interrupter, we were to connect the terminals of the primary coil P directly across the line supplying an alternating current of the proper voltage and frequency as is shown in Fig. 2, the variations in the magnitude of the current through the various portions of the cycle will cause corresponding variations in the magnetic flux produced in the core with a consequent variable induced electro-motive force in the secondary.

The magnitude of the E. M. F. so induced in S will be dependent upon the amount of magnetism produced by the primary, which in turn will be dependent upon the strength of the primary current, and the E. M. F. will also depend upon the number of turns composing the sec-

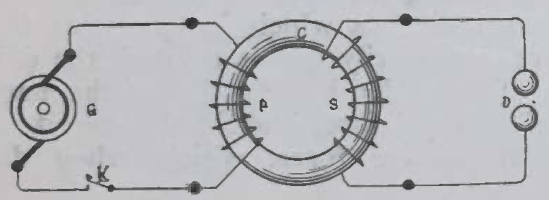


Fig. 2

ondary. By increasing the number of turns in S the value of the induced electro-motive-force may be made anything desired so long as sufficient insulation is provided, and it will be found that the ratio existing between the number of turns in P and those comprising S is exactly equal to the ratio of the electro-motive-forces of the two circuits. Thus, for example, if it is desired to raise the potential of a 100-volt circuit to 1,000 volts, it is necessary that the secondary coil of the transformer employed shall have exactly ten times the number of turns as the primary coil. But in having ten times the number of turns, the secondary will also have ten times as much resistance and hence the current in S will be only one-tenth of that in P. Thus it can be seen that the current in each of the coils is inversely proportional to their voltages and hence the energy of the two circuits—neglecting the losses in transformation—is equal, these principles being applicable whether the transformer is used to raise or to lower the voltage of the supply.

If the cores of transformers were made of a solid ring of iron as is indicated in Fig. 2, the current in the primary coil would induce in it an electro-motive-force for the same reasons that one is induced in the secondary coil and, although of small value, this would give rise to very large currents in it due to the exceedingly low resistance of the comparatively large mass of iron. This would cause the core to heat and thus greatly reduce the efficiency of the device. In order to reduce these "circulating" or "eddy" currents, as they are called, the cores of all transformers are invariably made up of very thin sheets of soft iron which are carefully insulated from each other and built up like the leaves of a book. The insulation between these "laminæ" consists usually of a coat of some good insulating varnish or shellac and as the difference of potential between them is exceedingly small, this insulation is generally more than sufficient. This form of construction reduces the loss by eddy currents to such an extent as to render it almost negligible.

On account of the difficulty of winding the wire on a circular magnetic circuit the cores of transformers are usually made rectangular in form, the coils being form-wound and placed over two opposite sides of the rectangle after which the cores are then bolted together in the manner shown in Fig. 3. In commercial transformers, where maximum efficiency is of extreme importance, one-half of each of the primary and secondary coils is usually wound up on each limb, they being placed over each other and carefully insulated. The order of the primary and the secondary is also reversed upon each of the limbs, that is, on one limb the primary is put next to the core and the secondary placed over it, while on the other limb the secondary is placed next to the core and the primary placed on top of it. This distribution of the two windings is for the purpose of reducing the leakage of the magnet flux around the cores to a minimum and thereby causes all of it that is produced by the primary to be utilized to advantage in generating electro-motive forces in the secondary.

The continual reversal of the polarity of the magnetism in the core of a transformer causes it to heat considerably unless special precautions be taken against it. This is due to the friction between the molecules of the iron constituting the core and is known as "hysteresis," or magnetic friction. It is dependent upon the quality of the iron used in making the core and to the degree of magnetization produced by the current, and it can only be reduced by using a core of large cross-section and by employing the softest grade of iron that is obtainable.

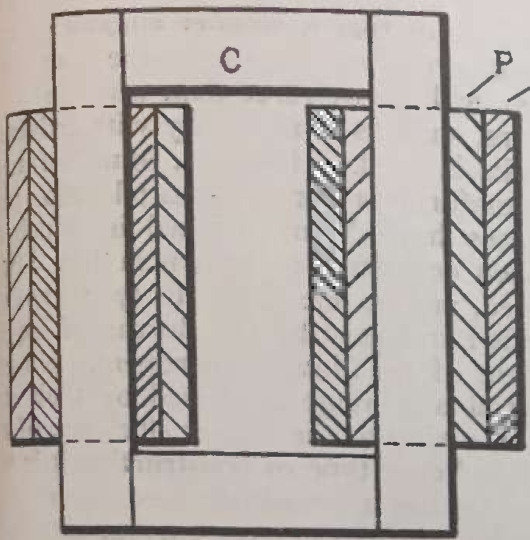


Fig. 3

The action of the alternating current transformer under varying conditions of load is most remarkable. The primary coil is often of very low ohmic resistance and yet when it is connected across a comparatively high voltage source of supply practically no current will flow into it so long as the terminals of the secondary are left open. As soon as a load is put upon the secondary, however, current will flow into it, the amount depending entirely upon the current demanded by the secondary load. This is due to the following causes:

When the primary circuit is closed (Fig. 2), the alternating current rushes into it, thereby producing a magnetic flux in C which oscillates in unison with the changes in the value of the current throughout the different portions of the cycle. This flux, while generating an electro-motive-force in S, must, in traversing the core, necessarily also pass through the primary P and in doing so it generates an E. M. F. also in the latter. But this electro-motive force is directly opposed to that impressed upon P from the line and when S is open it is nearly equal to it. Hence the current taken by P under these conditions will be dependent upon the difference between the E. M. F. of the line and the counter E. M. F. or the self induction of P itself, and therefore it will be of very small value. If, however, a load consisting of some lamps or motors be connected to the secondary a current will flow through it which will tend also to magnetize the core just the same as P, but the magnetism so produced will be in opposition to that produced by the primary and hence the latter will be reduced slightly in value. This reduction will diminish the number of magnetic lines of force passing through P and the opposing or counter E. M. F. will therefore drop slightly, thereby causing the difference between it and the impressed E. M. F. from the line to become greater, which will in turn increase the value of the E. M. F. which is effective in producing the current in P, and in this manner the more current taken by S the greater will be the amount that will flow into P.

In transformers designed for high potential work thorough insulation is a very important factor and designers aim to make this feature as perfect as possible. The coils are very carefully insulated from the cores and from each other and in order to render the insulation still more efficient the entire transformer is placed in an iron tank which is then filled with some good insulating mineral oil. The oil, while greatly improving the insulation covering the wire, is of great advantage in several other respects. It possesses the very desirable and important property of automatically sealing any puncture in the ordinary insulation which might occur and at the same time it also provides a most efficient method of cooling the smaller sized transformers by thermal convection.

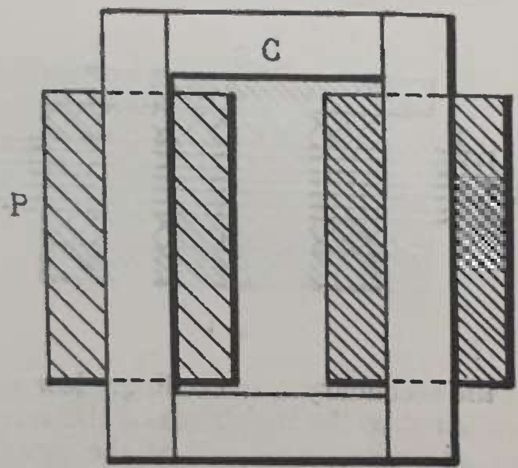


Fig. 4

In high tension transformers for experimental use and for wireless telegraph work, where extremely high efficiency is of secondary importance, the coils are wound in sections and are often mounted separately on each of the two main limbs of the core after the manner shown in Fig. 4. This is done in order to further improve the insulation and to render the two circuits mechanically independent and thereby greatly facilitating repairs when necessary. Such transformers, however, are never wound to produce such high voltage as those commonly obtained from induction coils of equal output and therefore the spark obtained from them is never very long. From fifteen to forty thousand volts is the usual secondary potential for which the secondaries of wireless telegraph transformers are wound. In some instances this is increased to as high as 60,000 volts, but in many of the smaller transformers even 10,000 volts is sometimes employed. The spark obtained is very short, but as the resistance

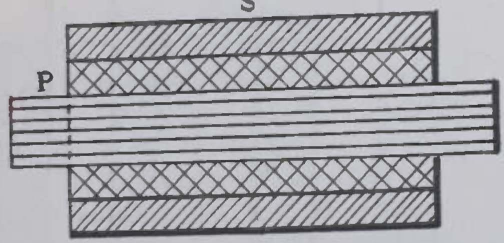


Fig. 1

of the secondary is exceedingly low when compared to the resistance of the secondary of an induction coil of the same capacity, the current obtained is relatively very large and the spark that it produces is thick and hot, thus rendering it of great advantage for wireless transmission. These transformers are never rated by the length of the secondary spark but their output is always expressed in kilowatts as in the case with commercial transformers.

The high tension transformer requires but very little care and attention after it has once been installed and owing to its simple and rugged construction and the absence of all interrupters and other delicate and troublesome adjuncts there is practically nothing to it to get out of order and cause annoyance. On the other hand, they are exceedingly dangerous and must be handled with the greatest of caution, as a shock caused by contact with the secondary of even those of the smallest sizes will very frequently prove fatal. This is due to the comparatively large current which is delivered by the secondary and for this reason extreme care must be exercised in handling them when in operation.

The high efficiency of the transformer as compared to the induction coil is largely due to the closed magnetic circuit upon which its coils are wound. This forms a path of very low reluctance with the result that a smaller amount of current is required to produce the same number of lines of force than when the open core, such as is necessary with induction coils is used. However, some forms of transformers for wireless telegraph purposes have been designed in which an open core such as shown in Fig. 5 was used, and at one time this type was specified and used by the Bureau of Equipment of the Navy Department. No material advantage is gained by their use, and owing to the higher efficiency of the closed core type of construction it is still by far the most widely used form.

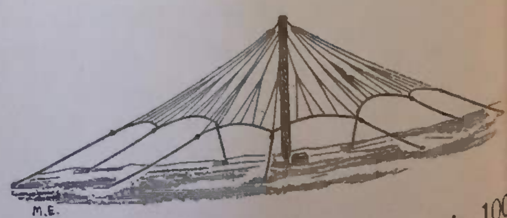
In view of the large current obtainable from the transformer, together with its high efficiency it has displaced the induction coil in nearly all commercial ship and shore stations capable of sending 100 miles or more. It is also considerably used by experimental stations sending below this distance and there can be but little doubt that the near future will see it installed in many amateur stations of moderate power.

UMBRELLA ANTENNA.

(By our Berlin Correspondent.)

The new wireless station at Nauen (Germany) is one of the most powerful in the world.

The antenna, which we reproduce herewith, is of the so-called umbrella type, as its shape resembles an umbrella. The



total height of the center mast is 100 meters, from which the aerial wires radiate in all directions.

The actual surface covered by the aerial wires is 180,000 square feet.

A New Idea in Push Buttons

By PIERRE MEDINGER.

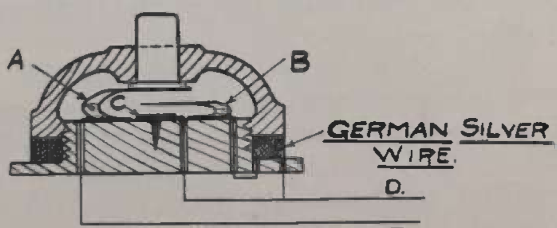
Perhaps with the majority of electrical bell installations, several push buttons are usually connected with this system. With such installations, if one desires to know who is ringing the bell it becomes necessary to install a house call annunciator. However, as the cost of such apparatus is quite high and the same invariably costs more than the rest of the installation, and as it also requires a good deal more wire one very often takes recourse to using several bells having different sounds, or if this is not possible one uses simply one bell and gives different signals from the various push buttons, viz., from this room one rings twice; from another room three times, etc.

-FIG 1.-

This method is, however, unreliable, as such signals are easily forgotten and it happens sometimes that instead of pushing the button once, two short contacts are made, and the signals therefore are everything but satisfactory. The writer will describe below a few push buttons which are entirely automatic, each of which giving a certain signal. As the construction of such push buttons is very simple indeed, readers of MODERN ELECTRICS will without doubt welcome the innovation.

An ordinary push button, some German silver wire No. 18 or No. 20 B. & S. and a few brass tacks, is all that is needed. Take an ordinary push button and lift up the lower spring B, Fig. 1. The spring should not touch the wood below. Directly under the wood insert the brass tack C in the wood. From the two inleading wires D and E, one connects E with the spring A, and D on the brass tack C.

The cover of the push button is then screwed back, but not entirely, only about half way down which is shown clearly in Fig. 2. In this groove the German silver wire is wound, about twenty to thirty feet being needed. One end of this wire is connected with the spring B the other end with the wire D. This finishes the push button. If now the button is depressed the upper spring A touches the lower one B, and the current is connected through the resistance of the German silver wire: the bell will ring faintly. Being pressed down furthermore the spring B will touch the tack C, and the current will pass through the bell with its full strength as there is no resistance in the circuit; the bell therefore will ring loud. As soon as the button goes back contact C B is broken, contact B A still established, the bell will ring faintly. If we replace the faint



-FIG 2.-

M.E.

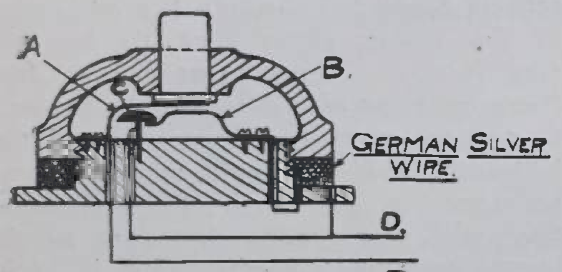
ring with a dot the loud ring with a dash, the push button will give the following signal: - — -

In connection with the second push button just as easily constructed the spring B is also lifted up but the brass tack is pushed in the wood in such a manner that the spring B will press against its lower rim from *underneath*. (One must be careful that the spring A when going down will not touch the tack.) By referring to Fig. 3, the German silver wire is connected between the springs B and wire D. If now the button is depressed, spring A will first touch the spring B, and the current goes from A, B, C, D: the bell will ring loud. During the next moment contact B C is broken and the current will have to pass through the German silver wire: the bell will ring faintly. After the button is released and B touches C again the bell will sound loud. Signal: — - —

No. 3 push button is easily constructed the same as the one shown in Fig. 3, however, one simply leaves away the German silver wire resistance. This button will give the following signal: — —

A fourth push button is made in the manner of the first one, Fig. 2, however one leaves away the contact C. On account of the resistance which is in the circuit of the bell, same will ring faint. Signal: -

For a fifth push button, one uses a



-FIG 3.-

regular one without any alterations and same consequently gives the following signal: —

These five variations will probably do in most cases, and the author who possibly, like many more readers of MODERN ELECTRICS, has been in the habit of installing electrical systems, has had excellent results from same.

WIRELESS BY COMPULSION.

Washington.—Another wireless bill, more sweeping than any of those yet introduced in the House, was presented to-day by Representative McCall of Massachusetts. It provides that any ship carrying passengers from or to any ports in the United States, or between them, shall be required to have a wireless outfit if any stage in the ship's itinerary is 100 miles or more.

The three bills bearing on this subject will be given a hearing before the Merchant Marine Committee within a few days.

"ELECTRIC SAFETY VALVE."

By EARLE WILLIAM GAGE.

When the pressure in a steam boiler reaches the danger point, beyond which it would be apt to explode, the steam opens a valve and escapes. Thus the very pressure that constitutes the danger furnishes also a refuge from it.

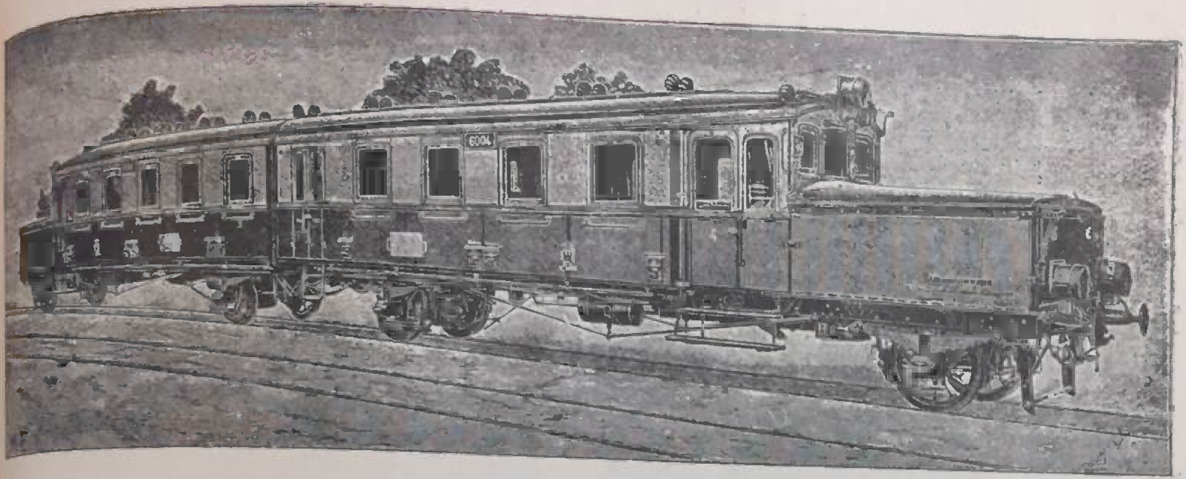
In a system of electric wiring the fuse plays a somewhat similar part, for when the current becomes sufficiently strong to do damage the fuse melts and breaks the circuit. The noise and flash caused by the "burning out" of an electric fuse are somewhat startling, but, like the sudden hiss of steam from a safety valve, they are a sign of relief, not of present danger. The likeness between a fuse and a safety valve, however, is not quite complete.

When the boiler pressure is lowered to the safety point the valve closes and all goes on as before. The burning out of the fuse, on the contrary, cuts off the current altogether, putting a stop to the operation of the system until a new fuse can be inserted.

A recently discovered property of some metals, such as aluminum and magnesium, however, makes it possible to construct a real electric safety valve, which is already in use on transmission lines of high voltage. If two aluminum plates be immersed in any one of various liquids and a current be sent through the combination the flow lasts only for a fraction of a second, for an insulating oxide is formed on the metal surfaces. An increase in voltage causes a short resumption of flow and another stoppage, due to a thickening of the insulating layer. This goes on until the current reaches four hundred volts, when the insulation is permanently broken down.

By coupling several cells in series this limiting voltage may be increased as desired. Thus a series of ten will not allow the current to pass freely below four thousand volts. If such a series be connected to a transmission line at one end and to the earth at the other it will divert part of the current to the ground as soon as the voltage exceeds four thousand, and "close up" again when the pressure drops below this limit, thus acting precisely like the safety valve of a boiler.

Accumulator Railroad.



The Prussian Imperial Railroad now has in operation 19 trains of the type shown in accompanying illustration. These trains, composed of two cars, usually, have in front and in the rear a special tender carrying the storage batteries which are used for the propulsion of the odd looking "train." These trains are used a good deal on lines which carry but few passengers, and also for the quick despatch of mails and parcels. The storage batteries are capable to carry the train over a distance of about 100 kilometers, each car having two electric motors furnishing 80 H. P. each. So far the new cars have proved entirely successful.

SINKING OF THE REPUBLIC.

The United Wireless Station at 42 Broadway, New York City, did very efficient work in reporting news of the Republic disaster to the various newspapers of the city. Not only did they keep in touch with the course of events from the time of the crash between the Florida and the Republic, through their operator stationed on board the Standard Oil tug "City of Everett," whose offer of assistance was refused by Captain Sealby of the Republic, although it is conceded now that this might have saved the ship, but they were the first to give the news to the papers of the sinking of the ship at 8.30 p. m., January 24th, off No Man's Land when in tow by the revenue cutter Gresham. In fact, record time was made in the transmission of the news of the sinking of the ship. Mr. Burchard the operator on duty at New York 'phoning the newspapers immediately after receiving the message and they knowing of the fact five minutes after the ship went down. Fifteen minutes later extras were already on the street.

SOCIETY OF WIRELESS TELEGRAPH ENGINEERS.

At a meeting of the Society of Wireless Telegraph Engineers held at 192 Bay State road, Boston, Mass., Jan. 4, Dr. R. T. Wells delivered an address on the subject of "The Inductance, Resistance and Impedance of Telephones as a Function of the Frequency of the Current Actuating Them."

Mr. Sewall Cabot spoke upon the power rating of wireless telegraph stations, and Mr. John S. Stone spoke on the audibility of wireless telegraph signals in their relation to the spark frequency at the transmitting station. He gave the results of a mathematical inquiry which indicates that the audibility of wireless telegraph signals is more a function of the harmonics than of the fundamental of the wave-train frequency.

The next meeting of the society will be held on Feb. 1, when Mr. C. E. Russell will present a paper on the subject of a "New Magnetic Detector," and Mr. E. D. Forbes another on "The Singing Arc."

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EDITORIALS.

At last wireless telegraphy has had its real christening. For the first time in history, due directly to wireless telegraphy a terrible disaster was averted and close to 500 human beings are now alive instead of resting on the bottom of the ocean, like so many others, before the days of wireless.

Only a few weeks ago there were many people who doubted the practicability and usefulness of wireless. In fact the public at large rather had an idea that wireless was a scientific toy, and on a ship nothing but a diversion for passengers, who had too much money to spend by sending telegrams, "which never arrived at their destination, anyway."

All this has been changed in less than a week. Wireless has at last become public property, a position which it was denied for years. It has stood the fire test and has emerged from it gloriously.

Accidents such as the one just witnessed when the steamer Florida collided with the ill-fated Republic will soon become a thing of the past, thanks to wireless. Already the U. S. Government has taken steps to make wireless compulsory on ocean ships and other Governments will undoubtedly follow soon, as the tremendous importance of the subject has at last been realized.

However, when talking of the Republic, let us not forget its gallant wireless operator, John Robinson Binns, the now famous "C. Q. D." man. It was due chiefly to his efforts that the passengers of the Republic were saved so promptly without the loss of a single life. He has set an unforgetable example to all wireless ship operators and has shown us what the duties of the operator are when his ship is sinking. His story will be found elsewhere.

The announcement of the Wireless Association of America in the January number has brought such an avalanche of mail that it is impossible at this date of writing to do the entire correspondence justice. Members and prospective members will please have patience, all letters will be answered as fast as it is possible to write them. Apologies are also due new members who ordered the association button after January 15. As stated in the January issue only 1,000 buttons were ordered; this entire amount had been mailed at about the 15th, and the second thousand could only be sent out by January 26th. The delay in shipping was unavoidable, as the great demand had not been anticipated, and the Editor trusts that the new members will understand the situation now.

The editor is truly amazed at the tremendous interest shown in the association, and as up to this writing over 3,200 members have applied, it is safe to say that the Wireless Association of America is the largest official wireless association in the world.

A membership application card has been issued which will be sent free of charge to any prospective member.

The demand for the association button is so tremendous that we will possibly run short again. Every mail brings dozens of orders, and if you do not receive your button at once, please do not get impatient. The buttons are shipped just as quick as the factory can turn them out and just as quick as our mailing department can address and ship them.

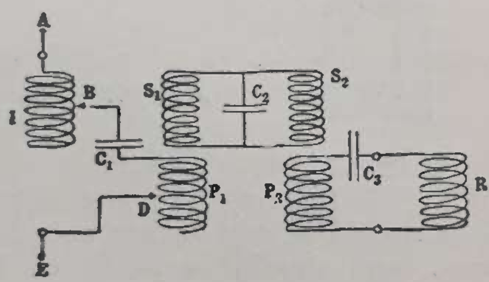
Members are requested to be kind enough to refrain from asking for information as to members near their localities at least till the 15th or 20th of this month.

On account of the great amount of work necessitated in classifying and assorting the membership cards and the mail, it will be an impossibility to furnish any information before that date.

The Editor, in behalf of the Wireless Association of America, wishes to thank all members for the interest shown and trusts that by next month the amount of members will have doubled.

TUNED WIRELESS TELEGRAPHY.

At the recent exhibition of the Physical Society in London, the Marconi Wireless Telegraph Company showed a multiple tuner for tuning a wireless telegraph receiver so as to render it immune to interference from other stations. It can also be used for measuring the lengths of the transmitted and received waves and for estimating the distance of a known station. The instrument has been designed so as to stand several climates and comparatively rough usage, and is suitable for all wave lengths from 300 ft. to 8,000 ft. Its general principle is shown in illustration where A represents the aerial, E the earth, R the receiver or detector. There are three separate circuits, termed the aerial circuit, the intermediate circuit, and the detector circuit. The aerial circuit passes from the aerial A, through the aerial tuning inductance I, aerial tuning condenser C_1 and aerial inducing inductance P_1 to the earth at E. The intermediate circuit consists of two equal inductances S_1 and S_2 connected in parallel to the intermediate tuning condenser C_1. The detector circuit consists of an inductance P_2 in series with the detector tuning condenser C_2 and detector R. The inductances I and P are adjustable at B and D respectively, and the condensers C_1, C_2 and C_3 are all adjustable, so that the three circuits can be tuned to the received wave length. The oscillations in the aerial circuit then induce (by means of P_1 and S_1) oscillations in the intermediate circuit, which in turn induce (by means of S_2 and P_2) oscillations in the detector circuit. In addition to the above adjustments, the two coils S_1 and S_2 may be rotated relatively to the coils P_1 and P_2 so that the couplings between the three circuits may be varied. The condensers C_1, C_2 and C_3 are continuously variable from zero to a maximum of 10 jars (a jar being 1,000 cm), but the range of the instrument is increased by other condensers placed in parallel or series by means of the tuning switch. In



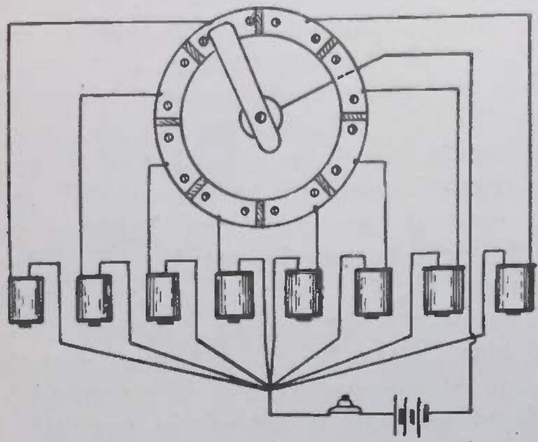
addition to the parts shown in cut, the instrument is fitted with a micrometer spark-gap and shunt inductance (of the order of 80,000 microhenries) connected between the aerial and earth terminals to prevent the accumulation of an electrostatic charge in the aerial, with a change switch by means of which the whole of the tuned circuits may be cut out, and with a tuning switch by means of which the capacity in the intermediate and detector circuits may be increased to a maximum of 30 jars. When signals from the station to which it is required to communicate are received the aerial tuning inductance and the aerial tuning condenser should be adjusted till the strongest signals are obtained. The intensifier handle is set to 90 degs., and the tuning switch to the wave length roughly indicated by the amount of the aerial tuning inductance and condenser. Then the change-over switch is thrown over to position "tune," and the intermediate and detector condensers varied together till the best signals are obtained.

(Continued on Page 414)

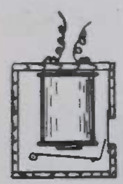
Electrical Registering Weather Vane

By C. C. Whittaker.

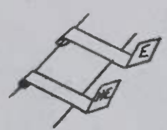
In the following article I shall endeavor to describe the construction and connection of a weather vane that shall indicate each of sixteen different directions of the wind.



-FIG. 1-



-FIG. 2-



-FIG. 3-

In Fig. 1, the ring with the eight divisions should be two inches outside diameter, and should be made of hard wood. The distance between each adjacent copper segment should be 1/8 in. Each segment is screwed to the hard wood ring by two screws which must be countersunk.

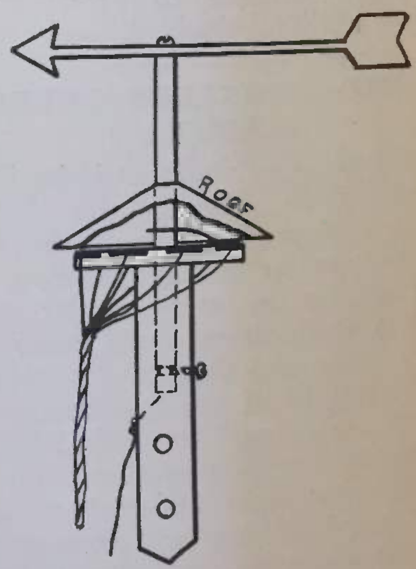
The switch arm which connects with and slides on each segment is fastened to the main shaft and is 1/4 inch in width so that it can make a contact on two adjacent segments at the same time.

The magnets should be about an inch in length and should consist of about fifty turns of wire. They are suspended from the top of a rectangular box having a long glass window in its front. The whole length of the box ought not to exceed ten inches. Fig. 2 shows an end section of this box with one of the magnets and the armature indicator just below it.

These indicators are shown in more detail in Fig. 3. They consist of strips of thin sheet iron 1 1/2 inches long and 1/2 inch wide. One-half inch from one end they are bent so as to form a right angle. The other end is bent around a stiff wire which extends lengthwise of the box just under the back edge of the magnets. This stiff wire forms the axis upon which each of the indicators turn when attracted by the magnet immediately over it. The short arm of the indicator has attached to it a piece of white cardboard bearing an initial of a point of the compass, as: E., N.E., N., N.W., etc.

By having eight segments on the ring, eight points of the compass each have a separate magnet and indicator. As an illustration, let the magnet at the right indicate the east and the one adjacent to the left indicate northeast. Then, if the switch arm makes contact with the two segments which complete the circuit with these two magnets, both indicators will be attracted and the direction of the wind as indicated will be E.-N.E. Thus, by making the switch arm wide enough to touch two segments at a time, the number of indications is doubled.

Fig. 4 (not drawn to scale) shows an upright cross section of the part mounted out-of-doors. To the vertical shaft, the



-FIG. 4-

vane, the switch arm, and the small roof are rigidly fastened. At the lower end of this shaft, a narrow groove is cut at right angles to its longitudinal axis. A set-screw screws into this through the outside socket to keep the shaft from being blown out.

Two or three dry cells should be sufficient to operate the magnets.

An ordinary push button is inserted into the circuit by means of which the circuit is completed when the wind's direction is to be ascertained.

Operator Binns' Wireless Log

(The log begins at 6.38 a. m., when Binns found himself on the floor of his cabin and the splintered woodwork piling in about him. He lost only a second rushing to his wire and calling C. Q. D. Owing to the darkness the time is fixed approximately.)

The most dramatic tale of the sea ever unfolded is this log of Binns. It reads:

"6.38—Called 'C. Q. D.'

"6.40—MSC (Siasconsett) answered C. Q. D.

"6.41—Tell him 'Republic shipwrecked. Stand by for captain's message.' Cabin wrecked, telephone gone, must run to captain's bridge.

"6.42—Send MSG (captain's message) 'Republic rammed by unknown steamer 175 miles east Ambrose Light. Lat. 40.7, lon. 70. No danger to lives.'

"6.45—MSG says: 'Have wired Wood's Hole for tugs to send to your aid. Will also tell BC' (Baltic). Lever of key broken in darkness.

"6.50—Standing by MSC (captain's message) working BC. Can hear BC O. K. but impossible to get our weak spark.

"7 a. m.—Tell MSC occasionally our condition. 'Hurry up assistance.' Still pitch dark. Can't see lever.

"8.00—Now getting light. Send more MSG to MSC (Siasconsett).

"8.20—MSC calls us. Can't read our answer through jamming. Boat settling fast. Tried to tell them to hurry aid. Jamming fierce.

"8.30—BC now reads our spark. Mighty cold here. Tell him our condition and to make haste. Give him our position. Steward taking messages to and from bridge. My 'phone gone.

"8.45—Get MSC. He tells me BC and LI (La Lorraine) rushing to our aid.

"8.30 (about)—Florida comes up. Her bow is smashed. She willing to take our passengers. Transfer begins.

"8.46—Answer O. K. Tell BC and LI to 'Hurry, please, old man.' No sign of anything to help us. Passengers remarkably calm. Two bodies outside my room. Don't know who they are. Killed in their staterooms.

"9.12—Hear LI tell MSC 'We are rushing to MKC (Republic). Our boilers bursting.'

"9.15—Captain sends message saying passengers all aboard Florida and all O. K.

"9.45—LI (La Lorraine) calls us, but don't get our answer.

"9.47—LI now gets our spark. Asks 'What depth of water and what course shall we take. Thick fog. Hard to navigate. Have you got fog?'

"9.50—Reply. 'Thick fog here. Listen for our rockets. Florida about, but can't see her. Now 26 miles SW of Nantucket Lightship. Florida disabled, has no wireless and on starboard side. Our passengers on Florida.'

"10 a. m.—Working to BC. Giving him steering directions. Steward says we will surely sink and to watch for signal to leave boat. Heard that only two were killed. Jamming fierce.

"11.30—Hear LA (Lucania) faintly working MSC. He tells him of our condition.

"11.55—Get through to MSC again. Tell him we are in bad condition. To rush aid. Looks like we are going down.

"12 Noon—Working continually with BC who is coming fast. Got something to eat out of pantry. Haven't had anything to eat since last night. Only half dressed.

"2 p. m.—Still working continuously with BC and LI, but they can't find us. Ship settling fast. Tell BC. Stern going down.

"3.30—BC tells CQ (all stations) to keep quiet. He is getting near us.

"4.15—Working BC all the time. He'll be alongside shortly. He hears our rockets. Gee! I wish he'd hurry. This place isn't pleasant, but I'll stick with the Cap.

"4.30—BC still trying to locate us. Captain says: 'Hear bomb to eastward.' I ask BC if it was his. BC says 'Yes.' Tell him to steer to west. Fine work.

"5.10—BC now tells us she can hear our submarine bell. Fog not raising. Almost pitch dark yet.

"5.12—Tell BC we hear his last bomb to west-nor'west. Tell him to run east-sou'east.

"5.30 p. m.—Send MSG to BC.

"6.30—BC says 'Think we can find you.' Also, 'Think LI and LA have found Florida. Give me plenty notice when we are nearing you. Sending up rockets. Look out for 'em.'

"6.08—Tell BC his foghorn is getting stronger.

"6.14—LI says 'Can hear four blasts.' Tell him that it is Florida's foghorn and to go to her assistance if he can find her.

"6.20—BC now getting very close. Say 'Come carefully.' He is near our port side. Boat now lower. Very dark now. Funny BC can't find us. All alone here.

"6.40—BC tells LI to go to Florida and he'll stand by us.

"7—Tell BC to come extremely careful, as he is too close for comfort. We can't see him, however.

"7.20—Hear cheer. See Baltic through cabin. Fog lifting. Great guns! BC looks good to me! Captains exchange greetings. Sealby says, 'Come on our leeward and stand by to take up our boats.' Wireless now closed. Say good-bye to BC's 'Good-bye, old man, until we meet again.' Hate to leave Republic. Release key and go forward to take boats.

(When Operator Binns left his wrecked Marconi cabin he was off the Republic until next day, Sunday. Captain Sealby and Chief Officer Crossland remained aboard the Republic during the night. Binns insisted on rejoining his captain and took up his station when a select crew were sent aboard the Republic. Mr. Binns' next entry is at 9 a. m.)

"9 a. m.—Try station. Find everything O. K. Spark weak. Report to captain. Republic has big hole in port side. Covered with tarpaulin. Jammed abreast engine room. She looks like sinking.

"9.10 a. m.—Send message for captain asking where tugs are.

"10 a. m.—Give good-bye to Baltic. She has all of Republic's and Florida's passengers and part of our crew. Florida gone on. Commence with FI (Furnessia), who has come up to stand by.

"10.55 a. m.—Revenue cutter Gresham comes up. Takes line from our bows and commences towing. Tell FI to come to stern and stand by to take lines to steer us.

"1.30 a. m.—Tell RCG (Gresham) to come to starboard, as his line is fouling our port anchor. Republic appears to be holding up now. May save her.

"11.55 a. m.—Ask RCG what course he is taking. Reply nor'west.

"12 noon—Tell FI that RCG is taking nor'westerly course.

"12.30 p. m.—Towing operations now under way. Going mighty slow. Captain and crew numbers thirty-eight. All standing by captain.

"1 p. m.—Send message to MSC (Siasconsett) saying, 'Towing now. RCG ahead, FI astern, steering.'

"2 p. m.—Standing by. RCG and FI talking.

"3 p. m.—Listening in case of calls. No one wants me. FI and RCG talking about towing. No ships on horizon. Baltic and Florida disappeared.

"4 p. m.—Boat settling fast. Fear she can't stay up much longer. No time to get effects together.

"5 p. m.—Captain sends down and orders me forward. Ready to take to boats. Ship badly off. Go back for one last look at station and go forward. Last message to FI and RCG says 'Good luck, old man.'"

(Operator Binns and all but Captain Sealby and Second Officer Williams departed from the Republic at captain's orders. They went at once aboard the Gresham and stood by to watch the last struggle of the Republic. Two hours later the Republic went to the bottom).

OMISSION.

In the article "Modern Wireless Instruments," January issue, the following paragraphs were omitted for some unaccountable reason:

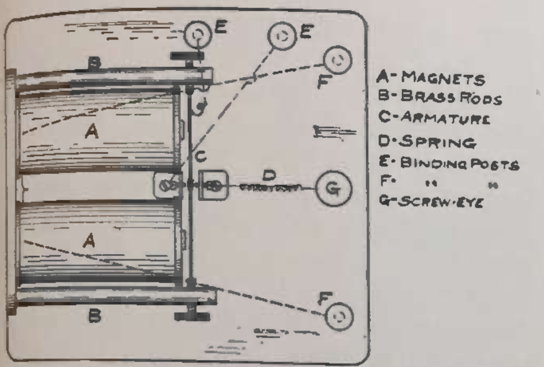
Above instruments are manufactured exclusively by the Radio-Telephone Co. of New York in connection with Dr. De Forest's patents.

Bulletins describing the apparatus at length will be sent to anyone upon application.

How to Make a 1,000-Ohm Relay

By A. R. Greenleaf.

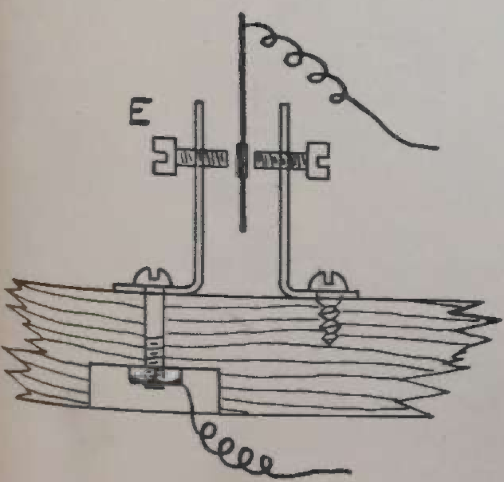
First, procure a 1,000-ohm magneto ringer from any dealer in telephone supplies, and remove the magnets from the box, detaching all other parts of the ringer.



-FIG. 1-

M.E.

Mount the magnets upon a base-board about 4 by 6 inches. Then make a soft iron armature as shown in Fig. 2, and solder to it a silver or platinum contact on one side, and a spring made of fine

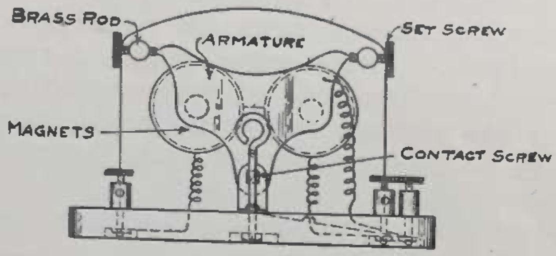


M.E.

-FIG.3-

copper wire (about No. 34), on the other. Fasten the other end of the spring to a screw-eye to get the required tension, as shown in Fig. 1.

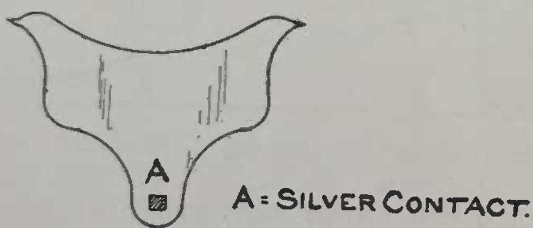
Make two brass rods BB, Fig. 1. Secure these to the base holding the magnets. At the other end of the rods, tap a hole to accommodate a thumb screw which should have hollow ends, in which the pointed parts of the armature C rest. On each side of the armature place a brass or copper up-



M.E. -FIG 2-

right holding a set screw, as shown in Fig. 3.

The connections are shown in Fig. 1, the wires leading from the magnets are connected to the binding posts FF, the standard holding the armature and the upright holding the set screw E (Fig. 3)



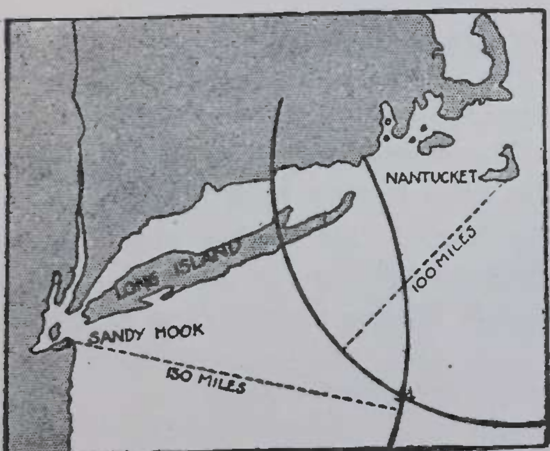
M.E.

are connected to the binding posts EE.

This relay, if adjusted well, is very sensitive, and can be used in wireless telegraphy.

Navigation By Wireless

Navigating a ship from New York to Europe or from San Francisco to Manila without taking an observation, is the latest prediction of scientists. M. Bouquet de La Grye, member of the French Academy of Sciences, has just devised a method by which the captains of ships at sea may regulate their chronometers without troubling their heads about the sun or the stars. He suggested to the French Naval Department that at a certain fixed hour every day a wireless message announcing the precise time be flashed from the Eiffel Tower in Paris.* Every vessel within a radius of many hundreds of miles would pick up the message and be under no necessity of taking observations to determine its longitude. The French Minister of Marine has accepted the suggestion, and



the Academy and naval officials are now working out the details of this plan, which will render such great service to mariners.

But this service is not to stop here. Several men of science have suggested that lighthouses along all coasts be equipped with wireless apparatus and that they flash wireless messages not only announcing the time, but that will enable ship captains to know exactly where they are at any hour of the day or night and in the thickest fog. Lieut. Lair, of the French Navy, explains a system that he has worked out, as follows:

A lighthouse emitting in every direction hertzian waves of absolutely constant intensity, the strength of which is inversely proportional to the square of the distance from the point of emission. The captain of a vessel fitted with an apparatus known as the bolometer, which measures this strength, could from it calculate how far he was from the lighthouse emitting the waves. On receiving such waves from two different points in succession he would, to find his position, describe two circles upon his chart, with the lighthouses as centres and the distances indicated by his bolometer as radii, and the point at which these circles intersect would be the position of the ship. On the accompanying diagram the captain of the ship has picked up a message from the Nantucket light and has calculated that he is just 100 miles distant from this point. He has also picked up a message from Sandy Hook, which tells him he is 135 miles distant from there. With Nantucket as a centre and 100 miles as a radius he describes a circle on his chart. With Sandy Hook as a centre and 135 miles as a radius he describes a second circle. His ship is at the point of intersection of these two circles.

These hertzian lighthouses could be distinguished one from another by the duration and intervals of their wave-emissions, just as lighthouses now are distinguished by the length of their flashes of light and the intervals between the flashes.

This process of Lieut. Lair's has been tried upon a small scale, and before it is finally adopted by the French Government it will receive a thorough trial on a large scale. There are difficulties to be overcome, such as maintaining the regularity of the emissions, regulating the receiving instruments and overcoming the variations in the electric tension of the atmosphere; but greater obstacles than these have been overcome, and it is not likely that these will prove insuperable.—*N. Y. World.*

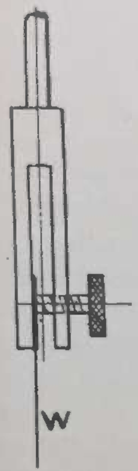
*Described at length, page 64, May issue, this magazine.

New Method of Securing Wollaston Wire

By H. Gernsback.

The Electrolytic Detector, which unquestionably is as yet the most sensitive detector, despite the fact that new ones are invented almost every day, has only one really bad feature, which is found in the delicate Wollaston wire.

-FIG. 1-



-FIG. 2-

M.E.

I do not mean that it is the wire itself, but, rather, the handling of same, which exasperates the operator, as the wire, being of a very minute size, does not stand much abuse. If Wollaston wire was cheap it would not make much difference, but as it sells from 25 to 40 cents an inch, for the finer sizes, one understands that an effective method to handle this wire has been sorely in demand.

For sake of the uninitiated let me say a few words about Wollaston wire.

It was invented by William Heyde Wollaston, an Englishman, and a famous scientist living in the former part of the last century.

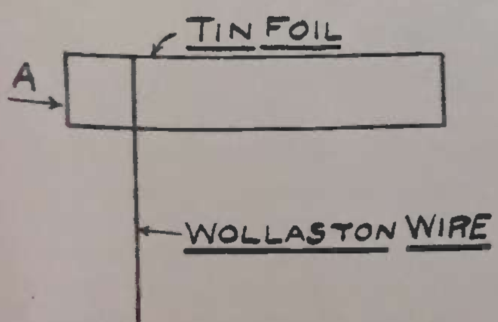
The wire is made by the following process: A platinum wire is coated heavily with silver. This coated wire is then passed through dies and it can be drawn to such extraordinary fineness as one hundred thousandths of an inch thick. This means of course that the entire wire is not of this size, but the so-called core, or platinum wire—still covered with a silver coating. This silver coating is easily dissolved in nitric acid, leaving the minute platinum wire exposed.

In wireless detectors Wollaston wire plays an important role. This is especially true of electrolytic detectors. While some writers suggest the use of thin platinum wires (0.001 to 0.005 inch diameter) it may be stated that such wire is absolutely unfit to use—at least when messages are to be received from distances over 5 to 10 miles.

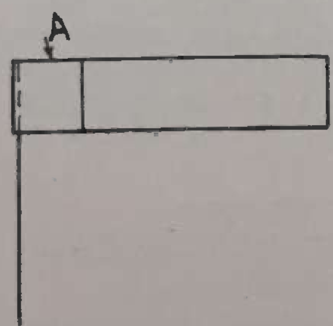
The reason is that this wire is far too heavy and it practically "short circuits" the detector.

Anybody can readily convince himself by a few trials that thin wires such as Wollaston wire 0.0001 inch to 0.0005 inch (one ten thousands to one five thousands inch), can only be used for fine work. For long distances nothing but wires 0.0001 inch to 0.0003 inch are to be considered at all.

The simplest way to attach such a minute wire to the thumb screw or other moving parts of an electrolytic detector,



-FIG. 3-



-FIG. 4-

-FIG. 5-

M.E.

is by soldering. While satisfactory in a way, the method is rather crude, and not every operator has the skill nor the tools to solder such a thin wire. Soldering, moreover, requires time and when one has only one wire in the detector and it breaks or is otherwise damaged it means an interruption of 30 to 40 minutes at best before messages can be received again.

The "bare point" Electrolytic Detector therefore comes now in use extensively, which does not require a soldered wire. Usually the wire is gripped in a clamp which is made to close by means of a screw, Fig. 1, or still better, by a flat screw pressing the wire against a metal wall. Fig. 2.

Both these methods, used extensively now, while satisfactory, have one bad feature. If one is not careful the thin wire is "bitten through" when the clamp or screw is tightened too much. As the wire is so extremely thin it is of course necessary to get a good grip on it, and quite often, to the dismay of the operator, the grip has been too good—and the wire is cut through.

I experienced the same trouble very frequently and thought often to protect the wire in some way. While I devised several methods the one given below, for simplicity, speed and cheapness has proved by far the best.

Cut a piece of ordinary tinfoil about 1/4 inch wide and 1/2 inch long. Place one end of the Wollaston wire in position as shown in Fig. 3. Fold A over to clamp the wire, Fig. 4. Fold again 2 to 3 times and finally roll the tinfoil between thumb and forefinger, pressing hard, which not alone will grip the wire effectively, but will form a solid end on it. Fig. 5.

This can be handled quite safely now and the wire will not break, even if considerable pressure is put on it, as the soft tinfoil "gives"; it also affords an excellent grip.

FACTS ABOUT ELECTRICAL CURRENTS.

There are thousands of electrical experimenters and amateurs who are well versed in the electrical arts. However, we present below a list giving certain facts about electrical currents which, while by no means new, are not generally known.

The simplest method of ascertaining if two wires carry a current is by inserting the bared ends in water, to which a pinch of salt, a little vinegar or acid has been added. On one of the two wires—if they carry current—small white gas bubbles will form immediately. This is the NEGATIVE pole.

Take two strips of lead and insert them in dilute sulphuric acid. If a current passes through the strips for a few minutes one of the strips will become brown in color. This color is caused by chemical action, in fact, it is nothing but a film of peroxide of lead. The other lead strip does not change its color.

Weak electrical currents up to 10 volts can be "tested" simply by putting the bared leads on the tip of the tongue. The current produces a somewhat sourly and stringent taste, caused by the decomposition of water on the tongue.

With bared hands a current must at least have 20 volts before it can be felt.

Currents of 110 volts are not dangerous. In fact, most all electricians are in the habit of testing lines, switches or fuse blocks simply by *quickly* touching the two bare parts with forefinger and middlefinger. The shock of 110 volt direct current, line is not strong, unless hands are moist or wet. If contact is made lasting over a few seconds, the fingers will get quite hot at point of contact. If the contact lasts longer, bad burns will be the result.

A current of 110 volts alternating current should be handled more carefully. It has in some cases proved fatal.

To form a steady arc between carbons at least 44 volts are required. Under 40 volts the arc will hiss and burn unsteady.

A quickly improvised battery, furnishing a weak current, may be made by wrapping a thin wire around a silver coin, and another wire around a gold coin. The coins should be clean. Place one coin on the tongue, the other under it. The two outleading wires may be connected to the instruments.

To ascertain whether the ordinary lighting current is alternating or direct hold a small permanent magnet outside of a lighted incandescent lamp bulb. If the current is direct the filament of the lamp will bend towards the magnet. If the current is alternating the filament of the lamp will vibrate back and forward, making it appear as if it were thicker than its actual size.

Spark Gap Muffler

L. Spangenberg.

Perhaps some readers of Modern Electrics who have a wireless station, including the sending instruments, find that the spark at the spark gap is very annoying, not so much to the operator, for the more noise his apparatus makes the better he likes it, but to those in the room or house with him.

Those having the sending inductance of the vertical wire type, may overcome this annoyance by making a spark gap and muffler as follows, and placing it in the helix:

The first step will be to obtain the material. Purchase from some glass house a piece of glass tubing 1 1/4 inches inside diameter, 5/32 inch thick, and 3 1/2 inches long. You will notice that the ends of tube will be very uneven and to make a neat finish construct from hard rubber or hard wood two caps as shown, which should fit the tube tight. Get an ordinary battery zinc for the spark gap, a piece of brass for the bracket on top of helix, a piece of hard rubber 3/4 inch diameter and 3 inches long for the handle and about 18 inches of 5 /32 inch brass rod and make each part as shown in drawing.

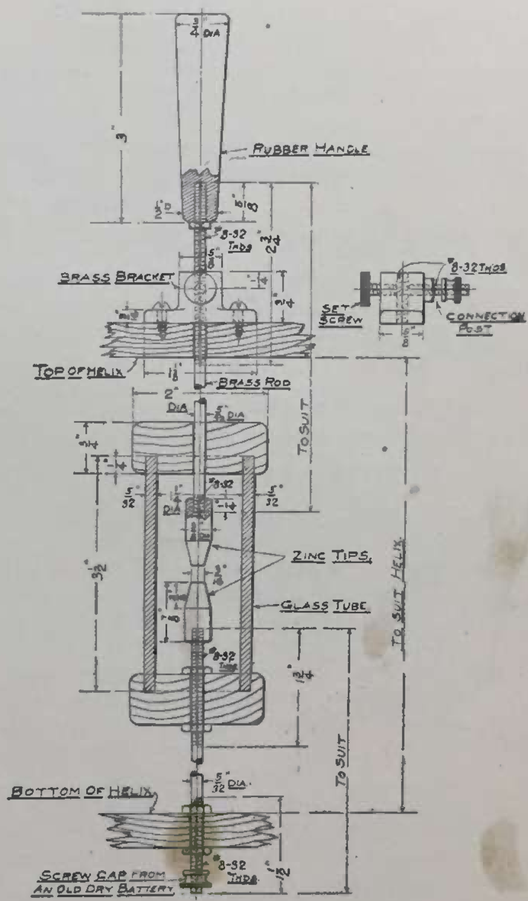
It will at first glance appear difficult to the experimenter as to how he can get this arrangement in place, but he will find the operation quite simple by following instructions.

He will have to remove the wire from the helix, which will be quite easy, and drill one hole in the center of the top of helix and one in the bottom to let a 5/32 inch rod pass through.

Put the bracket into place and cut the rod for the top part the right length, and thread with No. 8-32 thread. Now put the top cap on the rod, which should fit it quite snug and screw the zinc tip on and put it into place, after which the handle can be put on.

Cut the bottom rod the right length and thread and locate the zinc tip and cap as shown and put a nut near the bottom of rod. Now put the glass tube into the top cap, using shellac, and lift the tube and cap up to allow the bottom part to be put into place and then drop the tube down and put into bottom cap.

With a spark gap and muffler constructed as above the operator will find



that the adjusting of spark gap will be quite easy, even while sending and during experiments he will find his transmitter far more efficient.

SPECIAL EXTRA

The Wireless Screech

OUR MOTTO ..——.. ...——.

THE ETHER: TRANSPARENT. OPAQUE AT NIGHT

No. 24½ FEBRUARY, 1909 Price One Spark

The Wireless Screech

A Magazine devoted entirely to the Wireless Sparks.

Published when we feel like it, by **Interplanetarian Wireless Pub. Co.**

"Fips" *Editor.*

Subscription price for U. S. and other planets, 10 Sparks, payable in advance.

Forms close the 32d of the month. Advertising rates, none of your business.

The editor is not pleased to receive contributions. He knows it all himself. Only articles accompanied by fat checks considered at all. The editor reserves himself the right to keep the checks and return the articles, if return postage is enclosed.

SATURNIAN OFFICE:
99 Ring Street, Satonia, Sat.

EDITORIALS

"FIPS" OUR EDITOR

We confess that our throat is somewhat sore. We have been screeching so much and so loud in the December issue that we had to take a rest in January.

Of course all our wireless fiends screeched because of our non-appearance last month and we desire to present our deep-felt regrets, but you see even editors may get sore throats.

But the cat is back. Incidentally we might say that we have had a tremendous success with our new paper. We have received about 62,427 1-2 letters so far congratulating us on our noble enterprise. Every mail brings carloads of them, and conditions are so bad that the Editor who fell under a pile of letters recently had to be dug out, which involved the services of six coal shovelers, two mining engineers, a wrecking car and a 5-ton crane. After 10 hours' hard labor he was discovered at the bottom and it took 18 cakes of oxygen to revive him. 89,512 sparks have been received so far for subscriptions.

Success? Well, we should screech.

WIRELESS ON MARS.

By Our Martian Correspondent.

Mr. Spif Marseroni, the great national wireless scientist, has scored another great triumph. As will be recalled, Martians have been for a long time in the habit of receiving and sending telephone messages, no matter if they were walking in the street or gliding in an aeroplane. In fact, this system is now so popular that the "Interplanetarian Remembering Co." has found no trouble whatsoever in getting over 60 million subscribers to their new system. The system is simple enough.

Suppose you are a busy man. During the night you suddenly recall that you must see a certain party to-morrow afternoon, 4 p. m. While you stay in bed you call up the Remembering Co. and tell the operator to call you to-morrow afternoon at 3.30 p. m.

Next day at 3.30 p. m. the little buzzer which you carry in your vest pocket suddenly "goes off" and when you put your pocket phone to the ear a young lady will tell you in a silver voice, that you have to meet a party at 4 p. m. The service of the new company is so efficient that it does not make much difference *where* you are. The Remembering Co. will locate you, whether you are taking a bath, or whether you are napping in a Morris chair in the lobby of an airship.

It will also be recalled that Mr. Marseroni is the inventor of the Telewirltransport. This as will be known, has been considered up to a few days ago, his greatest invention. By means of his system Martians may ride on electric motor rollers, the energy being supplied from a central station wirelessly through the ether. The power on all Martian airships and aeroplanes is furnished wirelessly to them from the same central station to which the users must be subscribers.

Now Mr. Marseroni has succeeded by conveying food through the ether wirelessly for unlimited distances. Already a large syndicate has been formed under name of "Interplanetarian Wireless Food Co." to exploit the invention. If you are a subscriber and you are walking in the street, and if it is 12 o'clock noon, your call buzzer suddenly rings. You put the phone to your ear and this may be what you hear:

"Luncheon ready, please. What will you have?"

"Ham sandwich and a glass of milk," you call back.

You then draw your silver case out of your pocket and connect its terminals with your antenna, fastened on your hat. Two seconds later and a ham sandwich has "materialized" in the silver case. The milk is received in the same manner. In fact, Mr. Marseroni has succeeded to send almost anything now from champagne down to lobster salad. The only thing he does not send are onions, as the odor is lost in transmission and an onion without smell is like a river without water.

The process of sending food by wireless is not as difficult as might be thought at first.

The food is passed through "puffers," which blow it to atoms step by step. It is finally reduced so much that its consistency is brought in "balance" with the ether. It is then passed through a system of Leyden jars and sent out in form of ether waves, carrying the infinite minute food particles. The receiving apparatus condenses these particles again and the food appears in its original condition, only far more palatable.

Of course the sending operator must be careful so as not to "mix" things, as in the beginning it happened a few times that a subscriber got hot when he received coffee mixed with chopped pickles or buckwheat cakes soaked in Worcestershire sauce.

However, by using tuning separators this defect has been entirely overcome now.

The Orattle.

(This department answers only fool questions; not more than 72 questions answered at a time. The questions we can't answer are deposited in the waste basket for further attention. If a quick reply is desired, come and see us when we're out and leave 10 sparks with the cashier, so we'll remember you.)

WIRELESS STUFF.

(928.) H. E. Lix, Hoboken, Cal., asks:

1.—Can I receive messages 387 1-4 miles away with the following outfit: Pie-crust detector, 16-slide tuner, variable key, adjustable aerial, 9 million ohm head-phones and 1-25 ohm condenser?

A. 1.—Yes, if you take the outfit to the sending station 2 feet away from the sending coil.

2.—How do you get a "ground" in a balloon?

A. 2.—You don't get it always, especially if you "land" in the ocean.

3.—My coherer and decoherer works sluggishly; that is, the decoherer works after a signal has been sent. What can I do?

A. 3.—Set it five minutes ahead of time. It will then receive messages five minutes before they are sent off.

"C. Q. D."

(927.) L. Airea, Tonopah, Wis., writes:

1.—During a recent storm, sleet settled on my aerial which broke down under the strain. Please tell me how I can avoid it hereafter.

A. 1.—The simplest way is to send lots of hot air messages during a sleet storm. This melts the sleet immediately.

2.—What, in your opinion, is the best ground?

A. 2.—Solid ground, we think, especially when you have been at sea for 3 weeks.

3.—What does C. Q. D. mean?

A. 3.—**C**amels **Q**uack **D**eliciously.

WIRELESS FIEND.

(926.) S. S. Eleriw, Chicago, D. C., asks:

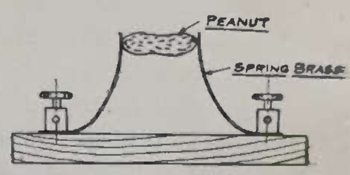
My brain is infected with wireless. I can think of nothing but wireless. I am wirelessly insane. My brain refuses to digest anything but wireless. What can I do?

A. Attach secondary leads of an 18-inch coil to each of your ears and operate coil for 15 minutes. Your thoughts will then be led in altogether different channels.

NEW DETECTOR.

By R. O. T. Ceted.

I just discovered a very sensitive detector which in my opinion has never been tried. Procure a base 3x4 1-16 inches square in diameter. About 2 feet thick. Take two steel springs, A and B, and fasten them to base by means of binding posts. When not in use these springs should touch each other at the top, but not under too great a tension. Now take



M.E.

a *salted* peanut, P, and clamp it between the two springs, A and B, as shown in illustration. If adjusted well this detector is marvelously sensitive — especially if squirrels are around.

C. Q. D.

"C. Q. D.! C. Q. D.!!"
Binns sent it flashing out over the sea
To where'er a ship or a port might be—
"C. Q. D.! C. Q. D.!!"
On went the message of peril and fear,
Winging its way to whoever might hear
The call borne out on the ether's thin
breath,
A cry of disaster and imminent death.
And, instant, wherever a ship could be
found,
Homeward or outward or anywhere
bound,
That caught the alarm, it turned in its
course
And rushed through the dark with all of
the force
Of steam-driven speed to rescue and save,
Heedless themselves of a possible grave
For them and their crews in the fog-cov-
ered wave.
And, again, as so oft, out of peril were
born
Names that shall live till earth's final
morn,
Names of true heroes as great as of old,
The records of daring and honor have
told—
Ruspini and Sealby and Ranson, and he
Who fearless, persistent, sent over the
sea
That call of distress, "C. Q. D.!
C. Q. D.!!"

J. A. METS.
(N. Y. Times.)

Wireless Department

Development In Wireless Telephony*

By WILLIAM MAVER, JR.

Wireless telephony is not altogether a new art. Over ten years ago Sir William H. Preece, in England, succeeded in transmitting speech without wires between the Skerries Lightship and the mainland of Anglesey, a distance of three miles across water. This was accomplished by the use of parallel wires stretched on poles along the shore of the island and the mainland. A telephone transmitter on one wire set up magnetic waves that were received by a telephone receiver in the other parallel wire. It was assumed in this experiment—it is more than an experiment, however, for the arrangement has been for years and still is in practical operation—that magnetic induction through the air and electric conduction through the water assisted in the transmission of speech.

Another type of wireless telephony is that in which variations in the luminosity of a beam of light are caused to reproduce speech at a distance. This device, which in some measure, is analogous to the latest developments of wireless telephony by electro-magnetic waves, is due to Alexander Graham Bell, the inventor of the telephone.

In the operation of this device, Bell caused a ray of light to fall upon a small concave mirror carried on the center of a suitable diaphragm at the end of a mouthpiece. From this mirror the ray was reflected as a parallel beam of light, and fell upon a distant parabolic reflector, in the focus of which reflector was placed a selenium cell. It is well known that the electrical resistance of selenium varies in accordance with variations of light to which it may be subjected. This selenium cell is made a part of a circuit containing a telephone receiver and a small battery. When the reflected light from a mirror falls on the selenium cell it takes on a certain resistance and a steady current flows in the circuit, depending on the amount of the resistance. When, however, sounds are spoken into the mouthpiece of the transmitter, the vibrations of the mirror on the diaphragm cause variations in the luminosity of the beam of light and these variations in turn affect the selenium cell, causing variations in its resistance, and consequently variations in the current strength of the circuit, which react upon the telephone receiver and reproduce speech very clearly. But the distance to which speech has been transmitted by this device is rather short—about 300 or 400 feet.

Subsequently, Simon, of Germany, discovered that if the resistance of the circuit of an arc light be disturbed by the introduction of a telephone transmitter in the circuit, the arc itself will reproduce speech spoken into the transmitter. The assumed explanation of this phenomenon is that it is due to rapid variations of the volume of the vapor of the arc caused by the variations of the current strength due to the vibrations of the transmitter when spoken into; the corresponding variations in the vapor of the arc setting up sound waves in the air. This is termed the speaking arc phenomenon. The following further explanation of or analogy to this phenomenon may be offered. The explanation of a thunder clap is that it is due to the rapid expansion and contraction of the air due to the lightning discharge. Analogously, we may consider the effect of the microphone transmitter upon the arc to be the production of minute changes of temperature in the arc that in turn cause condensations and rarefactions of the surrounding air corresponding to sound waves which we may regard as miniature thunder claps and which, occurring as they do in response to the vibrations of the transmitter, due to the voice, are recognized by us as articulate speech.

Following Simon's discovery, Bell and

*Paper read before the Association of Railway Telegraph Superintendents at the Montreal Conference.

Hayes found that the electric arc itself could be used as a transmitter of speech. Their method consists in placing the arc light in the center of a parabolic reflector. A telephone transmitter placed across the terminals of the arc light causes variations in its light which, although not visible to the eye, can be detected by a suitable detector in the focus of a parabolic reflector; this in turn reproducing speech in a telephone receiver. (Described at length in author's book, "Wireless Telegraphy.")

This idea was advanced a long step by M. E. Ruhmer, of Berlin, who utilized a sensitive selenium cell in the center of the receiving parabolic reflector and succeeded in transmitting speech due to the variations (caused by a microphone transmitter) in the intensity of a search light, to a distance of about ten miles. Some of the selenium cells used by Ruhmer have a resistance in the dark of about 25,000 ohms, which drops to about 1,500 ohms in the light.

In all of these systems of wireless telephony it will be observed that speech is transmitted by modifying the ether waves that constitute light. Systems of this kind, however successful they might be in actual operation, would obviously be limited as to distance of transmission by the actual distance at which light is visible under the best atmospheric conditions, about thirty miles and in times of fog and thick weather, this distance would be largely reduced.

Early workers in this field quickly recognized that if it were feasible to modify the electro-magnetic waves used in wireless telegraphy, a wireless telephone system might be developed that would be operative at distances, perhaps, approximating to that of wireless telegraphy, and that would not be limited in its operation by smoke, fog, or other somewhat similar atmospheric conditions.

But the difficulty in thus utilizing electric waves has been that the waves set up by the spark in wireless telegraphy are highly intermittent and are very quickly damped. Assume, for example, that an alternating current generator or the interruptor of an induction coil, giving an alternating current of say, eighty cycles per second, is employed as the source of current supply in wireless telegraphy. These alternations, by charging the oscillator circuit, may give rise to a frequency of, say, 800,000 cycles per second in the aerial wire. Unfortunately, however, owing to the damping of the oscillations, due to heat loss and the loss due to radiating energy in the shape of electric waves, these oscillations die out very rapidly and last for only a very small fraction of a second, and in consequence of this effect there is a comparatively long interval between the spark discharges (nearly one-ninetieth of a second) during which time no electric waves are radiated. In wireless telegraphy these pauses or breaks, or rather the beginnings of the new discharges, are observable in the telephone receiver as a tone or buzz which is broken into dots and dashes by the Morse key. Therefore, inasmuch as many of the tones, or overtones, that compose articulate speech consist of vibrations of 5,000 to 8,000 per second, it is clear that many of these tones would be lost during the pause between the spark discharges, which, of course, would conduce to inarticulate speech. Furthermore, obviously the noises in the telephone, due to the intermittent nature of the spark discharges, would prevent the successful transmission of speech.

To obviate this difficulty, a number of inventors have directed their energies toward the design of a machine generator that would deliver a smooth alternating current of very high frequency, but until somewhat recently, not with very marked success, the irregularity of the machines making the reception of speech difficult. Mr. Fessenden has lately devised a machine generator giving an output of two K. W. and a frequency of 80,000 cycles per second at a speed of 8,340 revolutions per minute. With this machine as the source of current supply, Mr. Fessenden reports that he has succeeded in transmitting speech between Long Island and Brant Rock (near Boston), a distance of about two hundred miles.

Another method entirely different from the machine method of obtaining sustained oscillations, is that due to Mr. Duddell's discovery of the singing arc. The principle of this discovery is that when an arc lamp, fed by a direct current of about two hundred and fifty volts, is shunted with a suitable capacity, and an inductance, alternating currents of a frequency of 40,000 per second are established in the shunt circuit. Mr. Duddell's explanation of this phenomenon is that at the moment when the shunt circuit is completed a current flows from the arc into the condenser circuit, which decreases the current flowing in the arc. This causes an increase in the difference of potential between the terminals of the arc, causing still more current to flow in the condenser circuit and raising its potential above the normal voltage of the arc. In consequence the condenser begins to discharge back into the arc, increasing the current in the arc and reducing the potential difference between the terminals. The condenser now discharges too much and the reverse process is set up and sustained or continuous oscillations are in this way maintained in the shunt circuit.

Owing to the comparatively high frequency and the smoothness of these sustained oscillations, the telephone receiver will not, by reason of its electrical inertia respond to them. Hence, if sustained oscillations, whether generated by a machine or by the arc, are to be utilized in wireless telegraphy some method of breaking the continuity of the waves has to be adopted, practically as, in certain other telegraph systems, a continuous current is broken by a buzzer and is heard in the telephone as a tone. Furthermore, while the telephone will not respond to the high frequency continuous oscillations of the Duddell arc, if the amplitude of the oscillations be varied to a degree that comes within range of the receptivity of the telephone receiver, as, for example, by speaking into a microphone transmitter placed in the aerial or in the oscillation circuit, the telephone receiver will respond and reproduce the speech spoken at the transmitter, practically as speech is reproduced by varying the amplitude of the waves of a beam of light in the cases mentioned.

So long, however, as the oscillations of the singing arc were limited to about 40,000 per second, but little practical use could be made of it owing chiefly to the weak magnetic effects at comparatively low frequencies, and the consequent inability to radiate wave energy of much power. Fortunately, it was discovered by Poulsen, the inventor of the telegraphone, that if the singing arc is placed in an atmosphere of hydrogen or other gas of high heat conducting qualities, the frequency of the oscillations are increased to a remarkable degree, namely, in some cases to 500,000 cycles per second and over. It was also found that by burning the arc in nitrogen gas, compressed air or in steam, the frequency of the arc oscillator is much increased. The flame from an alcohol lamp placed under the arc also has this effect.

The electrodes of the oscillating arc consist of a solid carbon (negative) and a copper tube (positive). The copper electrode is cooled by a stream of water passing through it; Poulsen having found that this cooling of the metal electrode increases the efficiency of the arc as a generator of oscillations. The capacity used in some experimental installations is quite small, being about .02 microfarads, but information as to the exact proportions of capacity and inductance employed in practice are not at present procurable. The arc requires for its proper operation in producing oscillations in the shunt circuit, a current of certain strength and a certain length of arc. For instance, Poulsen has found that with a difference of potential of two hundred and twenty volts at the arc it ceases to set up oscillations when the current falls below six amperes, with a water cooled positive electrode, or below four amperes with a non-cooled electrode.

The discovery of the oscillating arc opened the way for the use of these sustained oscillations in wireless telephony, and Poulsen and the Telefunken Wireless Company in Europe, and de Forest in this country, have made considerable progress in telephoning to a distance by modifications of this arrangement of the singing arc.

When the oscillating arc is employed the inductance is made part of a transformer, the secondary of which is in the aerial wire circuit. De Forest modifies the oscillations by placing a microphone transmitter directly in the aerial wire. Poulsen modifies the oscillations by means of a microphone transmitter inductively connected with the supply or feed circuit of the arc. Fessenden modifies the oscillations set up by the machine generator by means of a microphone transmitter in the generator circuit; the generator and transmitter being connected in the aerial circuit.

(To be concluded)

Wireless Telegraph Contest

Our Wireless Station and our Laboratory Contest will be continued every month until further notice. The best photograph for each contest is awarded a monthly prize of Three ($3) Dollars. If you have a good, clear photograph send it at once; you are doing yourself an injustice if you don't. If you have a wireless station or a laboratory (no matter how small) have a photograph taken of it by all means. Photographs not used will be returned in 30 days.

This competition is open freely to all who may desire to compete, without charge or consideration of any kind. Prospective contestants need not be subscribers for (the publication) in order to be entitled to compete for the prizes offered.

FIRST PRIZE THREE DOLLARS

The Sending Apparatus.

The sending apparatus is shown on the shelf and is composed of a one-half inch spark coil, condensers, sending inductance, spark gap, and key for primary circuit. The condenser shown is made of

five sheets of glass, each 5x7 inches, which are covered on both sides with tin-foil 3x5 inches. The condenser is made adjustable by means of spring contacts by which the capacity can be changed very easily. The inductance to the right of condenser is made of 27 turns of No. 14 B. & S. copper wire wound on a hard-wood frame. The number of turns can be changed by means of clips. The spark gap is made of zinc and is located directly beneath the shelf. A battery of five (5) wet cells is used to operate the spark coil.

The Receiving Apparatus.

On the table is shown the receiving set, which consists of a tuning coil with two (2) sliding contacts, potentiometer, variable condenser, silicon detector, dry cell, and one (1) bi-polar telephone receiver, with headband. The receiving condenser is of the intermeshing type, and has five (5) stationary and four (4) movable zinc plates with air spaces between them.

The Aerial.

The aerial is made of four (4) No. 14 copper wires (bare) each sixteen (16) feet long and nine (9) inches apart and is suspended from a twenty (20) foot mast on the roof. The entire length of the aerial being fifty (50) feet. The ground connection is made by soldering a No. 8 copper wire to a water-pipe.

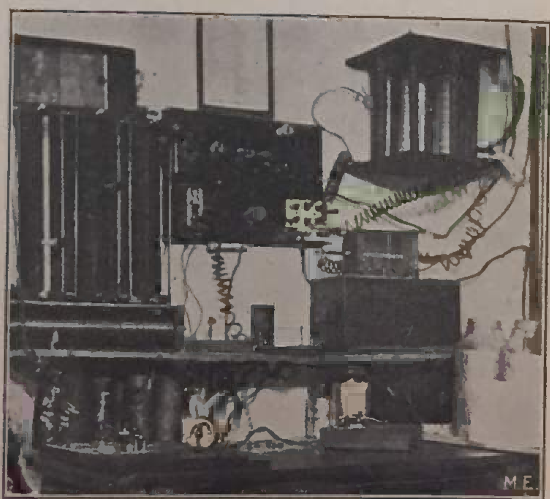
With this receiving set I have had very good results, being able to receive from the station at the Bellevue-Stratford, Philadelphia, and the station at League Island Navy Yard, about seven (7) miles away. These stations come in very strongly. Also have heard from several other stations. The relay and sounder shown in the picture is part of a coherer set which is not in working order. In addition to the above instruments I have also another receiving set, including silicon, microphone, and electrolytic detectors. All the above appartus were constructed by myself with the exception of the relay, spark coil, and telephone receiver. I have been experimenting with wireless telegraphy for about a year and have gained valuable instruction in making some of my apparatus, from MODERN ELECTRICS.

L. J. LEITENBERGER.

Philadelphia, Pa.

HONORABLE MENTION.

I am inclosing herewith photograph of my wireless station. I have experimented



of late with wireless, having considerable success. At present I am experimenting with the loose coupled tuner and have met with partial success. It is somewhat hard to get any one interested enough to put up stations here on account of one being unable to use them in summer on account of the hot dry climate making it difficult to transmit even a short distance. I am about the only one here who has a station in operation. However, I soon hope to be able to induce others to put up stations and make it more interesting for all.

In the photo you will notice the transmitting side of my station is on the right; on the wall in the center the switchboard and on the left the receiving side.

The transmitter consists of the Morse key, the coil built on the transformer plan which is run by the 110 volt alternating current through a variable impendance coil, a condenser being connected across the posts of the key to keep down sparking at the key contacts. The zinc spark gap is inclosed in a box, a glass sight in front to observe and muffle the spark. The Leyden jars used for a condenser are connected in series multiple. The sending inductance consists of a number of turns of hard drawn brass wire, No. 16, wound on a wooden frame. The leads were made from sheet brass connected to ordinary paper clips which make excellent contacts, the connections of the transmitting system being the same as the de Forest.

On the wall in the center of the photo is the switchboard. Here are located the switches and fuse controlling the alternating current for the transmitter, as well as the D. P. D. T. switch for the loop antenna; immediately below the antenna switch is the S. P. D. T. switch for the ground. In the upper left hand corner of the board a grounded buzzer is located which is used to "tune" the detectors.

On the right is the receiving side composed of a variable condenser consisting of two brass disks separated by glass and sliding over each other seen directly above the tuners. Three tuners in parallel, connected in a Hertzian loop according to the de Forest method. Each coil has a tuning length of 140 meters; they are of the double slide pattern. Below the tuners the potentiometer is located, which is of the slide pattern. No. 28 bare G. S. wire was wound on a wooden mandril, each winding having a thread separating it from its neighbor.

Below the potentiometer are the dry batteries to work the receiver and in front of them the detector. I also use a pair of head phones which are of high resistance. A carborundum detector shown in the photo, is connected in circuit, it being adapted to local work. However, any of the three other detectors, Silicon, "Electro"-Lytic, or Microphone, shown on the shelf below the switchboard, may readily be connected when required.

My wavelength is about 600 meters.

My call letter is T. W.

Transformer is of about a quarter K. W.

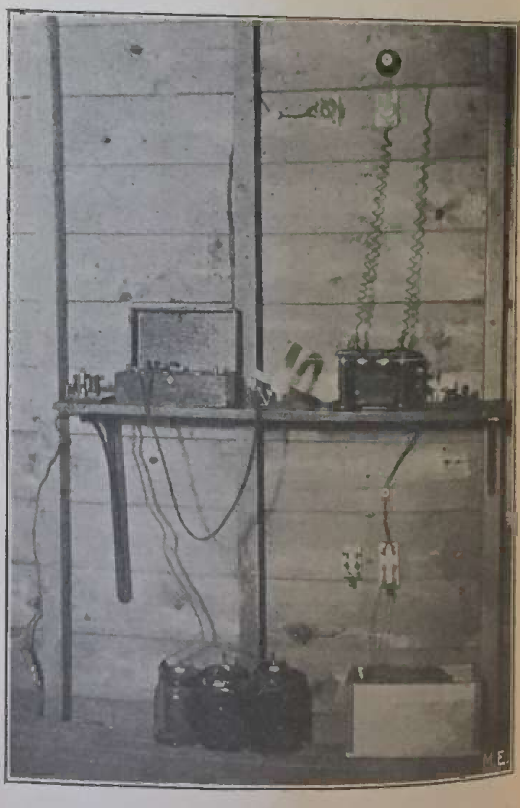
S. SWARTZ.

California.

HONORABLE MENTION.

Enclosed please find a flashlight photo of my wireless telegraph station.

The sending outfit consists of the following: A one-inch induction coil, telegraph key, six dry cells, which furnish



power for the induction coil, and a set of spark balls on hard rubber stands. These stands I made out of the shells from two old telephone receivers, and two binding posts. They can be seen in the picture directly in front of the induction coil.

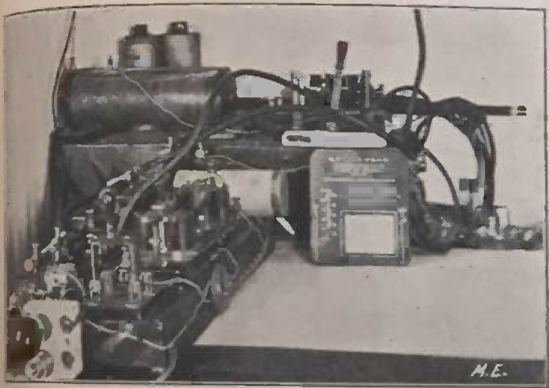
On account of my station being the only one in the vicinity, I made my receiving apparatus portable so that at any time I can take it out in the country, and using high trees as aerials, receive messages from my sending station. My receiving station consists of a microphone detector with a very fine adjustment and a 75 ohm telephone receiver.

The set above described, although very simple, has given me entire satisfaction on account of its absolute reliability as a means of local communication.

New York. A. E. SODERHOLM.

HONORABLE MENTION.

The photo I am sending represents my receiving station at Mt. Pocomo, Pa.



I have a very fine and complete sending station at my New York City residence, a photo of which I will send you later.

My sending instruments consist of:

1. Coherer and decoherer, two relays of 1,000 ohms each, used separately; 1 4-ohm sounder and a large tuning coil (in background).

2. The "Electro"-lytic detector, a specially made—that is to say, a finely made, but very simple resistance coil, the same tuner, a large sliding condenser and telephone receiver.

I use No. 1 to give me an audible signal, when waves are coming in; to reach the wave message I switch onto No. 2 and use the 'phone receiver.

Pennsylvania. HENRY MORTIGE.

HONORABLE MENTION.

I am sending you herewith a photograph of my wireless station.

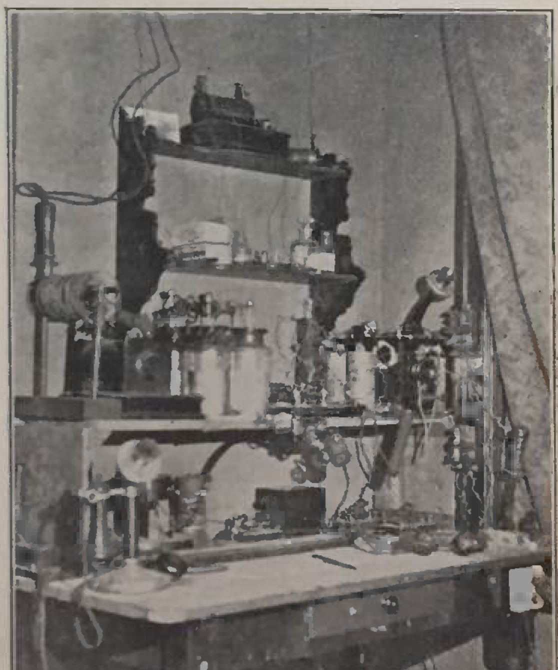
In the center of the picture on the shelf above the table is the ground switch; one side on the right of the table is the receiving apparatus consisting of an auto-type detector, silicon detector, resistance coil and one 150 and 2,000 ohm head band receivers. With this outfit I receive messages from stations several hundred miles distant.

I use the E. I. Co. 2,000 ohm head band receiver, which makes the detector much more sensitive.

The telephone transmitter on the box at the right hand of the table is a wireless telephone, which I am working on. I have been able to talk about thirty feet so far. I have not done much experimenting with wireless telephone as yet. The phone at the left end of the table is in connection with the lines of the city. When I throw the ground switch over to the left side I connect the sending end to the ground. The coil gives a 3-inch spark which is connected to four one-quart Leyden jars and a sending helix of my own design.

The end of the aerial is put in a plug switch which can be moved from the sending side to the receiving side by simply pulling it out of the socket. The tuning coil can be seen back of the wireless telephone. The spark coil on the top shelf gives one-inch. On the table to the right may be seen a large knife switch which operates the big coil which is run by a 110 volts alternating current and a Wehnelt interrupter.

The telephone instruments on the table are connected with a short line, there



is also a Wheatstone bridge and galvanometer, which is behind the telephone.

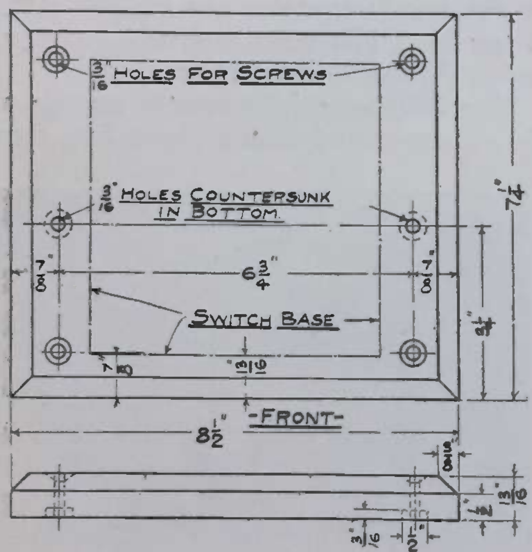
Accept my best wishes for the success of your most instructive magazine.

THOS. J. P. SHANNON,
Los Angeles, Cal.

A Simple Antenna Switch

By A. C. Austin, Jr.

The switch described in the following lines has been used by the author on several amateur installations and has given very good satisfaction. There are several advantages to be gained by the use of this switch especially if the station is to be used for intercommunication. No anchor gap (which when used in small stations cuts down the sending radius very materially) is used with same; it is impossible to damage receiving instruments by accidentally touching the sending key, as when switch is up for receiving the primary circuit is open, and as there is just a short throw and only one other switch to operate (the one for shorting the detector when sending), switching over may be done very rapidly, and with little effort.



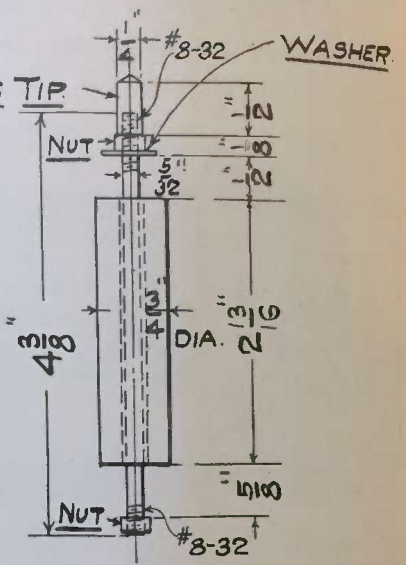
-FIG 1-

M.E.

The instrument is very easy to construct, is not costly and will repay the builder for time and labor spent on same.

Procure a wooden base, preferably of oak, and make up as per figure one, giving it two coats of black shellac when finished. Get two pieces of hard rubber rod 2 13-16 long and ¾-inch in diameter, and drill a hole lengthwise in each, large enough to pass a 5-32-inch brass rod. Get two pieces of brass rod 4 3-8 inches long by 5-32 inches, and put ½ inch of 8-32 thread on each end. Provide two nuts, a washer and a tip for each rod, as shown in Fig. 2.

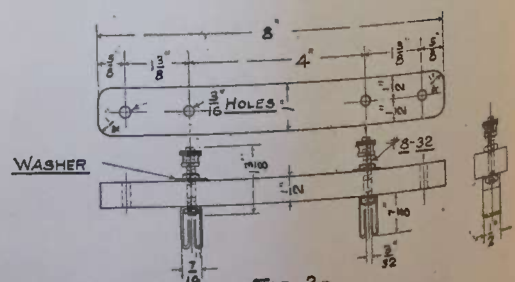
Now get a piece of hard rubber 8x1x1/2 and drill four 3/16-inch holes in same, as per Fig. 3. Round off the ends and trim up nicely. The hard rubber may be given a nice polish by rubbing smooth with fine emery paper and then polishing with an oiled cloth.



-FIG.-2-

M.E.

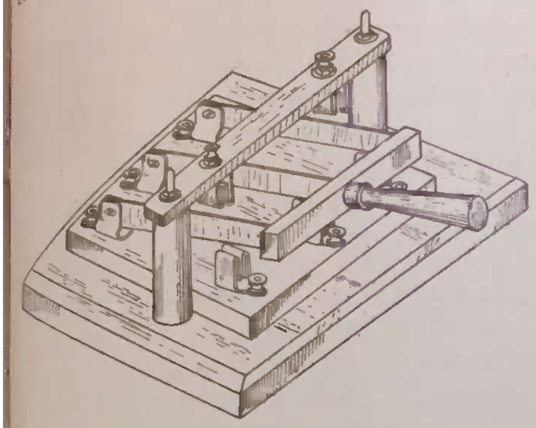
Get two pieces of 1-16 inch copper, 1/2 inch wide and 3 1/2 inches long, and bend as per Fig. 3. Also make two brass rods with 8/32 threads on each



-FIG.3-

end, the rods to be 1 3/8 inches long. Provide two nuts and a washer and also a battery knurl for each and set together in the inside holes of the 8 inch piece of rubber, as shown in Fig. 3.

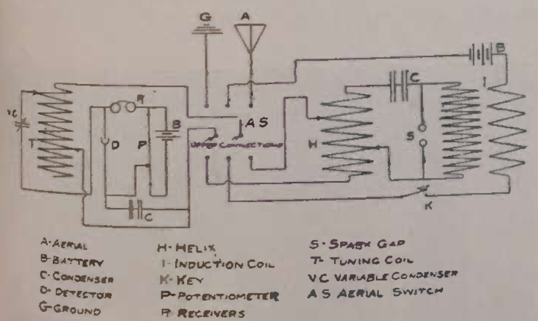
Now buy a 50 ampere three pole single throw fuseless switch and place same on the base in the position as shown in Fig. 1. Put the standards and the crosspiece together and set up on the base.



It would be well to measure the distance between the outside poles of the switch before boring holes in crosspiece as when the switch is thrown up these poles should fit in the clips on the cross piece.

The middle pole of the switch is connected in the primary circuit, and one outer pole at the back to the aerial, the other to the ground, leads from the inductance, being attached in the front of the switch.

The upper connections are aerial and ground for the receiving set. Complete



sending and receiving connections are shown in Fig. 4. The cut gives a clear idea of the general appearance of the switch when completed.

"FIPS."

Hurrah for "Fips,"
The funny chap.
He has got the Wire-
Less bee in his cap!

GROVER EICHINGER.

WIRELESS REGISTRY.

This Department has been started with the idea to bring the wireless amateur in closer touch with commercial land and ship stations. Each month a list of new members will be printed here and once each year an official BLUE BOOK will be issued by MODERN ELECTRICS, giving a list of all the members who registered during the year. Each member will receive the Official Blue Book free of charge. The Blue Book will also contain a complete list of commercial and government stations, their call letters, wave length, etc.

To register a station requires: Total length of aerial (from top to spark balls), spark length, call letter (if none is in existence M. E. will appoint one), name and address of owner.

Fee for Registry (including one Blue Book) 25 cents.

For other particulars see June issue of this magazine.

NAME AND ADDRESS OF OWNER.	CALL LETTER	APPROXIMATE WAVE LENGTH IN METERS.	SPARK LENGTH OF INDUCTION COIL.
Eric Leavens, Brooklyn, N. Y.,	Z.L.	240	½ ins.
Ralph Jeffers, Rochester, N. Y.,	J.	125	
L. Spangenberg, Paterson, N. J.,	R.S.	70	2½ "
St. George's School, Newport, R. I.,	N.B.	170	2 "
Jas. McNair, Jr., Lakewood, N. J.,	H.C.	117	2 "
S. Conradi Vance, Los Angeles, Cal.,	C.V.	55	½ "
J. O. Smith, New York City,	S.X.	325	4 "
J. B. Hyatt, Mt. Vernon, O.,	H.Y.	400	2 "
H. E. Sumner, Brooklyn, N. Y.,	H.S.	40	1 "
Maxwell P. Hellman, New York City,	M.M.	75	1 "
Fred Stiefel, New York City,	F.C.	366	1 "
Ozone Wireless Co., San Francisco, Cal.,	M.J.	80	10 "
Jack Steurer, New York City,	E.L.	320	6 "
George Schmitt, New York City,	E.L.	320	6 "
Frank E. Daubenbiss, Capitola, Cal.,	T.X.	150	1 "
C. R. Myers, Westwood, N. J.,	C.M.	32	2 "

CORRECTION.

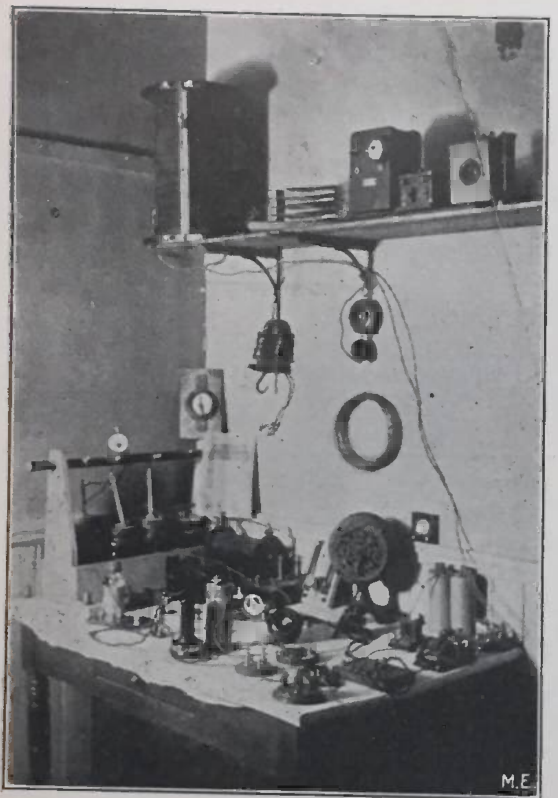
In the article "How to make a Chemical Rectifier," page 345, January issue, Fig. 4 was omitted. This figure may be found, however, on page 124, July issue, 1908. It is there shown as Fig.3.

Laboratory Contest

FIRST PRIZE THREE DOLLARS

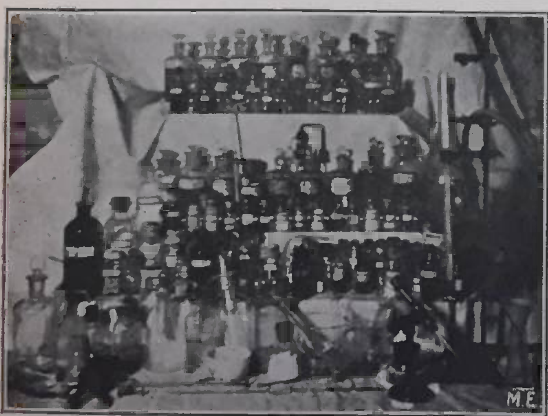
Inclosed please find pictures of my laboratory, both electrical and chemical.

My wireless sender is composed of 3 induction coils, a battery of bichromate cells, condensers, Leyden jar, telegraph key, zinc spark gap and the necessary switches. My antenna is 60 feet high and



is made of two 80 foot strands of copper wire; ground wire is soldered to the water pipe.

The receiver consists of a tuning coil having a capacity of 1,200 meters wave-length, variable condenser, an "Electro"-



Lytic detector, a microphone detector, an "Auto"-coherer, a filings coherer with relay and sounder, a bi-polar telephone receiver and a rheostat regulator. By means of a five point switch any detector may be cut in.

The other apparatus shown are: a testing magneto, telephones, an electro magnet, motors, a small shocker, a volt meter, a pocket volt ammeter, galvanometer, a lightning arrester, etc., etc.

The second picture shows my chemical laboratory, consisting of the chemicals and apparatus necessary for nearly all the experiments in inorganic chemistry and qualitative analysis. The more useful reagents are kept in glass stoppered bottles, the other chemicals are kept as dry salts in cork stoppered ones. The apparatus are made up of gas generators, flasks, beakers, test-tubes, Bunsen burners, crucibles, etc.

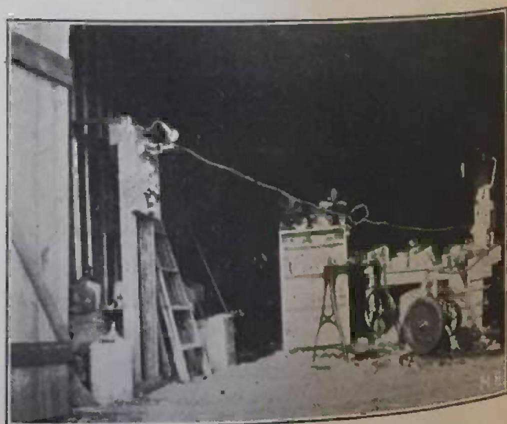
With these apparatus I have experimented with explosives, sympathetic inks, etc., and am able to analyse nearly all inorganic substances.

I am 16 years old and have been experimenting with electricity and chemistry for some time. I have received much assistance from MODERN ELECTRICS lately, and am making a selenium cell described in the January number.

Canada. E. A. TWIDALE.

HONORABLE MENTION.

As the last picture described an old shop of mine I will send you a picture of



it now. In the photograph at the left is first: the switchboard, next sawing bench, and next a table to hold supplies, novelties, etc. The table to the right of this holds models and other home made articles. Next is the tool chest and work bench, also my gasoline engine and lathe.

I have also a wireless station not shown in picture.

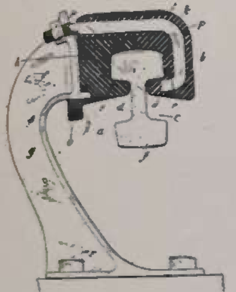
BEN ORR, Texas.

Electrical Patents for the Month

910,968. ELECTRIC LAMP AND METHOD OF MAKING THE SAME. CHARLES P. STEINMETZ, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York. Original application filed Nov. 17, 1902, Serial No. 131,650. Divided and this application filed Sept. 28, 1908. Serial No. 455,110.

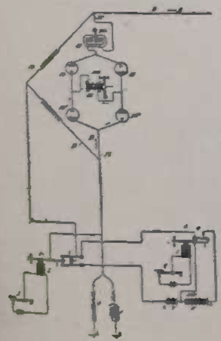
1. As an article of manufacture, a tube having a body portion formed out of fused quartz, and end portions formed out of fused quartz combined with potassium.

908,136. THIRD-RAIL INSULATOR. LEONARD M. RANDOLPH, Newark, N. J., assignor to Essex Company, Newark, N. J., a Corporation of New Jersey. Filed May 24, 1907. Serial No. 371,399.



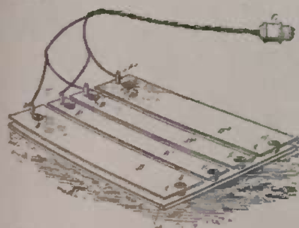
1. A two-part third-rail insulator, each part having a flange to support the rail, and one part overlapping the other part so as to cover the joint between the two parts.

909,877. TELEGRAPHY. THOMAS A. EDISON, Llewellyn Park, Orange, N. J. Filed June 20, 1907. Serial No. 379,830.



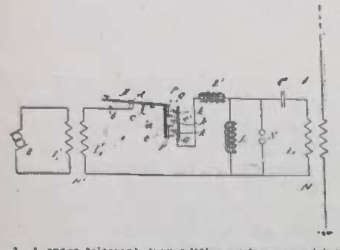
1. The combination with a circuit, and means for impressing thereon currents of varying strength and of reversed polarity, of a neutral relay and a series of rectifiers between the said relay and said circuit and so disposed as to commutate said currents, whereby all of said currents will pass through the relay in the same direction, substantially as and for the purposes set forth.

909,814. ELECTRIC TRAP FOR RATS, &c. JOHN T. NOSSIA, Troy, N. C., assignor of one-half to Christopher C. Wade, Troy, N. C. Filed Sept. 24, 1908. Serial No. 454,521.



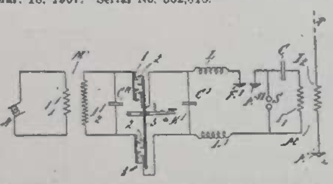
1. An electric trap comprising an insulated base a series of conducting plates separated from each other and supported on said base but insulated therefrom, and positive and negative wires adapted to be connected with a source of electrical energy and with alternate plates.

908,815. SPACE TELEGRAPHY. JOHN S. STONE, Boston, Mass. Filed Mar. 25, 1908. Serial No. 428,099.



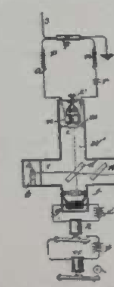
1. A space telegraph transmitting system comprising a transformer, a source of vibratory current of definite frequency in series with the primary of said transformer, a sonorous circuit, connections from the secondary of said transformer to said sonorous circuit and an inductance connected across said sonorous circuit, said inductance being so proportioned that for currents of said frequency the power factor of the circuit including said primary is substantially unity.

908,742. SPACE TELEGRAPHY. SEWALL CABOT, Brookline, Mass., assignor to Stone Telegraph and Telephone Company, a Corporation of Maine. Filed Mar. 18, 1907. Serial No. 362,818.



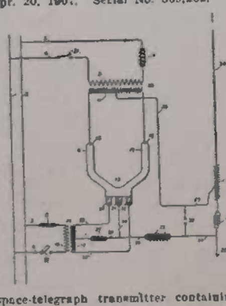
1. A space telegraph transmitting system comprising a sonorous circuit, a power circuit including the primary of a transformer, an intermediate circuit connected with said sonorous circuit and including the secondary of said transformer, and means associated with said intermediate circuit for increasing the power factor of said power circuit.

908,725. RECEIVER. CHARLES G. ASHLEY, Chicago, Ill. Filed Jan. 10, 1908. Serial No. 205,485.



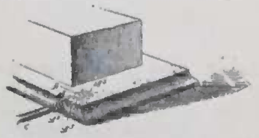
1. A receiving apparatus of the class described, including a source of light, an electrically operated mirror located in association with said light, subject to incoming current, for governing a ray from said light, a second mirror, said mirrors being so arranged that they reflect rays, the reflected rays constituting component rays for producing a resultant, and a signal translating device subject to the resultant.

910,430. WIRELESS-TELEGRAPH TRANSMITTER. CHARLES P. STEINMETZ, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York. Filed Apr. 20, 1907. Serial No. 369,262.



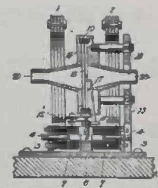
1. A space-telegraph transmitter containing a sparking gap fed by a condenser, in combination with a source of alternating current, means for converting the alternating impulses into high tension uni-directional current of substantially uniform strength, and means for charging the condenser by the converted current, substantially as described.

910,842. ELECTRIC-TERMINAL CLIP. GEORGE MCINTYRE, Jersey City, N. J. Filed Aug. 2, 1906. Serial No. 328,838.



As an article of manufacture, an electric terminal clip for engagement with a binding post, made from a single piece of spring wire, doubled up to form a resilient eye, and a loop for engagement with a binding post, the terminals of the said eye crossing each other to merge into the said engaging loop, one terminal of the engaging loop being arranged for attachment to a conductor and for forming a finger piece, and the other terminal of the engaging loop forming a second finger piece, the said finger pieces when pressed toward each other opening the said engaging loop, and when released of pressure allowing the engaging loop to close by the resiliency of the said eye to firmly contact with the binding post.

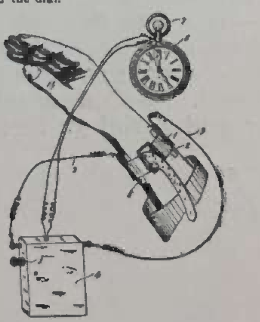
910,244. TELEPHONE-RECEIVER. HARVE R. STUART, Wheeling, W. Va. Filed Jan. 10, 1907. Serial No. 351,578.



1. In a telephone receiver, a pair of magnets forming parts of separate magnetic circuits, a longitudinally movable armature for each of said circuits, and means movable therewith for transmitting to a distance the movements of the armature corresponding to variations in the flux of said magnetic circuits.

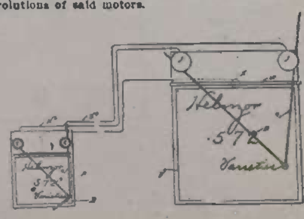
910,474. ELECTRIC BELT. ABRAHAM HORNUNG, Czarna near Pilzno, and ISIDOR SPERLING, Tarnopol, Austria-Hungary. Filed July 12, 1907. Serial No. 383,405.

1. A band adapted to be fastened about the wrist or other part of a person and provided with contacts arranged at interval to send an electric current through the flesh, in combination with a source of electricity, circuit conductors and a watch switched into the circuit and arranged to close the same when the hands indicate a certain time on the dial.



909,421. TELAUTOGRAPH. CHARLES F. JENKINS, Washington, D. C. Filed Feb. 7, 1908. Serial No. 414,701.

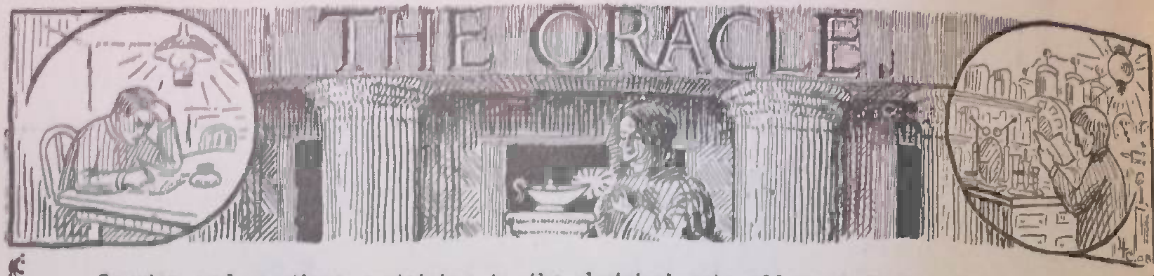
1. In a telautographic apparatus, the combination of a transmitting instrument, a reproducing instrument having a plurality of stylus-actuating motors therein, and means in the transmitting instrument for producing complete revolutions of said motors.



2. In a telautographic apparatus, the combination of a transmitting instrument, a receiving instrument having a plurality of stylus-actuating motors therein, and means in the transmitting instrument for distributing electrical current successively to the several coils of said motors to produce a shifting magnetic field therein, to cause complete rotations of the motor armatures.

Original Electrical Inventions for Which Letters Patent Have Been Granted, for Month Ending January 26th.

Copy of any of the above Patents will be mailed on receipt of 10 cents.



Queries and questions pertaining to the electrical arts addressed to this department will be published free of charge. Only answers to inquiries of general interest will be published here for the benefit of all readers. Common questions will be promptly answered by mail.

On account of the large amount of inquiries received, it may not be possible to print all the answers in any one issue, as each has to take its turn. Correspondents should bear this in mind when writing, as *all* questions will be answered either by mail or in this department.

If a quick reply is wanted by mail, a charge of 15 cents is made for each question. Special information requiring a large amount of calculation and labor cannot be furnished without remuneration. THE ORACLE has no fixed rate for such work, but will inform the correspondent promptly as to the charges involved.

Name and address must always be given in all letters. When writing only one side of question sheet must be used; not more than three questions answered at one time. No attention paid to letters not observing above rules.

If you want anything electrical and don't know where to get it, THE ORACLE will give you such information free.

1000-OHM RECEIVER.

(140.) W. H. KNOWLES, R. I., asks:

1.—Could a double pole watch case receiver be wound to 1000 ohms?

A. 1.—Yes.

2.—Would the inclosed wire be small enough?

A. 2.—No; you will have to use what is known as mil, or mil and ½ wire.

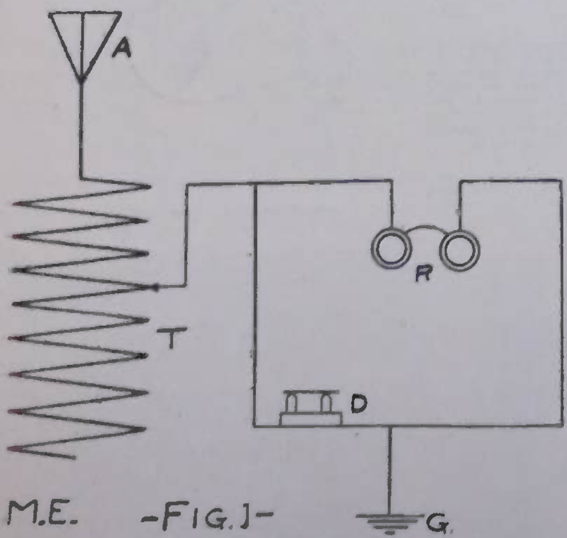
RECEIVING DISTANCE.

(141.) HAROLD S. BALLON, of N. Y., writes:

1.—How far would a ¾-inch coil send with instruments given below?

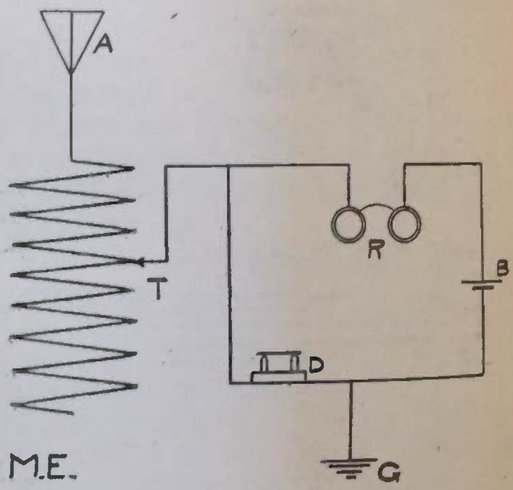
A. 1.—Three to five miles.

2.—How far should I be able to receive with receiving instruments consisting of tuning coil, 75-ohm receiver, microphone, detector and aerial 32 feet high and 31 feet long, connected up as per diagram? With "Auto coherer"? With electrolytic detector?



-FIG. 1-

A. 2.—With a microphone detector, 50 to 75 miles; with an "Auto"-coherer, 50-100 miles; and with Electrolytic detector, 200-250 miles. If you use batteries as in Diagram B it will increase your receiving distance.



-FIG. 2-

WIRELESS QUERIES.

(142.) CLARENCE TERHUNE, Ind., asks:

1.—Give a diagram showing how to connect a relay and an "auto"-coherer so as to ring a bell when called by wireless.

A. 1.—It is impossible to use a relay with an auto-coherer.

2.—How much wave length in an "E. I. Co.'s Electro Tuner, Jr."?

A. 2.—Approximately 400 meters.

3.—Give a diagram showing how to connect an electrolytic detector.

A. 3.—We refer you to the December issue of MODERN ELECTRICS, page 320.

DYNAMO TROUBLE.

(143.) J. M. WALSH, Pa., asks:

1.—In grinding tools, should the grindstone be revolved towards the tool, or away from it?

A. 1.—Stone should revolve towards the tool.

2.—Why does not my "Electroport" Type S, dynamo generate when run at the proper speed? Neither will it run as motor on four dry cells. I have tested the armature and field magnets, and find no short-circuit or reversal of the poles. The commutator is true, and has been carefully cleaned. The brushes seem to be in good shape, too.

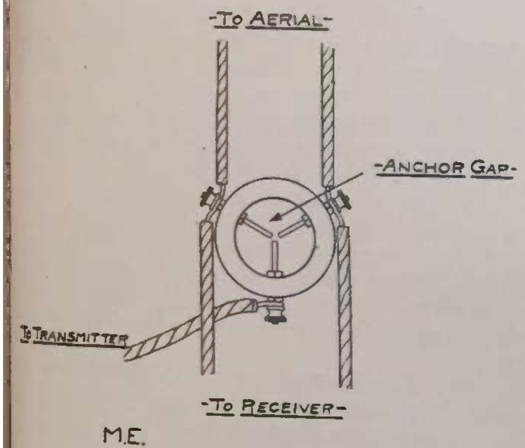
A. 2.—We cannot tell. We should think you are running the machine in the wrong direction. To generate, it should run when you are facing the commutator counter clock-wise. If this does not clear the trouble, there must be an open circuit in the windings.

LOOPED AERIAL.

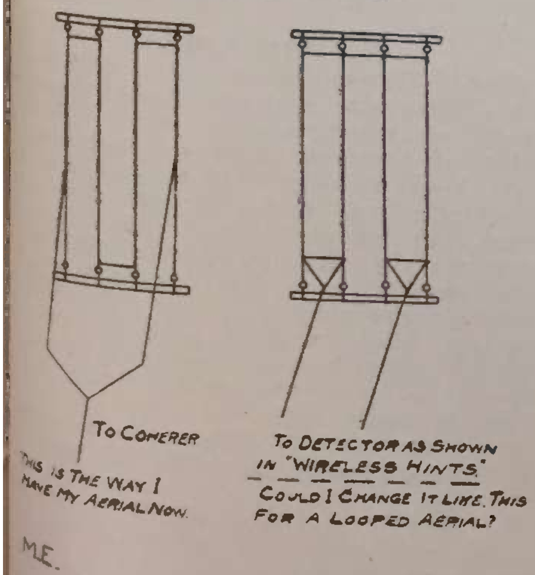
(144.) HARRY EARL McKINNEY, Ohio, writes:

1.—In the January issue of MODERN ELECTRICS, under the heading, "Wireless Hints," was shown how to connect a looped aerial to overcome induction in receiving. With this type of aerial there are two lead-in wires. How should I connect this aerial for sending?

A. 1.—Anchor gap must be used with this type of aerial, the spark jumping to both leads, as per diagram "A."



2.—I was about to erect an aerial with four strands, connected as per diagram B. Could I not change it to the looped one shown in MODERN ELECTRICS under "Wireless Hints," as per diagram "C."

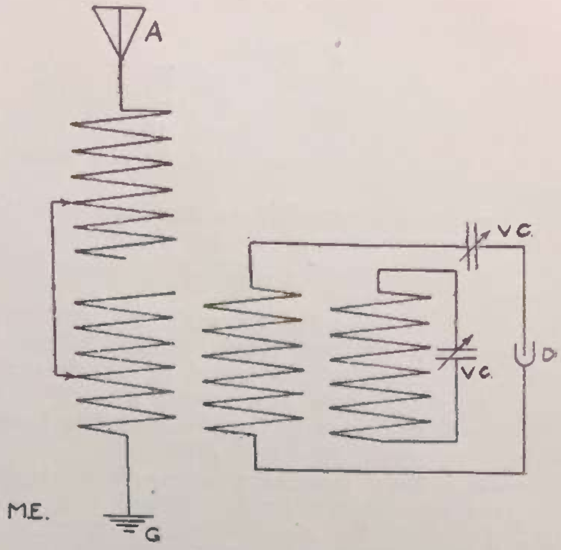


A. 2.—Yes.

SELECTIVE TUNER.

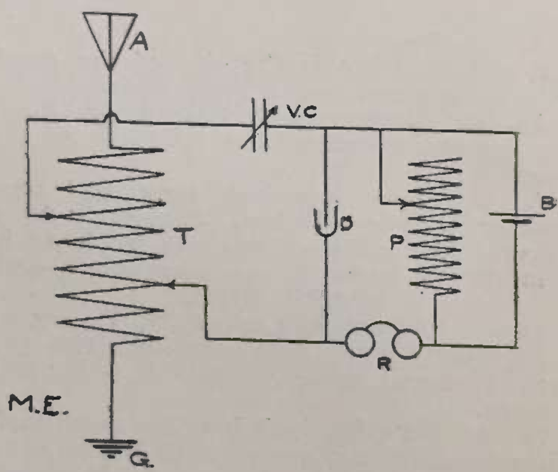
(145.) ED. SCHLUETER, Cal., asks:

1.—Can the selective tuner described in the November issue be connected with an ordinary tuning coil as follows:



A. 1.—Yes; but it would be advisable to use selective tuner alone.

2.—Can a single tuning coil be connected as follows:



A. 2.—Yes.

RECEIVING DISTANCE.

(146.) CHAS. LAMAR, N. J., writes:

1.—What will be my receiving distance, having an aerial comprised of four strands of 22 copper, on 6 foot spreaders, suspended on two poles, 10 feet high, distance between poles 60 feet.? Above poles are on roof of house, about 75 feet high. Also using tuning coil of 700 meters wavelength, electrolytic detector, variable condenser, one 1,000 ohm telephone receiver, rheostat regulator.

A. 1.—From 250 to 300 miles.

2.—(A power house is located about 300 feet from house, and two 3,000 volt feed wires pass 30 feet from roof.) Will this make any material difference?

A. 2.—Yes; you will have to use double tuning coil or a looped aerial, to overcome induction.

AERIAL.

(147.) CHAS. R. KIME, Ark., asks:

1.—What is best for an aerial—copper wire or galvanized iron?

A. 1.—Copper wire is better than galvanized iron wire, for aerial, but aluminum is considered better than copper on account of its lightness.

2.—Are not the E. I. Co.'s one-half inch coils (secondary) wound with bare wire?

A. 2.—Yes, but with paraffine insulation between the wires.

TUNER.

(148.) FERDINAND KUEHN, N. Y, writes:

1.—Which is the most sensitive (for working a 1600 ohm buzzer) the graphite-carbon - grain Auto-coherer or the microphone detector?

A. 1.—It is impossible to use buzzer with Auto-coherer or microphone detector, neither have we ever heard of a 1600 ohm buzzer.

2.—Will I be able to pick up stations having 1800 metres wave length with a tuning coil having 288 turns of number 20 D. C. C. wire each one meter long.

A. 2.—Yes; provided your aerial is long enough to make up the difference.

3.—Will two tumblers made into Leyden jars do for the transmitting?

A. 3.—Yes; for short distance work.

WEHNELT INTERRUPTER.

(149.) CHARLES PHILLIPS, Va., writes:

1.—Can the Wehnelt-Caldwell interrupter, described on page 306 in the December number, be used with a half-inch or one-inch coil?

A. 1.—Yes.

2.—About what is the size of the spark used in transmitting a long distance message, say 1000 miles. Something about the length, diameter and loudness of the sound?

A. 2.—About one inch long, and one-quarter to one-half inch diameter. As a general rule a gap of this size is placed in a muffler in order to cut down the sound.

SPARK COIL.

(150.) EDWARD R. CULLEN, N. Y., writes:

1.—Kindly give dimensions for two (2) inch spark coil, using No. 30 B. &. S. for secondary.

A. 1.—Core 8½ inch long by 15/16 inch diameter. Primary wound with No. 12 or 14 wire in two layers. Secondary 6½ inch long by 2 13/16ths diameter, wound in 50 sections with 3 ½ lbs. of No. 30 wire, condenser 80 sheets of tin foil, 7x5.

2.—Current required.

A. 2.—Voltage 12, amperage 6-8.

3.—How far will it send with silicon detector, tuner, condenser, and 1000 ohm receivers at receiving station?

A. 3.—Fifteen to twenty-five miles.

TESLA COIL.

(151.) W. A. STEEL, Ont., Can., writes:

1.—I have constructed a Tesla coil capable of giving a five-inch spark as per directions given in "Scientific American Supplement No. 1087, but I have only made my condenser about one-third the size called for, and I only get one-third the spark required. Would I get full spark if I increased my condenser to the size called for? I use a one-inch spark coil, which gives a very fat spark, in place of the transformer, and I operate it on eight Columbia dry cells in series multiple.

A. 1.—Yes, we think so; but you should use at least a two to two and one-half inch coil.

2.—Would this Tesla coil be as useful as an induction coil for distance wireless experiments (from one to three miles)?

A. 2.—Tesla coils or oscillation transformers have been used by various experimenters for wireless telegraphy. We believe that satisfactory results can be had with same, although it is extremely difficult to obtain good insulation and a minimum of leakage.

SNEE WAVE MOTOR.

(152.) RAYBURN WATERS, Conn., writes:

In the December, 1908, issue of your magazine (of which I am a reader) you published an article entitled "Harnessing the Ocean," in which you speak of the adaptability of the Snee motor as a windmill.

I should like to have the relation of the diameter and length to horse-power, etc., also any other information about its use as a wind motor that I can get. If you could give me this information or refer me to one who can, it would be highly appreciated.

A.—We refer you to Snee Wave Motor Co., 1278 Broadway, N. Y. City.

COIL AND BATTERIES.

(153.) CHAS. O'CONNELL, Mass., asks:

1.—Should four Edison primary 150 A. H. batteries work a half-inch coil? A friend and myself each have a coil, and each only gives one-quarter in. needle point spark on four cells of almost new batteries. What should I do about it?

A. 1.—You should use at least six of these batteries, also see that the positive and negative plates of the batteries come as close together as possible. This is necessary, as all spark coils use strong current.

2.—My friend has a E. I. Co. Lytic detector. It will not piek up Brant Rock with a 40-foot aerial and 75 ohm receiver, 13 miles. What shall he do?

A. 2.—He should use a potentiometer, also thousand ohm receivers, and tuner in connection with detector, as a detector alone, no matter how sensitive, will not work well under all circumstances, unless above instruments are used in connection with same.

SEARCH LIGHT.

(154.) HAROLD LEWSLY, Pa., writes:

1.—What size material should I utilize in the construction of a search light capable of throwing light one-half mile?

A. 1.—It is very hard to give you the information you desire through these columns, but we should say that the main parts are the carbons, which should be at least one-half inch diameter each, if you wish to throw a light one-half mile. Almost any searchlight will do this, but you do not tell us with what intensity the light should be received one-half mile away from the searchlight.

2.—Where can I obtain the necessary material, and what would be the approximate cost of same?

A. 2.—Any electrical supply house can furnish you with this material. See our advertising columns.

3.—Is a 32 C. P. frosted bulb sufficiently powerful to produce the requisite results and if not will you kindly advise what bulb would be required to produce such results as mentioned.

A. 3.—Hardly; we do not consider any incandescent lamps sufficient to throw a light this distance.

WIRELESS TELEPHONE.

(155.) GROVER EICHINGER, Wisc., writes:

1.—I have read of a form of electricity that is very annoying to wireless operators, called "X." Please explain it. What can be done to eliminate it?

A. 1.—We understand that you refer to static electricity, or atmospheric, which sometimes bothers wireless operators a good deal. This can be overcome with the use of variable condenser or condensers, sometimes used in the ground circuit.

2.—On which wireless telephone has speech been carried furthest—Collins, or the DeForest?

A. 2.—The De Forest system, as far as we can ascertain, carries further than the other system.

110 VOLT ON COIL.

(156.) LEWIS SHULMAN, N. Y. City, writes:

Would you be kind enough to inform me whether the lighting current furnished by the New York Edison Co. is essential for wireless, and also the furthest distance it can be sent?

I am not a subscriber, but hope to become one within a short time.

A.—It is not essential to use lighting current in connection with wireless unless you refer to alternating current and transformer. When using a spark coil on 110 volts or 220 volts direct current it is necessary to have an electrolytic interrupter something like the one described in the December issue.

DETECTOR TROUBLE.

(157.) HAROLD H. SCOTT, N. Dak., asks:

1.—I am having trouble with my electrolytic detector. When I work my coil, as fast as I screw the platinum wire into the acid it "burns out." I use a one-inch coil in connection with an electro adjustable condenser, and the detector is about four feet from sending instruments. I use one dry battery with a rheostat and telephone receiver for detector. How can I keep the wire from burning out?

A. 1.—You probably are not using a potentiometer in connection with the detector. The idea of the potentiometer is merely to save the detector from receiving too much current from the batteries, and we are confident that if you could procure one of these instruments, you will not again experience any trouble.

2.—How far should I be able to send on a clear night with the following apparatus: Aerial 30 feet high, and composed of two wires two feet apart and ten feet long, one-inch coil "Electro" adjustable condenser and helix, and zinc spark gap.

A. 2. About eight miles, if conditions are favorable, else you could not send more than six miles.

SPARK COILS.

(158.) H. L. CARVER, Ia., asks:

What is the voltage and amperage required to run one-half inch, one inch, and two inch spark coils? What current do they give?

A good one-half inch coil uses one ampere, one inch coil 1¼-1½, 2 inch coil from 2 to 3 amperes. One inch spark between sharp points is equal to 50,000 volts in dry air.

MISCELLANEOUS.

(159.) CLARENCE KRUG, Pa., writes:

1.—Is it necessary to have a condenser in series with the primary of a one-half inch coil? If so, of what size?

A. 1.—It is necessary to have a condenser in parallel with the vibrator, not in series with the primary. The condenser for one-half inch coil should have forty sheets of tin foil 4x3 inches.

2.—How long will a good piece of ebonite give a spark?

A. 2.—We cannot answer your question, as it is not definite enough. By using an ebonite disc on a static machine about ten inches diameter, one individual plate can give in connection with another plate 2½ inch to 3 inch spark. It all depends just how the ebonite is used.

3.—Could the diagram on page 69 E. I. Co.'s catalogue No. 5, be made and used as a receiving outfit?

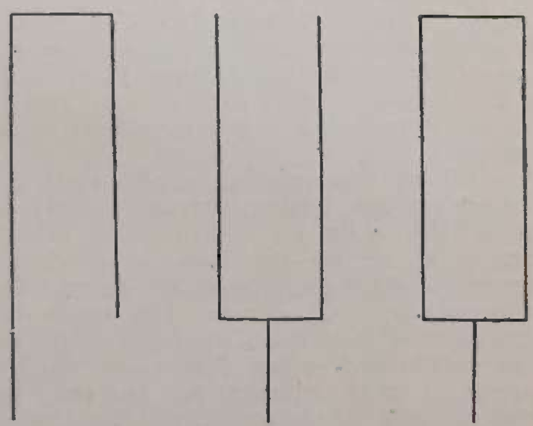
A. 3.—Yes, we think so.

AERIALS.

(160). ALLEN R. GREENLEAF, Mass., asks:

1.—Which of these three forms of aerial is the best for general work?

A. 1.—No. 2 or No. 3 are considered the best under the circumstances.



-FIG 1- -FIG 2- -FIG 3-

M.E.

2.—Please show a good method for connecting a silicon detector.

A. 2.—We refer you to article on the Silicon Detector in the June issue.

3.—By connecting a condenser across the vibrator of my coil the secondary spark is cut down about one-half, while the spark at the vibrator is hardly cut down at all. Why is this?

A. 3.—Apparently your condenser is broken down.

GRAVITY CELLS.

(161) MELVIN GETCHELL, of Massachusetts, writes:

1.—How many gravity cells would be required to replace a 6-volt battery of dry cells now used to run an inch spark coil?

A. 1.—It is not practical to use the gravity cells to run spark coil, as this battery has a very low amperage and very large such batteries only give about 1/10 ampere.

You would have to connect the batteries on a plan similar to the diagram shown on page 311 of the December issue.

2.—How is it possible to cut the miniature lamp bulb used in making a detector as in Fig. 3, page 58 of the May issue of MODERN ELECTRICS. Have tried two or three but they have broken.

A. 2.—The easiest way to cut small lamps is as follows: Take the bulb and heat the top of it over an alcohol flame, and as the lamp has a vacuum the outside air will push the softened glass inwards, leaving a large hole, which has the edges rounded inwardly. By heating the lamp 2-3 times you can easily get a very large hole or any hole to suit your requirements.

CROOKES TUBE.

(162.) CHARLES PARSONS, Ida., asks:

1.—Will a Crookes tube four inches in diameter work with a static Wimshurst machine giving a three-inch spark?

A. 1.—Yes, without a doubt.

2.—Please describe the unit of resistance as sold with the static machine by the Electro Importing Co., New York.

A. 2.—The so-called "unit of resistance" is a condenser arrangement with several condensers in series.

COIL QUERIES.

(163.) THOS. P. J. SHANNON, Cal., writes:

Is there a way in which the primaries of small induction coils from ½-inch up, can be wound so that they can be run on 110 volts alternating current without an interruptor?

A.—All of the existing spark coils can be used on alternating current simply by putting the coils in circuit with several lamps, in series—multiple, in a similar manner as shown on page 299 of the December issue. Of course, the spark obtained for instance from a 1 in. coil will not be of this length when the coil is used in connection with alternating current, but a shorter and fatter spark will be the result. If you are using a regular spark coil with a vibrator, simply screw up the vibrator, while working the coil.

TELEGRAPHONE.

(164.) W. H. POOLE, Ills., writes:

Will you please tell me the size of the wire used upon the small electro-magnet used upon the Poulsen Telegraphone. Also the ohmic resistance of the inscribing magnet?

A.—The wire used on the Poulsen Telegraphone is about No. 20, although different sizes may be used advantageously. This is for the iron "talk" wire. The small electro-magnets usually have a resistance of 75 ohms or more.

CLASSIFIED ADVERTISEMENTS.

Advertisements in this column 2 cents a word, no display of any kind. Payable in advance, stamps not accepted. Count 7 words per line. Minimum, 2 lines. Heavy face type 4 cents a word. Minimum, 3 lines.

Advertisements under "Wireless" 5 cents a word. Minimum, 4 lines. Wireless books and blueprints not listed under "Wireless" 2 cents a word.

Advertisements for the March issue must be in our hands by February 25.

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STUDY ELECTRICITY AT HOME—A complete electrical course at home, containing 30-page detail book, 220-page text-book, 200 experiments and over 100 pieces of apparatus. Price, complete, only $5.60. Catalogue "M. E. S." explains this and other remarkable offers. Thomas M. St. John, 848 Ninth Ave., New York.

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CHEMICAL RECTIFIER, how to make, 25 cents. Slate for wireless work, cheaper than wood. Electro Shop, Barker, N. Y. (5).

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WIRELESS EXPERIMENTERS, build your own spark coil. Blueprints and detailed information, 25 cents. No stamps. Samuel Mather, 8 Mann ave., Cohoes, N. Y.

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LOOK. Twenty dollars will build 20,000 volt, 1 K. W. Transformer. Blueprints and directions for fifty cents. J. H. White, Ross, California.

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New York and Detroit

ANNOUNCEMENT

Throughout the entire period of wireless progress there has been no adequate source of instruction in wireless operating and engineering.

The mechanical development of the wireless art has outstripped the ability of the public to furnish the experts needed, until to-day the progress of the great wireless enterprises is threatened through the inability of the wireless companies to secure the men needed for the extension of their business into the fields that so sorely need wireless communication. This seems almost paradoxical in view of the popularity of wireless and the thousands of more or less skilled mechanics who are experimenting in wireless to-day. The truth is, the country posseses the necessary operatives, in embryo, and only awaits the agency of some great national institution to bring the companies in contact with the men they need.

The American Wireless Institute has been founded for the express purpose of qualifying the progressive men and women of the nation to step into this lucrative connection with our stupendous wireless enterprises.

Association with wireless means boundless opportunity. Thousands of successful business men of to-day owe their present position in the world to their early association with the development of the wire telephone and telegraph. How much greater is the field awaiting those who become identified with the early history of wireless!

Success lies, in a great measure, in one's ability to discern an opportunity when it is presented and courage to put aside the old line of thought and action to take up the new.

Wireless offers unquestionably the most fascinating and awe-inspiring vocation of the present. Recognition and speedy promotion invariably follow energy and thought expended in the cause of improvement.

There is only one right way to learn wireless thoroughly, and that is in a school properly equipped with modern instruments and commanding the services of able engineers. Joining the navy in order to learn the art of wireless is a long, expensive, and roundabout way to reach the desired goal. In its comparatively short course of instruction the American Wireless Institute can give the earnest student a greater insight into wireless theory and practise than he could obtain during the four years of hard work required of all who enlist in the navy.

The American Wireless Institute is the only organization of its kind in the world, and is managed by expert wireless engineers whose experience throughout the entire period of wireless development, both in the navy and with the great wireless companies, has especially qualified them for this great work.

The American Wireless Institute teaches all the details pertaining to the construction, operation and maintenance of wireless telephone and telegraph transmitting and receiving apparatus, antennae, power, etc., as well as a general course in electrical science.

This instruction is given in three courses, namely, a preliminary or correspondence course, a primary course, and an advanced course. The primary course offers a thorough and practical training in every up-to-date feature of wireless. A student can, in about six weeks, secure a thorough understanding of both wireless telephone and telegraph operation. While the regular course of instruction is arranged to occupy about six weeks, the student is given every assistance in completing the work sooner. The instruction is *individual*, and *the student's progress depends upon himself.* The student who completes this course is qualified to accept a position as an operator and, after a certain amount of experience, may expect advancement into the ranks of inspectors and installing engineers.

To the student who qualifies in the advanced course is assured a position as an inspector or engineer, after a preliminary training as an operator in actual service, where after a brief experience, a capable person may even have an opportunity to step into a responsible executive position with one of the great wireless companies. This advanced course of four weeks is open only to students who have successfully passed the required examination.

The preliminary course is given *by correspondence only.* We do not believe that practical wireless operation can be taught by mail any more than can piano playing, but it is no doubt a fact that a great deal of the preliminary work necessary to mastering either wireless or the piano can be done by a correspondence course. This course gives adequate instruction in nomenclature, theory and principle, and will save most students more than double its cost in the time saved in completing the other courses. While not requiring this course, we urge every student who can afford it to secure this supplementary instruction before undertaking the primary course.

The correspondence course costs twenty ($20.00) dollars, the primary course fifty ($50.00) dollars and the advanced course fifty ($50.00) dollars. The total cost of tuition, including all three courses, is one hundred ($100.00) dollars, a special reduction of twenty ($20.00) dollars being extended to every student completing the three courses. There are no tedious waits to get started, as a new class is begun in each regular course every Monday, while the correspondence course may be commenced at any time.

Every student must furnish with his application for enrollment the names of at least three responsible persons able to vouch for his character, integrity and earnestness of purpose. Every reference will be carefully investigated before any of the privileges of the school can be granted to any candidate.

Detroit has been chosen as the seat of the first branch of the American Wireless Institute, as that city occupies a central position on the Great Lakes, which will doubtless be the scene of one of the first great commercial developments of wireless communication. The student at Detroit will have the immense benefit of practical work in the field within reach of a majority of the instruments on the Great Lakes, in conjunction with laboratory and schoolroom work.

Competent students should be able to secure good positions with the shipping interests on the Great Lakes, even before graduation.

Female operators are in almost as great demand as men. We are prepared to give the three courses of instruction to women and recommend to them this vocation, as presenting a field unequalled in opportunity for quick recognition and substantial financial appreciation.

An Accommodation Bureau has been established for the convenience of out-of-town students, whom we will gladly assist in securing board and rooms at suitable rates, with home comforts and the proper environment for work. The cost of room and board runs from about $5.00 to $10.00 a week, according to accommodations required by the student.

It is manifestly impossible for us to pledge positions before students demonstrate their capabilities and their value to the world of wireless, but our Employment Bureau is continually receiving requests for trained wireless men, and so far we have been unable to supply the demand.

Once more, let us urge upon every young man and woman of the nation the study of wireless as a vocation, as a life work holding out to the capable student a future fraught with independence, accomplishment, recognition, and the happiness that comes only with a career whose usefulness to our fellows cannot be gainsaid.

Additional information cheerfully furnished upon application.

Address office nearest your place of residence.

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University Building,

M. A. CASE, Secretary,
American Wireless Institute,
52 Broadway,
New York, N. Y.

TUNED WIRELESS TELEGRAPHY.

(Continued from Page 385)

Again, after adjusting the aerial tuning condenser to give the strongest signals, and if interference is found, the intensifier handle is adjusted to a small valve and the condensers are again adjusted. It will be found that the further the intensifier handle is turned from 90 deg. the sharper will the adjustments of the condensers become, and the greater will be the freedom from interference.—Lond. *Electrician.*

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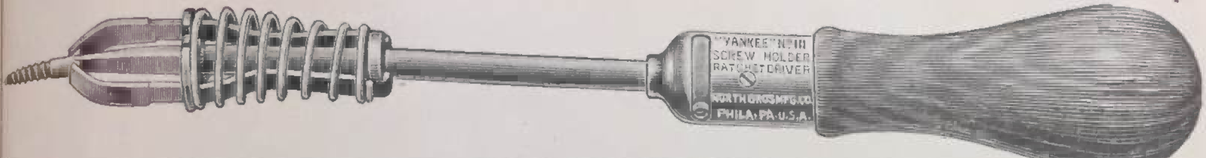

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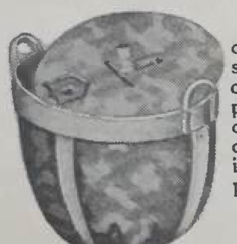

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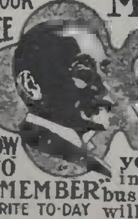

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We find that our stock on our regular 2 inch Coil, No. 1089, listing at $10.50, is too large. We built over 500 of these coils before Christmas and find that we have about 150 on hand now. As our usual stock is from 50 to 75 2 inch Coils, we will sell One **Hundred 2 Inch Coils only** practically at cost.

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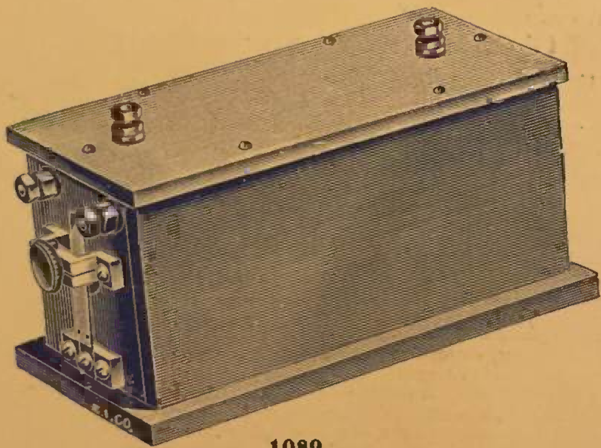

1089

a net saving of $3.00. Remember, each coil is fully guaranteed. As soon as the 100 coils are gone the price will be again $10.50 as heretofore. As soon as the stock is cleared we will refund money to customer, or advise him. NOTE—Our young friends desiring to get one of these fine Coils, and who just now cannot send in the entire amount are requested to send one Dollar on deposit. We shall then reserve one Coil for them, to be shipped C. O. D. (if desired) within 30 days.

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