

HOT OFF THE PRESS EVERY 7 DAYS—15c

RADIO WORLD

THE ONLY RADIO WEEKLY



(c. International.)
Miss Jane Richardson, leading lady in "Just Because" at the Earl Carroll Theatre, New York, has a radio set in her dressing room.

APRIL 22, 1922 **15c**
A COPY
1 year, \$6.00
6 mos., \$3.00
3 mos., \$1.50

In this issue:

Radio Primer

Follow It Weekly
in this Paper
If You Want
to Understand
Radio

—
OUR AIM IS
SERVICE

USES OF THE VACUUM TUBE---By Walter J. Howell

RADIO FOR EVERYBODY

By
AUSTIN C. LESCARBOURA,
Managing Editor
SCIENTIFIC AMERICAN

Here it is—the A B C of Radio with all explanations and instructions written so everyone can understand them. In 352 pages and 180 illustrations it describes how to install radio-telephone sets, how to use them; broadcasting concerts; apparatus to buy according to your locality; the dot and dash for signal work, etc.

This is the first intelligent, complete and authoritative book on Radio understandable to all; written and backed by the reputation of Scientific American.

Price \$1.50
by Mail \$1.60

SCIENTIFIC AMERICAN
MUNN & CO.

233 Broadway, New York City

Wants More About Telegraphy

I have just bought the second copy of RADIO WORLD I am so pleased with it that I am going to take a subscription.

There is only one fault I find with it. You have too much of this phone "stuff." A little more telegraphy and less telephony will about make your magazine 100 per cent. perfect.

I read with joy the charges brought by Attorney-General Daugherty. If somebody would wipe out entirely these broadcasting stations it would be a boon to wireless.

I have been interested in the game for eight years, and have had a set working for three.

Anybody can get these broadcasting stations, but let some of these people sit down. If they can copy, code, and try to copy an "8" or "9", some night, with his "Wonderful Westinghouse" set.

I notice on page 11 of RADIO WORLD, under the title of "The Broadcaster," you tell about the growth of radio. I don't call that growing. It might be in quantity, but not in quality. How many of these new "hams" can tell you anything about wireless. About one out of twenty.

The broadcasting stations are trying to shut the amateur up until after eleven o'clock. I can get hundreds of amateurs to back up my statement.

Another thing you said is, "Since its creation, the radio telephone has grown from the baby of the amateur to a giant entering thousands of homes." How do you get that way! "Baby of the amateur!" Why if it wasn't for the amateur where would the navy get its operators. If it wasn't for the amateur where would you get the man to run these big stations. If it wasn't for the amateur, there wouldn't be any wireless.

RALPH R. GARRICK,
Operator JART, 3 P. M.

Complete your files by getting Nos. 1 and 2 of RADIO WORLD and save them so that you can have 52 copies bound at the end of the year. If your newsdealer cannot supply you with the copies, he can get back numbers through the American News Co. and its branches, or copies at 15 cents each, will be sent direct from publication office, or better still, subscribe and have your subscription start. RADIO WORLD CO., 1493 Broadway, New York, N. Y. (Adv.)

Subscribe for RADIO WORLD direct or thru your newsdealer. \$6.00 a year, \$3.00 for six months, \$1.50 for three months.

RADIO BOOKS ALL UP TO DATE

Design Data for Radio Transmitters and Receivers, by Sleeper. Price 75c.

Experimental Wireless Stations, by Edelman. Price \$3.00.

Wireless Telegraphy and Telephony Simply Explained, by Morgan. Price \$1.50.

The A B C of Vacuum Tubes used in Radio Reception, by E. H. Lewis. Price \$1.00.

Radio Hook-Ups, by Sleeper. Price 75c.

Construction of New Type Transatlantic Receiving Sets, by Sleeper. Price 75c.

How to Make Commercial Type Radio Apparatus, by Sleeper. Price 75c.

Construction of Radiophone and Telegraph Receivers for Beginners, by Sleeper. Price 75c.

FREE! Catalogue of Radio, Automobile and Other Books. Sent Free on Request. Liberal Discount to Supply Houses

THE NORMAN W. HENLEY PUB. CO.

2 West 45th Street

Take Elevator to Sixth Floor. Visit us at Travelers Show, Booth 103, where books can be seen.

FREE THIS MONTH

VACUUM TUBE
WIRELESS RADIOPHONE AND
CODE SET

Also the Wonderful OMNIGRAPH for learning the Code, and best Theory Text Books given FREE with our Simplified Spare Time Professional Home Course.

LEARN WIRELESS

It Pays Big Money

The demand for experts exceeds supply. Pays \$250 monthly up to \$10,000 a year or more.

Nationally recognized as foremost Wireless Institute. Wireless is entering new fields of business, it offers an opportunity of a lifetime to the man who is awake.

FREE—LEARN-O-GRAPH



Code Sender—Text books given with our Low Cost AMATEUR COURSE, Simple, non-technical, qualifies you for amateur license.

New Stock Radiophones for Immediate—Call and Hear Our Wonderful Amplifier.

Free Booklet—"How to Become a Wireless Operator."

New York Wireless Institute
154 Nassau St., New York City

ATTENTION AMATEURS

A complete line of high grade radio material backed with quick service has built up a remarkable radio trade.

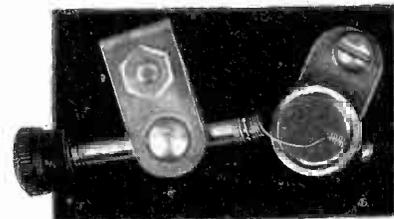
The Quaker Light Supply Co.

728 ARCH STREET,
PHILADELPHIA, PA.

RADIO WORLD IS READY FOR
YOU EVERY WEDNESDAY

LOOK

The "Junior" Crystal Detector



THESE

CRYSTAL DETECTORS

Are The Very Best For Constant Satisfactory Results.

Lowest of All in Price

Dealers and Jobbers Write For Proposition

WALTER H. SAMUEL

400 BELLVILLE AVE.
Bloomfield, New Jersey

NOVO "B" BATTERIES FOR YOUR RADIO SET

All standard sizes 22½ to 105 volts.



For Sale by Leading Dealers

NOVO MFG. CO.

NEW YORK—424-438 W. 33rd St.
CHICAGO—531 So. Dearborn St.

RADIO WORLD

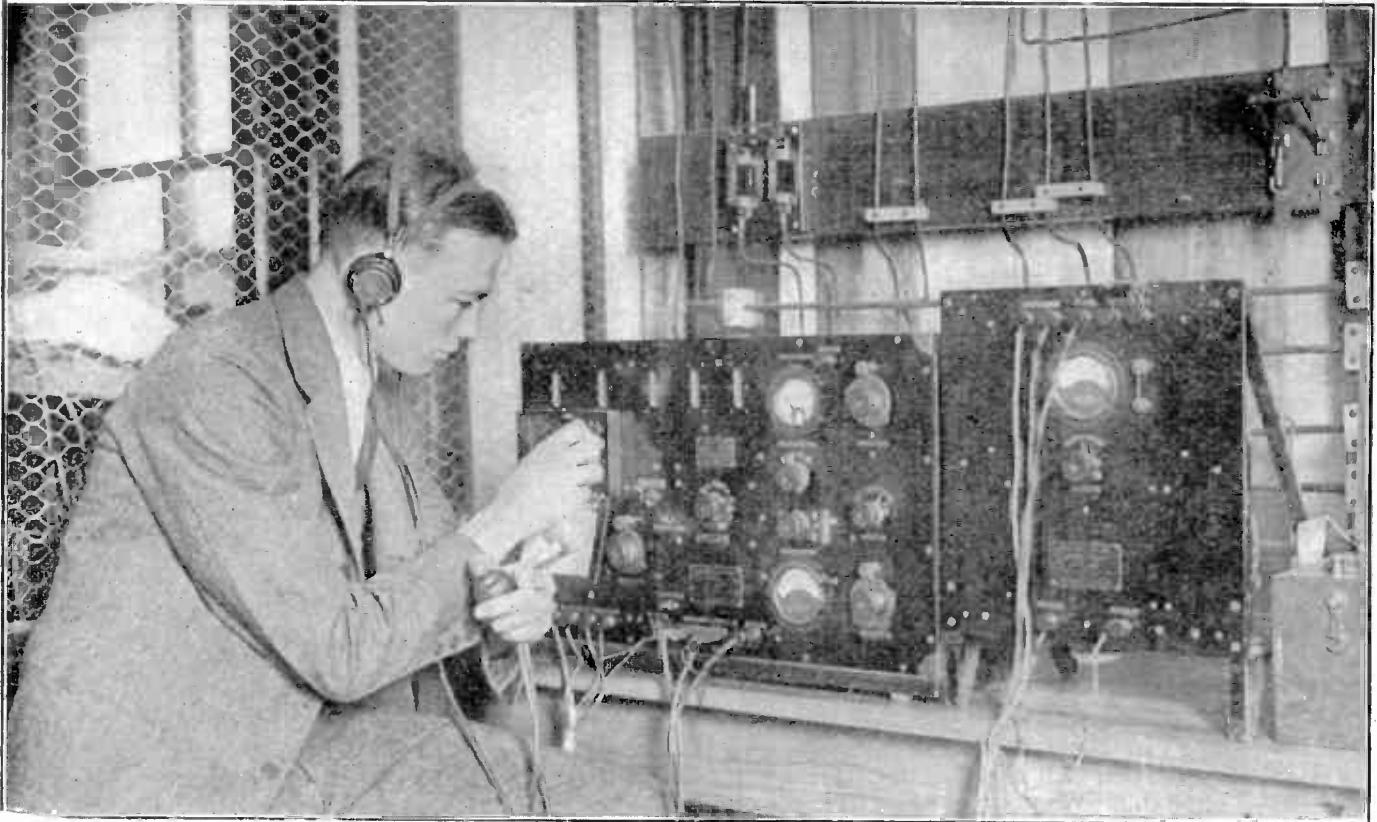
[Copyright, 1922, by Radio World Co., New York, N. Y.]

A WEEKLY JOURNAL, PUBLISHED EVERY WEDNESDAY AND DATED SATURDAY BY RADIO WORLD COMPANY, FROM PUBLICATION OFFICE, 1493 BROADWAY, NEW YORK, N. Y.

Vol. I. No. 4.

April 22, 1922

15c. per copy, \$6.00 a year



(c. Kadel & Herbert News Service, N. Y.)

One of the first pictures made of the radio set used for communication with airplanes. It is in operation at the Cornell University Radio School, New York. Very few radio enthusiasts have ever seen a set of this type. A. W. Manatee is photographed at the transmitter.



(c. Underwood & Underwood)

Congressman Joseph J. Cannon has become a radio fan—just for fun.



(c. Kadel & Herbert News Service, N. Y.)

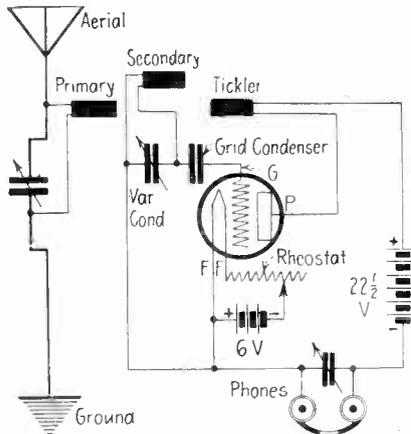
An ardent radio enthusiast is four-year-old Bruce Rae Gillam. He is listening in while the bagpipes are coming over the ether.

Solving the Puzzle of the Honeycomb

By Fred. Chas. Ehlert

THE writer wishes to bring forward the question of using honeycomb coils, which seems to puzzle many amateurs. These so-called inductances are to be used exactly like any other type inductances having a fixed value. They differ from the inductances usually employed for radio telegraphy in this way: Instead of having the inefficient taps connected to cumbersome switches, each coil is provided with a plug which fits into a receptacle in the coil mounting, taking the place of a mechanical coupler. Condensers are connected in series, or parallel with the coils, which provides the tuning qualities of the coils to a given wavelength; and if it is desired to receive stations with wave lengths beyond the range of the condensers, larger coils must be substituted. In this way, the losses due to dead-end turns and high-resistance taps are done away with.

The ultra-honeycomb coil with the duo-lateral winding is an improvement on the honeycomb coil, and is well worth any additional cost. The De Forest ultra-honeycomb coil differs from the honeycomb coil in this respect; it has incorporated a duo-lateral winding and, therefore, has all the electrical advantages that characterize this new type of winding.



Circuit displaying the units of honeycomb coils. With the proper mounting and connections an ideal regenerative-set can be made. Suggested by Fred Chas. Ehlert. Drawn by F. Newman.

The duo-lateral winding differs essentially from the older honeycomb type. The wires are not laid directly above one another, but are so arranged that parallel wires in consecutive layers fall in between one another instead of being directly above or below one another.

The obvious advantage of a lower distributed capacity and lower dielectric loss, which results from such an arrangement, makes the coil unexcelled for radio work where extremely

low distributed capacity and extremely low dielectric losses are essential.

The proper coils for use as secondaries of a loose coupler shunted by the usual .001 variable air-condenser may be readily chosen from the table given below. There are coils for various wave length; so be sure, to purchase the right coils for the wave lengths desired. With an average aerial of .0007 MFD capacity, a primary condenser of .0015 MFD capacity coils will respond to wave lengths as follows. The figures in the table at the right indicate meters.

Number	Approximate Wave lengths with .001 MFD in shunt
DL-25	180—375
DL-35	180—515
DL-50	240—730
DL-75	330—1,030
DL-100	450—1,460
DL-150	660—2,200
DL-200	930—2,840

There are still coils which are made to respond to higher wave lengths.

If the desired coils are purchased and placed upon the inductance-coil mounting and connected, according to the accompanying diagram, good results will be obtained when using the tickler coil. By close coupling regeneration or undamped reception is secured.

Will Radio Hurt Vaudeville Shows

Just how far, if at all, is the radiophone fad destined to cut into the patronage of musical shows—and vaudeville performances in which singing and talking acts predominate?

The answer is: Not so far that you could notice it, writes Ashby Deering in the New York "Telegraph." There are several reasons for this calm assertion based upon facts.

It is true that the Vaudeville Managers' Association of Newark, N. J., recently passed a resolution that they would not book artists who gratuitously or for pay gave their voices or the patter of their feet to the broadcasting station. Also the subject has been discussed by officers of the Actors' Equity Association, and there is some probability that the Equity Council will soon make a ruling to the effect all services of this nature must receive compensation.

Keeping Amateurs within the Law



(c. International.)

Many amateurs who have licensed transmitting-sets get very angry when Q. R. M. is bad and in turn try to succeed in advancing up a few meters in order to carry on communication with the distant operator. This is a direct violation of the rules and regulations of the radio law. In order to catch these violators, Inspector Schmitt, of Chicago—pictured here with his receiving set and wave meter—checks up anyone he finds working over the wave lengths allowed by law.

Radio as It Figures in Daily Events



(c. Underwood & Underwood.)

Among the thousands of radio enthusiasts throughout the country a large percentage are school boys. This art has gripped the youngsters so strongly that they are laying aside their "Wild West" novels for "How to Make Your Own Radio Set." The picture shows a school boy listening to the results obtained from the variations of the tuning qualities which are being made by the instructor. There is no question that, within a short period, fifty per cent. of the nation's youth will be listening in on the concerts. With all this in mind, it is safe to say that the development in this art will soon be taking strides, as everyone knows that it was the boy amateur who brought the radio telephone, with its vast developments, to such a marked degree of efficiency that the entire world seems to be taking active interest in this remarkable achievement.



(c. Sport Commercial, N. Y.)

Frank H. Schnell, traffic manager of the American Radio and Relay League. This organization has 15,000 members and its object is to relay messages for mutual benefit. It promises to be a most useful organization.



(c. International.)

Now that market and weather reports are broadcasted, the farmer—the man most interested in the marketing of America's foodstuffs—finds that science has, at last, rendered him a great service. Here is an example. Charles Daugherty, a farmer, of Champagne, Ill., at 10 o'clock every morning, receives his crop news the radio way. The apparatus is rigged up in his barn. He is in touch, at the moment, with the latest reports from Washington. The farmers are among the most interested radio enthusiasts, and many have constructed their own radio sets, owing to the fact that the radio salesman has not yet penetrated the rural districts.



(c. International.)

Today it is possible for customers of the Noel State Bank, Chicago, to receive market and weather reports at the bank by radio. In the above picture, Miss Lydia Martin, radio operator, is receiving messages. The radio is set up temporarily in a room; but, if the innovation is successful, the bank will open a special "Radio Room."

Ernst F. W. Alexanderson

Life Story of the Chief Engineer of the Radio Corporation of America

By George H. Flint

ERNST F. W. ALEXANDERSON, chief engineer of the Radio Corporation of America, is the pioneer and leading exponent of the modern tendency to bring radio engineering on to the same plane with power engineering. His invention of the Alexanderson alternator was the first step in this line, this machine being in design and operation essentially a power unit.

Among the other inventions of Mr. Alexanderson in the field of radio engineering the best known are the multiple tuned antenna, by means of which the energy-wasting components of the total resistance of an antenna are greatly reduced and the efficiency of the radiating system correspondingly increased, and the magnetic modulator, which controls large quantities of power by the change in flux caused by a relatively small change in magnetizing current.

Mr. Alexanderson was born at Upsala, Sweden, on Jan. 25, 1878, the son of a university professor, A. M. Alexanderson, and Mrs. Amelie von Heidenstam Alexanderson. He was graduated from the high school of Lund in 1896, and afterward studied a year at the University of Lund. He

then entered the Royal Institute of Technology, Stockholm. This was followed by post-graduate work at the Koenigliche Technische Hochschule, Berlin.

Realizing that the larger opportunities for young electrical engineers were to be found in the United States, Mr. Alexanderson came to this country in 1901. His first position was as electrical draftsman with the C. & C. Electric Company of New Jersey, in 1902, he accepted employment with the General Electric Company in Schenectady. His advancement was speedy and he soon became a consulting engineer of the company. In November, 1919, he was appointed chief engineer for the Radio Corporation of America, a new company combining the radio interests of the General Electric Company and the Marconi Wireless Telegraph Company of America.

Mr. Alexanderson's radio researches have greatly extended efficiency of radio transmitting apparatus; he has also carried out no small amount of development and research in connection with radio receiving apparatus. Thus, during the recent European war, he evolved a

system of radio reception which has become the foundation of the modern directive method of radio reception. The immediate object of this receiving system, first known as the barrage receiver, was to eliminate malicious radio interference of the enemy, who might send out waves of the same or nearly the same wave length as those which it was desired to receive."

Through an ingenious combination of receiving aerial systems and special apparatus, he was not only enabled to eliminate such interference, but also to receive signals from European stations nearby to a high-power transmitting station in the United States, which operated on the same wave length as that of the signal being received.

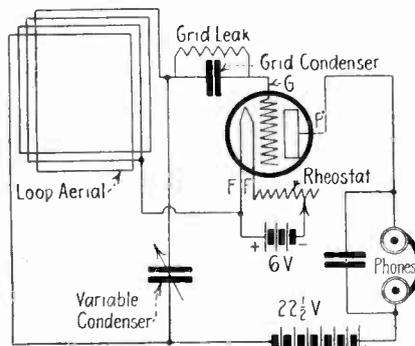
Other researches of vital importance were conducted by Alexanderson in the field of radio telephony. One of his developments consisted in the evolution of a complete duplex radio telephone system by which a subscriber to a land line telephone could establish connection with a radio telephone station and conduct a two-way conversation with the facility of an ordinary land-line circuit.

Hook-up for Loop Aerial Using V. T. Detector

THE loop aerial saves the expense of the outdoor aerial, but the radio amateur must bear in mind that the loop aerial is for receiving only and not for transmission. The loop has not sufficient insulation for transmission, and precautions should be taken not to use this type aerial for any transmitting purposes whatsoever. This loop takes but very little space and is inexpensive to make up. It is within the purchasing price of any amateurs pocketbook.

For direction finding and eliminating interference nothing is much handier than employing a loop aerial. The circuit in the accompanying diagram shows the loop aerial in which is employed a simple vacuum tube, but the writer admits that for efficient strength of signals a two- or three-stage amplifier should be connected on to the detector circuit. In discarding the open aerial for the loop, we must sacrifice this long aerial by plac-

ing the loop in a small area; therefore, to gain what has been lost we must apply this to our amplifiers. Some radio fans employ several stages of radio frequency, then detect the signal, then add a few stages of audio frequency, thence to the phone circuit.



Connections necessary for radio telephone reception employing loop aerial. Diagram suggested by Fred. Chas. Ehlert. Drawn by S. Newman.

Those contemplating a loop aerial, must bear in mind that if they use a loop they must employ a V. T., and, at least, a two-stage amplifier if good results are expected.

Radio Light the Latest

A wireless electric light which takes its current from the air, as sound waves are picked up by radio, is the invention of Juan J. Tomadelli, of Jersey City, N. J. His wireless light, apparently, approximates the cold light for years sought by scientists. The lamp burns with a white brilliance in any position. As it cannot be turned out, a metal curtain is provided for it.

According to the inventor, a 100-candle power lamp which he is manufacturing to sell at \$3 will burn three years without attention.

The process is secret, but the inventor intimates that the light is produced by the attraction of chemicals.

Radio World's Hall of Fame



ERNST F. W. ALEXANDERSON

Chief Engineer of the Radio Corporation of America. Pioneer of the modern tendency to bring radio engineering to the same plane with power engineering. Inventor of the multiple-tuned antenna and the Alexanderson alternator. During the World War, he evolved a system of radio reception which prevented interference by the enemy.

The Original Radio "Bugs"

Who They Are and What They Are Doing To-day

Is It Time to Organize the Radio Pioneers' Society?

THE old-time radio bugs—the fellows who started the radio game—and still are in the land of the living, have had no end of amusement during the past few months reading the fine stories telling all about those who launched radio to a hungry public waiting for some new morsel to devour.

A whole lot of names have appeared in the daily papers in connection with radio; but when the old-timer searches his memory, he fails to find any recollection of these birds back in the days when the radio amateur had the ether to himself—

before the days of radiophone broadcasting and Department of Commerce regulations.

All regular old-timers will remember when Thomas E. Clark, back in 1901, issued a handsome catalogue of radio apparatus showing coherer sets with large capacity drums. Clark's radio-telegraph sets were used on lake steamers and at several stations on the Great Lakes, and the very first amateurs had the advantage of Clark station sending to tune up home-made coherer sets.

The first head-phones made especially for radio were turned out by

W. C. Getz, of Baltimore, a telephone engineer. These phones were wound to 2,000 ohms each and had thin rolled gold-iron diaphragms. Getz died in the Philippine Islands, some years ago, where he had gone to do work for the Signal Corps.

C. Brandes, New York, put out a good phone as early as 1909. Brandes was killed in a train wreck, a few years later. His business has been continued and is prosperous.

The first understandable article on radio published in the United States was written by A. F. Collins, and appeared in the "Scientific American" in 1901 or 1902. This article started the ball, as plain instructions were given how to duplicate Mr. Marconi's original experiments.

Mr. Collins published a small radio magazine known as "Collins Wireless Bulletin," and one of the contributors was William Dubilier, who later became well-known radio engineer and successful manufacturer of radio apparatus.

In the New England States, W. W. Massie, at Providence, Rhode Island, got into the game at an early date and had to his credit a string of patents as early as 1905.

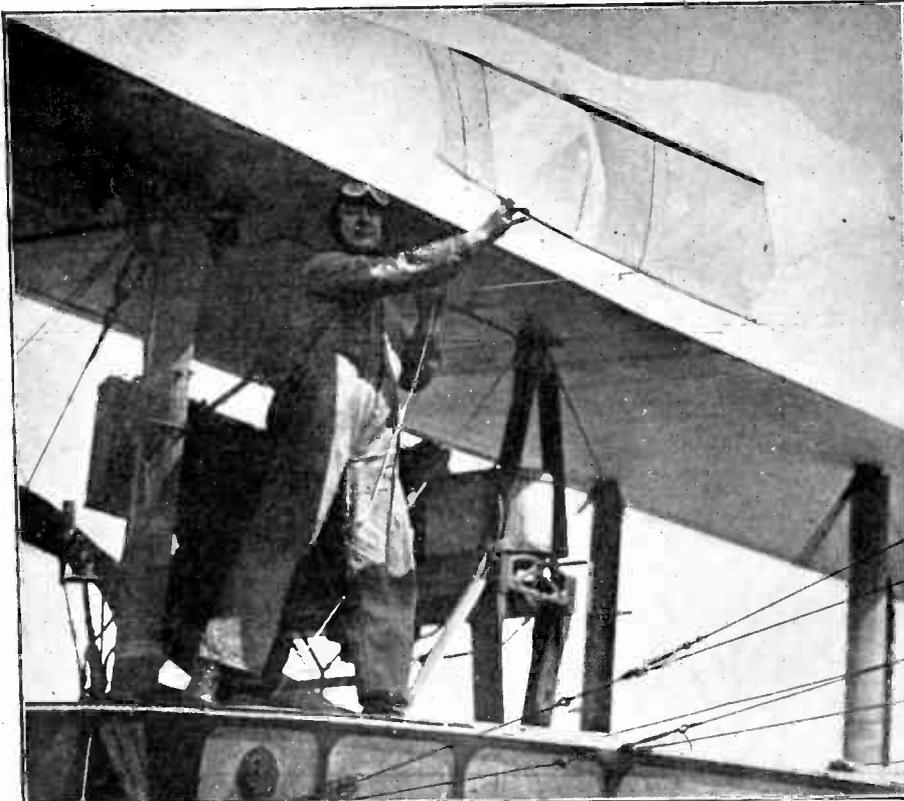
Yea bo! Do you remember the fine articles on radio written in the amateur magazines, radio and mechanical, by John Vincent? This lad was none other than he who is John V. L. Hogan, who, in 1919, became president of the Institute of Radio Engineers, and is, to-day, one of the best-informed radio engineers in the country.

David Sarnoff, who set up the radio station for John Wanamaker, about 1908, is now general manager of the Radio Corporation, and Mr. Gawler, who helped the French-Rochefort concern to get their primitive radio-gear working to suit the Navy, about 1903, is now doing big things for the Radio Corporation of America in New York.

The first radio operator to go down with his ship in performances of duty was George Eccles, a Canadian. Mr. Eccles was lost when the "Ohio" sank off the North Pacific Coast in 1909. His name appears on the fine monument erected to radio heroes and which is situated in Battery Park, New York.

Jack Binns, of the "Republic" and

Kite Device for Airplane Antenna



(c. Underwood & Underwood.)

Heretofore the antenna of the radio equipment of airplanes trailed from the "ship" and became unwieldy and useless when a landing had to be made. Now the antenna trail from a flown kite of the type shown in this picture.

By means of a new radio-invention, lost airplanes will be able to signal their location through an antenna trailing from a kite. Formerly a plane could use its radio only while in the air, where the antenna consisted of 200 or more feet of trailing wire. When the plane was forced to

land, the antenna could not be used.

The new kite-equipment weighs only a few pounds. Each plane carries two kites—for light and strong winds—and a reel of very light antenna-wire. The radio generator develops power for the sending of messages.

"Florida" fame, and John R. Irwin, who accompanied the celebrated correspondent, Walter Wellman, on the first attempt to fly a dirigible across the Atlantic, are still in the game and are well known to radio fans.

John Stone, one of the first American radio engineers to put down in black and white the mathematics of radio phenomena is in New York, and is a keen observer of the great things which have come to radio in recent months.

Charles V. Logwood, who had a Poulsen-arc working as early as 1908, and who later became chief engineer of the De Forest Laboratories, New York, now is in Chicago looking after radio for the educational department of the windy city.

Then there is Donald McNicol, who while but a boy had the earliest operative radio set in the Northwestern States—in Minneapolis in 1901—and who wrote one of the earliest book-length treatises on Wireless (1903). Mr. McNicol, to-day, is a member of the board of directors of the Institute of Radio Engineers, and possesses the largest private collection of radio literature, history, and relics, and is, also, assistant to the president of the Radio Corporation of America, New York.

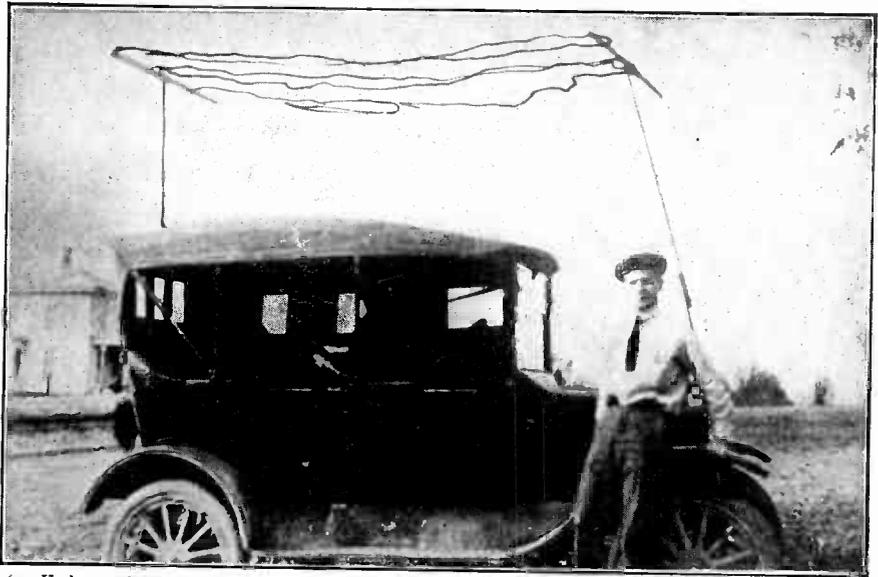
R. H. Marriott, who got the Department of Commerce's radio-inspection service started, is now in charge at the Bremerton, Washington, navy-yard. Phil Edelman, who wrote a book on radio many years ago, is in New York as a practicing engineer. E. N. Pickerill, the first railroad telegrapher to take up radio (about 1905) and who buzzed out good American Morse from old "WA" office, De Forest, on top of the Waldorf-Astoria Hotel for a few years, beginning about 1907, during the late war became a noted airplane-pilot. He is now in the radio game in New York.

Harry Shoemaker, who kept the patent office busy in the early nineteen hundreds, was one of the pioneers who made good contributions to radio. Fred M. Sammis, who was one of the early chief engineers of the American Marconi Company is now with the Westinghouse Company.

The first employed Marconi operator in America was Tom Tierney, who worked the old Nantucket Light station in 1901. Mr. Tierney is now night manager of the New York office of the Postal Telegraph-Cable Company.

Three of the earliest New York radio bugs were George S. De Sousa, Dr. Hudson and Bob Gowen, Mr. De Sousa now is treasurer of the Radio Corporation; Dr. Hudson who had

Michigan "Flivver" Rigged for Radio



(c. Underwood & Underwood.)

"Bud" Slocum, sixteen-year-old student of the Ionia High School, Michigan, has rigged an aerial on his "flivver" so he will not miss any radio messages if he chooses to stop his car. His only drawback must be looking for good ground where he can set up his receiving equipment. Then it will be quite possible for him, with the aid of his overhead wires, to tune in.

New York City to be a Broadcaster

Mayor Hylan has appointed a municipal radio committee to carry out the suggestion regarding control and the possible establishment of a radio broadcasting station by New York City. The committee is composed of Rodman Wanamaker, chairman; Borough President, Maurice E. Connolly; Arthur S. Tuttle, chief engineer of the Board of Estimate; Merrit H. Smith, chief engineer of the Department of Water Supply, Gas and Electricity; Grover A. Whalen, commissioner of plant and structures; Samuel G. Rhodes, of 124 East Fifteenth Street; Sanders A. Wertheim, of 52 Broadway, and Lloyd Espenscheid, of 195 Broadway.

The committee will pay particular attention to recreation and control, and will suggest measures to protect the public against any possibility of

the new medium of communication falling into the hands of a monopoly which might retard its development in the metropolis.

Reception in Radio Telephony

The apparatus ordinarily required for reception in radiotelephony is the same as that ordinarily used for reception in radio telegraphy. The transmitting apparatus, however, differs essentially.

Frequently it is possible to use one of two grounds; but both of them being doubtful, the experimenter is in a quandary as to his selection. In such cases, there is but one rule to follow, and many amateurs who have tried out various ideas have decided to observe that rule: Use of both grounds.

one of the best early transmitting stations, on Riverside Drive, New York City, died some years ago, and Bob Gowen, who later as chief engineer for the De Forest Company carried on the first broadcasting music experiments from his home in Ossining, New York in 1917, is now in China on radio work.

Alex Reoch, who put up early stations along the eastern coast of Canada, is now assistant chief engineer for the Radio Corporation.

Old-timers, this list is not complete,

but includes the names of a few of those whose names figured conspicuously in the amateur radio journals of a dozen years or more ago. The time has about arrived for the formation of a Radio Pioneers Society, to include in its membership those who can by evidence show that they were dabblers in the great game of radio as far back as twenty years ago.

RADIO WORLD would like to hear from the old-timers regarding the proposed society. What is your opinion regarding the new society?

More About Your Storage Battery

How to Install and Operate It. Proper System of Home Charging. The Best Way to Keep It Working Properly

By E. L. Bragdon

IN RADIO WORLD No. 3, dated April 15, the amateur was told how to use his storage battery in order to have it give its best service over a long period. It was explained to him, also, what careless treatment would do to the battery; that although batteries are sturdily built, they must be handled as carefully as any other part of a receiving outfit in order to give satisfaction. In this article, methods will be described by which the storage battery may be charged at home if the owner so desires. The man who uses only one vacuum-tube will seldom find it economical to invest in the added equipment necessary to do his own charging; but the owner of a three or four-tube station can figure that a charging set will soon repay its first cost in its elimination of the bother and delay occasioned by the frequent need for recharging. An outfit consisting of one stage of radio frequency amplification, a V. T., detector and two stages of audio frequency amplification will consume about four amperes. If the set is operated four hours an evening, a 60-ampere-hour battery would have to be recharged after three evening's use.

But by having his own charging equipment available, the battery can be kept charged by hooking it to the line for a few hours each day. This method will keep the battery plates in better condition than when the battery charge is fully depleted before discharging.

System Used in Home Charging

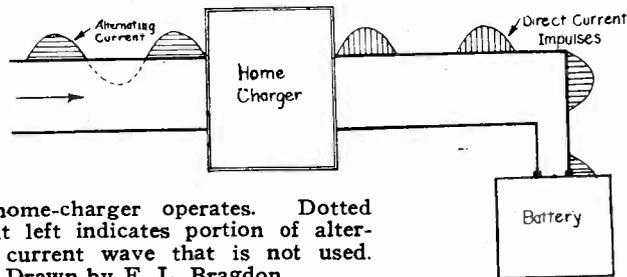
Storage batteries are charged only with direct current. But practically all house-lighting circuits are alternating current lines. Before a battery can be charged, then, it is essential that some way be found to change the alternating current to direct current. This is done in the principal charging outfits by some device that "rectifies" the alternating wave.

The sketch shows the wave form of an alternating current. If this current were connected to a storage battery, those plates which are supposed to be positive all the time would be positive only half the time. The other half would be negative, thus nullifying the work done by the first half of the cycle and incidentally ruining the plates.

In rectifying an alternating current,

it is necessary to find some way by which the negative half of the wave (noted by dotted line in the accompanying sketch can be turned around so that it flows in a positive direction. Or, if this is not possible or feasible, some way must be found of using only the positive half of the wave. The latter method is the one most frequently used. As can readily be seen by the sketch, this means that there is a part of each cycle when the battery is not being charged but this

but if the plate becomes positive, the current will flow from it to the filament. Knowing this the reader, no doubt, can see how the tube acts to rectify the alternating current. The latter is first positive and then negative. When it is positive, there is a flow of current from plate to filament and then to the battery being charged. But as the cycle changes and the alternating current becomes negative, the flow from plate to filament stops short. Current cannot flow back from



How home-charger operates. Dotted wave at left indicates portion of alternating current wave that is not used. Drawn by E. L. Bragdon.

works no harm. The pulsating direct-current is not as efficient nor as rapid in charging as a constant direct current but otherwise it serves as well.

One Type of Home Charger

It is interesting to notice that one of the most successful of home-charging equipment makes use of the same general type of vacuum tube as is found in radio detector units. The charging tube, however, consists only of a filament and a plate, the grid being omitted. The bulb is filled with one of the rare gases—argon.

When the filament is lighted, it gives off millions of electrons which are negative. If the plate is also negative, there can be no flow of current;

the battery to the line because there is no connection between the filament and the negative plate. Thus we have a case where the battery is charged by spurts of positive electricity.

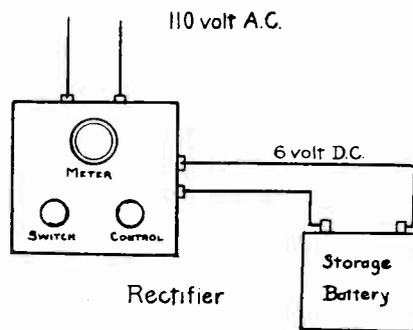
At first thought, it might seem that this method is wasteful since only one-half of the current is used. As a matter of fact, the efficiency is much higher than fifty per cent. The half of the wave not used is not wasted because it is not drawn from the line.

One excellent feature of these home-charging sets is their safety and freedom from trouble. They have been approved by the Board of Fire Underwriters and the owner of an outfit can feel free to leave his battery charging over night or during the day without fearing fire or injury.

A regulating device inside the case of the charger acts automatically if the alternating current supply fails. If this feature were not included, the storage battery would discharge back into the supply line, causing trouble, perhaps, to both line and battery. As it is, if the supply fails the battery is no longer charged; but as soon as the supply is restored the charger commences again to operate and the charging of the battery continued.

How to Install and Operate

As a rule, most of the home chargers are made in a variety of capacities to



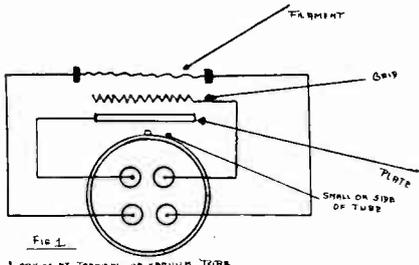
Simple wiring scheme for charging storage battery. Frequent charging with small charges is better than large charges only when battery is exhausted. Drawn by E. L. Bragdon.

Vacuum Tube as Applied to Receivers

By Walter J. Howell, (Associate Member I. R. E.)

Deputy Radio Inspector

THE vacuum tube is essentially a relay, which means that a small change of current in the input circuit of the tube will cause a big change of current in the output circuit of the tube. A vacuum tube, in general, consists of a filament which is raised to a high temperature by means of a current being sent through it, a grid or screen of wire and a metal plate. The grid is placed between the filament and plate, and the whole incased in a glass tube which is evacuated to a high degree of vacuum. Four connections are brought out to a base, as shown in Fig 1.

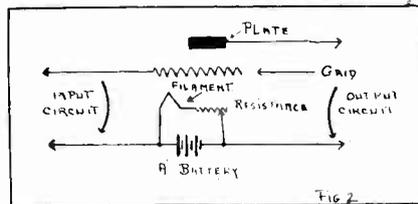


Looking at terminal end of a vacuum tube. Drawn by W. J. Howell.

Fig 2 shows the input circuit which consists of the grid and filament path through the tube and the output cir-

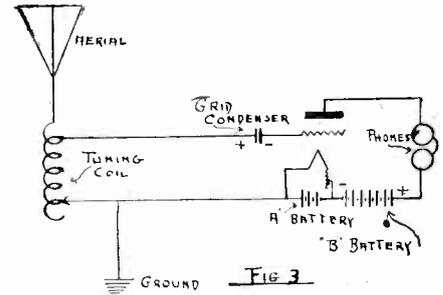
cuit which consists of the plate and filament path through the tube. Current can flow from the grid to the filament, or plate, to the filament, because electrons are being thrown off from the filament when it is raised to a sufficient temperature by means of the current from the battery A. This current is controlled by means of the resistance R., which, in turn, controls the temperature of the filament.

When the input circuit is connected across a coil of wire, or condenser, in a receiving set and the set is adjusted



The input circuit of the tube which consists of the grid and filament, and the output circuit which comprises the plate and filament path. Drawn by W. J. Howell.

to resonance with the sending station, there is impressed across it an alternating electro motive force, or rapidly fluctuating current of electricity. As shown in Fig. 3, the output circuit has a B. Battery and head telephones



Circuit with a conductively coupled coil connected to a vacuum tube detector. Drawn by W. J. Howell.

connected to it. Current is flowing from the positive of the B. Battery through the telephones, plate, filament circuit back to the negative of the battery. There being no change in this plate current you hear nothing, but the moment there is a charge of electricity in the grid the plate current is changed and you hear a sound in the telephones.

Now, a very important point comes up in the action of the tube. The current that is received from the sending station is alternating in character the same as the electric light current used in illuminating homes; but the frequency is beyond audibility and must be rectified before it can be heard. This is done by the input circuit in this manner: The electrons thrown off by the filament are negative; therefore, a positive charge will attract and a negative charge on the grid will repel, so that current can only flow from the grid to the filament. This results in the grid condenser becoming negatively charged which in turn repels electrons and reduces the plate current. This negative charge leaks off quickly, and the input circuit is ready for another impulse.

A Daily Audience of Over a Million

Out of the air come daily news bulletins, lectures, sermons, vocal and instrumental concerts, operas, market reports, government time signals, shipping news, weather forecasts, fashion tips, agricultural reports, church services and children's bed-time stories, says the "Observer," (Charlotte, N. C.)

Radio broadcasting service is available in all parts of the United States. The daily audience that listens in probably numbers more than 1,000,000 people.

(Continued from preceding page) accommodate the service. A purchaser has his choice of an equipment that will charge his battery rapidly by pushing into it several amperes; or, he may decide to charge over a longer period of time with a lesser number of amperes. In general it is better to follow the notation on the side of the battery case as regards the charging rate. With the 90-ampere-hour radio batteries this will be found to be 4 or 5 amperes.

The outfits are not ponderous or heavy. They may be set on a shelf or fastened to a wall. The latter method is the best to follow.

After attaching to the wall, the alternating current supply wires should be connected to the binding posts so marked. The rectifying bulb should be screwed into its socket. Then the positive pole of the battery should be connected to the (+) post of the charger and the two negative poles together. Usually these devices are equipped with a switch for turning on and off the alternating current—an ammeter for noting the charging cur-

rent, and a regulating device for regulating the charging current.

After the battery is properly connected to the charger, the switch should be turned. No current will flow until the control handle is moved. The ammeter should be watched as the handle is moved to see that the current is adjusted to the rate demanded by the battery. When this has been done, the charger will automatically continue to charge the battery so long as desired. When the charge is completed, the switch is turned off and the regulating handle returned to its zero position.

There are many types of chargers, but all of them follow the same general procedure. Many new home-charging outfits have made their appearance since the interest in radio became widespread and most of them are well suited to the work. It is always advisable, however, to talk the matter over with a capable electrician before investing in any outfit. Charging equipments, while new to the radio amateur, are old stories to electrical men familiar with the game.

Radio and the Woman



(c. Photographs, N. Y.)

When the Travel Show was the attraction at the Grand Central Palace, New York, radio parties were very much in vogue so far as the many women patrons were concerned. Here is Mrs. Van H. Cartmel and her invited guests. Mrs. Cartmel has just explained the mysteries of the amplitone which she is holding. The others in the party (from left to right) are the Misses L. A. Petra, Mary O. Field, Barbara Brokaw. The three at the back are the Misses Marian de Rham, Alice Beadleston, and Victorine Kellogg.

A BUSINESS WOMAN who goes to her office each day, voices the opinion that some day radio will relieve the tedium of useless hours consumed while riding in the subway. "What a joy it would be!" she exclaims, "if one might obtain the morning or evening news just by leaning back in one's seat and listening, instead of having to glean it with tired eyes from newspaper in badly lighted trains!"

* * *

Why doesn't some clever woman design a receiving set with a dainty, artistic exterior? It would have a much stronger appeal to our sex than most of the fearfully mechanical devices displayed.

* * *

The report that a New York branch of the Knights of Columbus has voted funds for the installation of a radio outfit at the House of Calvary for incurable patients, and that they intend extending this privilege to other hospitals throughout the country, causes one to ask if the welfare of scores of bedridden women does not mean fully as much to some equally great women's organization.

* * *

The window of an attractive tea room in the Forties displays this sign; "Radio concerts given here."

* * *

I was motoring out on Long Island the other day. It was just before noon. The chauffeur stopped at a farmhouse to obtain some water. From the front

porch, a buxom housewife smiled at me. More because I wanted something to say than because of any particular interest in the elements, I asked her if some slowly gathering clouds indicated rain. Her reply, if not enlightening at least, showed commendable progressiveness:

"There's no way of knowing for certain," she said, "until my husband returns from town with to-day's radio weather report."

* * *

A dear girl who was unable to enter college last year, due to the results of a bad accident, is hopefully looking forward to the series of lecture which New York University has promised will be broadcasted.

Motion-picture fans are waiting to hear the voice of some favorite star whose voice they have never heard—who they have only been permitted to see. Can't they have a few words from some such loved one as, say, Norma Talmadge, for instance?

* * *

Any supercilious engineer who might take it upon himself to frown on woman's fitness for this new field, should be reminded of those hundreds of our sex, who, during the war, studied wireless at Columbia and other colleges. If that fact doesn't prove fitness, what does?

* * *

I am awaiting the announcement that some progressive woman's college has arranged a course in radio. High schools and men's colleges have done this. Why haven't ours been heard from?

* * *

My hostess was robust and long past fifty, and so set in her ideas that she was not given to easily believing things. From the depths of a comfortable chair in the old-fashioned parlor of her cozy home some distance from New York, she surveyed me curiously as I told her of this new science. So that she might grasp something of its possibilities, I described how marvelously it brought music into one's home. I recounted the broadcasting stations' programmes; told her about the trip some Cornell boys made on a Lackawanna train from Ithaca to Hoboken, listening to music from the other; described as well as I, myself, understood it, how befogged ships were guided into port; explained how, by its means, human lives are being saved. In fact, knowing she knew nothing of radio, I did my level



(c. Underwood & Underwood)

Just to be in line with everybody who is anybody, Miss Doris Kenyon, the actress, has installed a small radio set in her home. The cameraman caught her in the act of listening in while a concert was coming over the wave lengths.

best to enlighten her, yet when I paused for breath, and in the hope that my recital had enabled her to understand, she merely sat and looked at me.

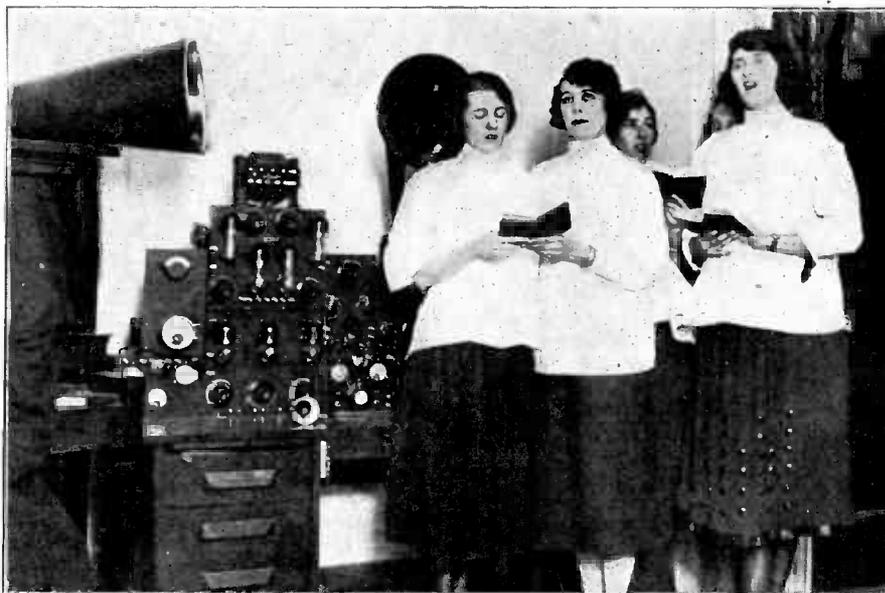
"My dear," she said, suddenly leaning forward, "I want your mother to come here. I shall write her that she must do so."

Just what mother's coming had to do with wireless was more than I could understand, but what I could see, was that she was not inclined to discuss the subject.

Later, when the house was quiet, I stole sleeplessly to the old parlor. An open grate and a candle provided all the warmth and light necessary to read. My glance strayed about for a book till it fell on a letter she had begun writing mother and which had evidently been laid aside for completion next day. Before withdrawing my eyes, I unconsciously read:

"She seems rational enough on all other subjects with the exception of this one she calls 'radio.' Could it be possible, do you think, that that trace of insanity on her great grandmother's side—"

I suppose the time will come when gold and silver-mounted head pieces will be as essentially a part of my lady's home paraphernalia as the present day powder-puff and rouge



(c. Kadel & Ferber News Service, N. Y.)

There is a church choir somewhere in America that sends out sacred songs. Perhaps, if you have been tuning in you have heard these songs, but you have never seen the charming young women whose blended voices waft them through the ether. The choir sings in the home of Walter J. Garvey, who owns the largest amateur radio set in America.

Mrs. W. H. Price, 362 Wadsworth Avenue, New York City, writes that she would like to get into touch with the Women's Radio League of America. Because of my inability to obtain the club's address, I have been unable to supply her with it.

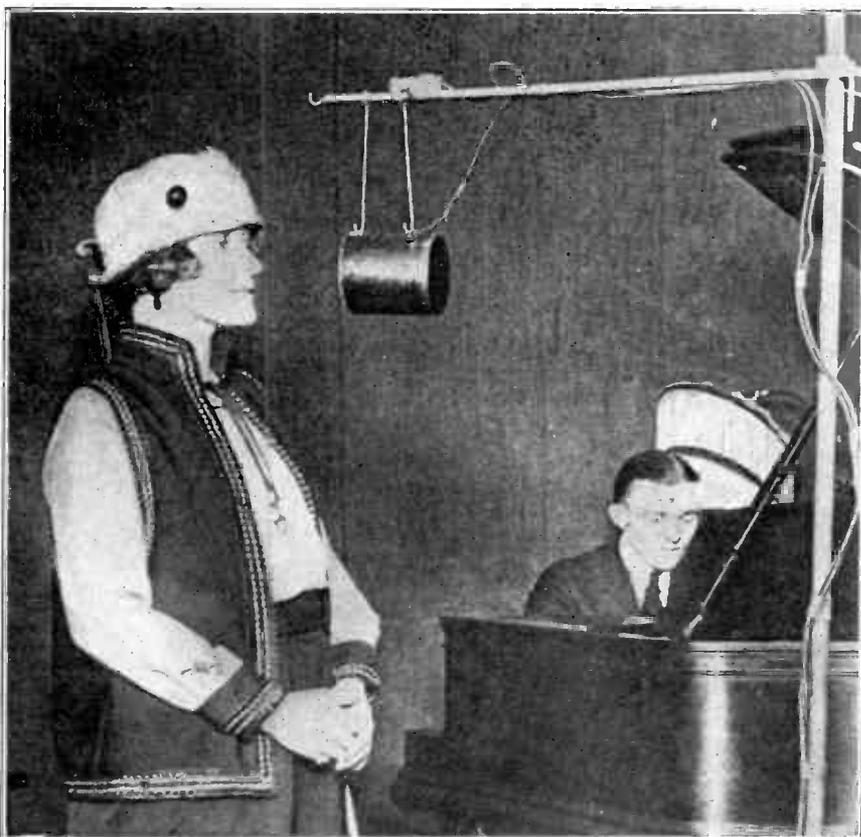
A radiophone receiver adjusted to the ear of the busy housewife, who invariably spends an hour each day preparing fruits and vegetables for the evening meal, is going to relieve the monotony of such work.

Thanks to WJZ, young folks, by only a slight stretch of the imagination, were able to visualize C. E. Le-Massena's operetta, "Pandora" recently—so well was it broadcasted.

Considering the great amount of interest we women are evincing in radio, wise, indeed, will be the manufacturer who turns out a specially designed head set that will not crush carefully dressed *coiffures* or tear our expensive hairnets.

Would it be too improbable to conjecture that the first receiving-set to be designed by a woman will have a tiny mirror inserted in it somewhere?

It is really wonderful to listen to the radio fans of the gentler sex talk in radio terms. To hear them discuss the new fad and tell all about amplifiers and ohms and regenerative receivers and antenna and vacuum tubes—and all the rest of it; why, one would imagine they were experts. It is remarkable how much they really do know. I heard one fair Fifth Avenue belle at the McAlpin Hotel, the other day, in an argument with a Navy chap. It was about interferences. From the look on his face, she was getting the best of it. Women are going to do a lot to make radio popular. —R. R. G.



(c. Underwood & Underwood)

Miss Louise Forester, of Chicago, is the good fairy who sings thousands of babies to sleep every night. From the Westinghouse station in her city, she broadcasts lullabies that float into thousands of homes equipped with radio. And she has been heard at a number of firesides far away in Canada.

How to Build the Loose Coupler and the Variometer

By Frederick J. Rumford, A. I. E. E.

The Loose Coupler

A VERY simple and efficient piece of radio apparatus namely the loose coupler, is described herewith. It is the next stage in the receiving end of wireless telegraphy, which, not so very long ago, was used by all radio men; but at the present is in use more by beginners; and the writer thinks it best for the beginner to build one as described.

This loose coupler, when built according to directions, is capable of receiving on various wave-lengths from 800 to about 4,000 meters when it has been connected up properly with its associate instruments its range can be increased by the introduction of loading coils and its tuning made more selective by the introduction of a variometer in the antenna circuit.

We will now pass to the actual making of this instrument. First the builder must purchase two gray seamless cardboard tubes of the following dimensions: one 7 inches long and 4½ inches in outside diameter, which will be the primary tube or known as such; the other tube should be 7 inches long and 4 inches in outside

diameter. Both of these tubes should be given a couple of good coats of shellac and left to dry. After they have dried, the primary tube should be wound with No. 30 D.S.C., magnet wire starting one-half inch in and continuing until one-half inch from the other ends has been reached, taking off taps at every one-half inch making a total of 12 taps. After the tube is wound full closely together with No. 34 S.S.C., magnet wire, the winding beginning in one-half inch from the end and continuing until one-half inch is reached from the other end, taking taps off at every inch, which would make a total of 6 taps. This tube should then be given a couple of good coats of shellac and left to dry.

The builder should now build a housing for his primary coil. The back piece should be 7 inches long, 6 inches wide, and ¾ of inch thick. The end piece should be 6 inches long, 6 inches wide, ¾ of an inch thick. The remaining end-piece should be the same size as the other end. With this one exception, there must be a large hole in its center, 4 inches in diameter, so as this piece will fit over the primary tube end. On the back

end, there must be a round piece fastened to it—the inside diameter of the primary tube. When this is done, the back and the two ends are placed around the primary tube, then the panel must be of bakelite and of the following dimensions: 7 inches long, 6 inches wide, and ¼ of an inch thick. It must be drilled so as to permit the mounting of the following parts: holes for 13 contacts, 2 stops, one at each end of the circuit of contacts, one for the switch lever, and 4 for the binding posts. After this is done, the panel must be given a good rubbing and all the above mentioned parts mounted on its front, and the complete panel mounted on the housing, and the taps from the primary coil connected to their respective contacts. The binding posts must then be connected up to their proper connections.

Now for the secondary tube. There must be 2 round-end pieces big enough in diameter to fit snug into the inside diameter of the secondary tube. These end-pieces must have 2 holes drilled in their centers, 1½ inches apart. Each hole must be large enough to permit the passing through of a ¼-inch brass rod. Two of these rods are necessary, each being 15 inches in length. These rods are to be fastened at the piece of the primary housing, and at the other end by means of a rest, built to suit the builders' own judgment, at the back end of the secondary tube and fastened thereon. The front of the secondary will have the remaining piece as a panel, which should have the following holes drilled in it: 7 holes for the contacts and 1 hole for the switch lever—that is, with the exception of the holes for the brass rods. You should now give the panel a couple of coats of some good insulating-compound. After it has dried, the switch lever and contacts should be mounted on it and the 6 contacts of the secondary connected unto the proper contacts. It should then be fastened to the front end of the secondary coil.

The secondary coil should have its winding-beginning soldered to a little runner which will, in turn, pass back and forth over one of the brass rods forming a connection. The brass rod will have a connection made at its



(c. Keystone View Co.)

Left to right: J. L. Larsen, Captain Raoul Amundsen, explorer; Lieutenant Om-dahl, of the Norwegian Naval Air Service, and Major Scanlon, commandant of Bolling Field, Washington, photographed at Washington, D. C., on Captain Amundsen's arrival by airplane to arrange details for his much heralded flight to the polar regions in which radio will play an important part.

primary end and fastened to one of the binding posts on the primary panel. The connection from the switch lever of the secondary will be connected to a runner and passed over the remaining brass rod which rod will have, at its primary end, a connection which will, in turn, connect to the remaining of the secondary binding-posts.

The whole thing should now be mounted on a large base with the secondary on the two brass rods with which the wave length of the coupler can be changed by the running back and forth of the secondary upon the rods within the primary coil. The housing of the primary coil should have a suitable cover made for it.

The Variometer

DESCRIBED below is a simple and cheap variometer, which has proved to be efficient in receiving circuits. The variometer is often used in conjunction with the loose coupler in the receiving circuit or set. It is hooked-up in series with the aerial, and is used to obtain more selective tuning in the primary circuit. It is more frequently used in regenerative receivers. In this case, two of them are used—one for the grid tuning, the other for the purpose of tuning the plate. The grid and the plate are essential elements in the vacuum tube for detection.

The actual data for making this variometer is as follows: The builder must purchase the following: a gray seamless cardboard tube $4\frac{7}{8}$ inches in outside diameter and $2\frac{1}{2}$ inches in length. The tube will be the primary, or the stator, and another tube as above but with these dimensions: $3\frac{7}{8}$ inches in outside diameter, and 2 inches in length. This tube will be the secondary or the rotator. He must now drill holes through the exact center of both tubes to allow a $3/16$ inch diameter shaft to pass through them. He will then drill two more holes in each tube, at opposite ends, for the fastening of small brass screws and nuts. These will act as binding posts for the starting and the finishing of the windings.

On the primary tube, the winding should start in about $1/2$ inch and continue for $1/2$ inch, making about 24 turns. The winding should again continue on after having left $1/2$ inch space in the center of the tube which would, in turn, permit the shafts to pass through. Then the winding should continue until it has reached $1/2$ inch from the end.

The starting and finishing of these windings are connected to the binding posts mentioned above.

To Study Radiotelegraph Signals

INTERNATIONAL RADIOTELEGRAPHIC CONVENTION

LIST OF ABBREVIATIONS TO BE USED IN RADIO COMMUNICATION

ABBREVIATION.	QUESTION.	ANSWER OR NOTICE.
PBB	Do you wish to communicate by means of the International Signal Code?	I wish to communicate by means of the International Signal Code.
QRA	What ship or coast station is that?	This is
QRB	What is your distance?	My distance is
QRC	What is your true bearing?	My true bearing is degrees.
QRD	Where are you bound for?	I am bound for
QRF	Where are you bound from?	I am bound from
QRG	What line do you belong to?	I belong to the Line.
QRH	What is your wave length in meters?	My wave length is meters.
QRJ	How many words have you to send?	I have words to send.
QRK	How do you receive me?	I am receiving well.
QRL	Are you receiving badly? Shall I send 20?	I am receiving badly. Please send 20. • • • • • for adjustment?
QRM	Are you being interfered with?	I am being interfered with.
QRN	Are the atmospherics strong?	Atmospherics are very strong.
QRO	Shall I increase power?	Increase power.
QRP	Shall I decrease power?	Decrease power.
QRQ	Shall I send faster?	Send faster.
QRS	Shall I send slower?	Send slower.
QRT	Shall I stop sending?	Stop sending.
QRU	Have you anything for me?	I have nothing for you.
QRV	Are you ready?	I am ready. All right now.
QRW	Are you busy?	I am busy (or: I am busy with). Please do not interfere.
QRX	Shall I stand by?	Stand by. I will call you when required.
QRY	When will be my turn?	Your turn will be No.
QRZ	Are my signals weak?	Your signals are weak.
QSA	Are my signals strong?	Your signals are strong.
QSB	Is my tone bad?	The tone is bad.
QSC	Is my spark bad?	The spark is bad.
QSD	Is my spacing bad?	Your spacing is bad.
QSE	What is your time?	My time is
QSF	Is transmission to be in alternate order or in series?	Transmission will be in alternate order.
QSG	.....	Transmission will be in series of 5 messages.
QSH	.....	Transmission will be in series of 10 messages.
QSI	What rate shall I collect for	Collect
QSK	Is the last radiogram canceled?	The last radiogram is canceled.
QSL	Did you get my receipt?	Please acknowledge.
QSM	What is your true course?	My true course is degrees.
QSN	Are you in communication with land?	I am not in communication with land.
QSO	Are you in communication with any ship or station (or: with)?	I am in communication with (through).
QSP	Shall I inform that you are calling him?	Inform that I am calling him.
QSQ	Is calling me?	You are being called by
QSB	Will you forward the radiogram?	I will forward the radiogram.
QST	Have you received the general call?	General call to all stations.
QSU	Please call me when you have finished (or: at o'clock)?	Will call when I have finished.
*QSV	Is public correspondence being handled?	Public correspondence is being handled. Please do not interfere.
QSW	Shall I increase my spark frequency?	Increase your spark frequency.
QSX	Shall I decrease my spark frequency?	Decrease your spark frequency.
QSY	Shall I send on a wave length of meters?	Let us change to the wave length of meters.
QSZ	.....	Send each word twice. I have difficulty in receiving you.
QTA	.....	Repeat the last radiogram.

*Public correspondence is any radio work, official or private, handled on commercial wave lengths. When an abbreviation is followed by a mark of interrogation, it refers to the question indicated for that abbreviation.

In order to pass the government examination, an amateur or expert must be familiar with the signals adopted by the International Radiotelegraphic Convention. This is an important question covering a license of communication.

The secondary coil is wound in the same way as the primary coil but with the following exceptions: The winding will start $1/4$ inch in from the edge and finish $1/4$ inch from the other edge, or end, with the usual $1/2$ inch space in the center and the $1/2$ inch winding on each side of the above-mentioned space, with the usual 24 turns per section which would make a total of 48 turns per coil.

Both coils are wound with No. 24 D. C. C. magnet wire.

The builder should then purchase a length of $10/24$ threaded brass-rod. This rod should be forced into the center holes of the above two coils, with nuts. It should be forced up against the inner and outer walls of the secondary at both sides and fastened tight against the walls at both sides of the primary. The coil is then ready to mount and should be given several coats of shellac.

This set is good for about 400 meters; possibly 600 meters.

Radios Speech to Voters 600 Miles Away



(C. International.)

Harry S. New, United States Senator from Indiana, is the first politician to use radio in order to broadcast a speech to his constituents. The apparatus at his left is not the transmitter, but the receiving set through which his hearers sent words of encouragement. The transmitter was located, probably, in the Washington Navy Yard, and was connected by land control to the telephone he is holding. But Secretary of the Navy Denby has since put a stop to political speeches being sent from Washington through the Navy transmitter.

TO Harry S. New, United States Senator from Indiana, falls the distinction of being the first politician to deliver a campaign speech to listening constituents 600 miles away. Senator New proposed to journey from Washington to his home State and take the stump against his opponent for election, former Senator Albert J. Beveridge; but he was obliged to remain in the capital city because of the treaty debate. In order that his supporters should hear his views on the issues at stake, he had his offices equipped with radio apparatus, and by the air route made his appeal for over half an hour. He spoke to thousands of farmers who have telephones in their home. They heard him distinctly.

Senator New talked into the wireless apparatus without any preliminary rehearsing. He hesitated frequently, and those who had transmitting machines sent back words of approval and cheers.

Senator New invited a number of his colleagues to his office to hear him make his long-distance radio appeal. President Harding listened in at the White House radio system.

In order that the delivery might be as simple as possible, Senator New

had written his speech and started to read it into the transmitter; but he soon found the undertaking so easy that he departed frequently from his written words and spoke *extempore*.

Owing to the possibility that Congress may be in session until the middle of August, the news from Washington states that a number of office-seekers will now use the wave lengths to reach their voters. The successful venture of Senator New into radio campaigning has already caused a lot of gossip in political circles. Many are optimistic that campaigning over the air route has already ceased to be a novelty and is a practical proposition. Next fall, the air will buzz with political opinions.

The development of radio has reached a point where addresses not only can be delivered to crowds assembled in some auditorium but to scores of homes in which receiving sets have been installed. The number of amateur and professional receiving sets in this country has gone over the half-million mark. The next six months will see another half million more in use.

Senator New's speech was picked up by stations 800 miles from Washington. He told his hearers that he

regretted but one thing regarding his method of addressing them: that he could not look into their faces.

When the Senator frequently asked if he could be heard distinctly the cry came back: "Yes—go on!"

St. Bernard Dog Has a Formidable Rival

The gallant St. Bernard dog of the Swiss Alps, savior of too ambitious mountain climbers, may soon find a rival in radio.

After twenty years of experimenting, Jean Lacarne, a French engineer, connected with the Valot Observatory on the summit of Mont Blanc, has perfected radio apparatus capable of resisting the severe atmospheric changes of the high altitudes which destroy ordinary wireless instruments.

The suggestion is made that climbing parties carry small wireless outfits so, if necessary, they may obtain quick help through the Mont Blanc observatory.

M. Lacarne hopes soon to be able to communicate with other points in the Alpine region. He has already talked with the Eiffel Tower in Paris.

Army Men of to-day Must Know Radio



(c. Sport Commercial, N. Y.)

Lieutenant Lomax, U. S. A., of the 258th Field Artillery, demonstrating the operation of Signal-Corp radio equipment to one of the numerous classes composed of enlisted men. The importance of radio as an arm of the military forces is reflected by the government's action in instituting a number of courses in radio telegraphy.

Who Thought of Radio First?

WHO invented radio? One might as well ask who invented the locomotive or the automobile.

The man in the street thinks that Marconi was the first man to transmit and receive messages through the ether. Marconi was not the first man to do this.

Back in 1860, one James Maxwell, a Scottish physicist, published a paper on "The Electromagnetic Theory of Light." That marked the beginning of the history of radio, says the New York "Mail." It was the boldest and most perfect piece of mathematical philosophy the world has ever seen. In that paper, Maxwell proved as far as mathematics could prove that electric waves could be produced in the ether. Maxwell did not live to see the great results of his work.

In 1885, Heinrich Hertz, a young experimenter working in the laboratory at the University of Bonn, found

those mysterious waves which had been discovered mathematically by Maxwell. Hertz produced these waves and then detected them. He was the first man to do this.

Marconi came after Hertz. He picked up the loose threads and conducted experiments with the idea of commercializing the thing. He was a practical, hard-working inventor, and he deserves a great deal of credit. However we must not forget the men who paved the way.

After Marconi scores of other inventors made contributions to the art. If it had not been for the work of these other inventors we would not be able to broadcast today, and radio would still be in its infancy. The radio hall of fame has many names in it and plenty of blank spaces have been left for more.

It will contain the names of women as well as the names of men.

Over 5,000 Will Hear at Astor Hotel

The Hotel Astor, New York, has installed a radio equipment which makes it possible for guests to listen to any part of the program of the various broadcasting stations. Not only has this radio equipment been installed, but, also, the loud-speaking apparatus whereby a speaker may address over 5,000 persons in different parts of the hotel. This is the same type of Western Electric Public Address System used by President Harding when making his address at the burial of the Unknown Soldier, at Arlington, on Armistice Day—which was heard throughout the United States.

Keep Your File of Radio World Complete

If you did not get the first three issues of RADIO WORLD, you can get them through the American News Co. and its branches, or send 15 cents per copy to RADIO WORLD CO., 1493 Broadway, New York, N. Y. (Adv.)

The Radio Primer

A. B. C. of Radio for the Beginner Who Must Have the Facts Put Plainly and Tersely, and all Terms Fully Explained

Radio Terms at a Glance

AMPLIFICATION. (*amp-lee-fee-kay-shun*). Meaning to magnify. In radio, the signals, as they are received, are so weak as to make it almost impossible to read them. If the detector is a vacuum tube, then other vacuum tubes can be used to magnify or strengthen the impulses. The detector detects the waves and then they are passed into the amplifying tubes where they are further magnified.

STAGES OF AMPLIFICATION. Each time a vacuum tube is added to a receiving set to strengthen the signals, the set is said to have a "stage of amplification." For example, an outfit having one detector tube and two amplifying tubes is said to be a "two-stage set."

FUNDAMENTAL WAVELENGTH. This is the length of the wave an aerial could receive without the aid of other tuning devices such as

tuning coils and condensers. In rough figures, it is equal to the total length of the aerial added to the length of the lead in wire and the length of the ground wire and the total multiplied by one and one-half.

BAKELITE. (*bay-kel-ite*). A patented insulator sold in sheets and tubes. Excellent for radio purposes. Composed of a mixture of phenol and formaldehyde produced by a secret process.

FORMICA. Also a patented insulating-compound of secret formula and manufacturing process.

VARIOCOUPLER. (*vay-ree-ocup-ler*). A tuning device which consists of one coil of wire rotating inside of a larger coil. Used to adjust the wave length of the receiving set to that of the sending set.

VARIOMETER. (*vay-ree-orm-eter*). A tuning device similar in many

respects to the variocoupler, but differing from it in that the inner and outer coils are made continuous by connecting one end of each together. The variometer finds its greatest application in so-called "regenerative sets."

HONEYCOMB COILS. A special form of tuning device in which the wires are wound in many layers but in spiral form, just as string is wound on a ball. This method of winding provides large capacity in a condensed space.

TAP. A "tap" is the connecting wire between one of the turns of a tuning coil and a controlling switch.

PRIMARY. The winding of a tuning coil that is connected to the aerial and ground.

SECONDARY. The winding of a tuning coil that is connected to the detector and head phones.

The Best Aerial for a Receiving Station

By Edward Linwood

What kind of aerial is best for a receiving station?

IT depends on the location and general make-up of the station. If the amateur is located more than fifty miles from any broadcasting station, he should not attempt to receive with anything less than an outdoor aerial consisting of one copper wire, one hundred or more feet in length. If he is within fifty miles and intends to install an outfit with one or more stages of amplification, then an indoor aerial may be considered.

* * *

Why is one wire considered sufficient for a receiving station?

For two reasons: wave length and static. Most amateurs are concerned primarily in the broadcasts which are sent out, with a few exceptions, on 360 meter wave-lengths. To receive these broadcasts most efficiently, demands that the natural wave-length of his aerial should not be over 360

meters. The second reason has to do with radio's greatest enemy—static interference. Static is a local affair, as described in "The Radio Primer" in RADIO WORLD of April 15. Therefore, the greater the network of wires making up the aerial, the greater the static charge on them. Of course, the greater the aerial, the stronger the signals received but not in the same proportion. For these reasons it is best to sacrifice some of the signal strength in order to reduce the intensity of static.

* * *

What is meant by natural wave-length of antenna?

Every aerial has a wave length which it should pick up without any tuning whatsoever. This is the natural or fundamental wave of the aerial.

* * *

What is a tuning coil?

A tuning coil is a length of wire wound around an insulated tube. The wire is copper and ranges in size from

No. 18 to No. 32 B. & S. The length of the wire depends on the number of turns required and the diameter of the coil. The tube may be made of pasteboard, fibre, bakelite, formica or any other of the patented composition materials. Metal tubes should never be used. The diameter is usually between 3½ inches and 5 inches.

* * *

What are some of the types of tuning coils?

Beginning with the simplest and working up to the latest and least used types they are: Single slide; double side; switch controlled; loose coupler; variocoupler; variometer and honeycomb, or as it is often called, duo-lateral coil.

* * *

Describe each of these tuning coils?

The single-slide tuner is the most elementary type and supplies the least range of selectivity. It consists of a tube with 50 or more turns of closely spaced copper magnet-wire. One end

The Radio Primer (Continued)

Radio Meanings at a Glance

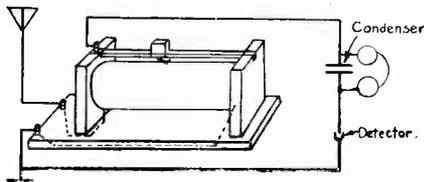
CALIBRATION — To measure and scale off an instrument the measurements of which are unknown with a calibrated instrument whose measurements are known.

CHOKE COIL—A coil that has great self-induction. This choking action is called impedance.

CONTINUOUS WAVE. — This term applies to a wave which has a constant amplitude. It is often called undamped wave.

(Continued from preceding page)

of the coil is connected to the aerial and the other end to the ground. The slider, which is a contact that slides across the surface of the wires on a bare path scraped through the insulation, is connected to the detector and



Single-slide tuner with wiring diagram. Double-slide tuners have a second slider similar to the first and this slider is connected to the aerial wire. Drawn by E. L. Bragdon.

the lower end of the coil—the same end which was connected to the ground—is connected to the other side of the detector.

The double-slide tuner is frequently constructed from the same size of tubing and with the same number of turns. It differs from the simple tuner in the addition of another slider. In connecting up this tuner, the aerial is brought to one of the sliders instead of to the coil end. The ground is connected to the lower end of the coil. The remaining slider is connected to one side of the detector and the lower end of the coil is attached to the other binding post of the detector. It will be seen from the foregoing that the detector circuits in both types of tuners are identical, the only change being in the connection of the aerial to one slider.

The switch-controlled tuning coil makes use of a multi-point switch in place of the sliders. In winding the turns on the tube it is arranged so that every tenth turn is connected to a circular switch. These connections to the switch are called "taps." A "tap" is taken off at each tenth turn

DETECTOR.—Any device which transforms electrical vibrations set up in an aerial into audible vibrations at the receiving end, is called a detector.

DIRECT CURRENT.—An electric current which flows in one direction only.

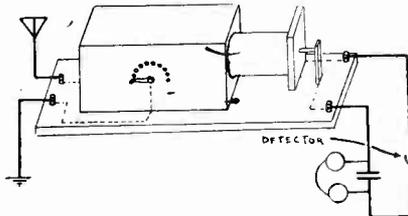
E. M. F.—Meaning electromotive force. The unit of the E. M. F., is the volt.

ELECTRONS. — The elementary corpuscle of electricity. In a vacuum tube the electrons are always negative.

until only ten turns remain. From these last ten turns, a tap is taken from each turn and carried to a second circular switch having ten points. With this arrangement, it is possible to use any number of turns desired. Each point on the "tens" switch adds ten turns while each point on the unit switch adds one turn.

The loose coupler is the most efficient and satisfactory of the simpler tuning units. It consists of two tubes wound with wire but with one of the tubes small enough so that it will slide into the larger tube. The winding on the outer tube is connected to the aerial and ground circuit, and is called the "primary." The primary turns may be adjusted by means of a slider or by a multi-point switch. One end of the coil is connected to the ground and the switch to the aerial wire.

There is no metal connection between the primary, and the inner coil called the secondary. The windings on the secondary may be continuous



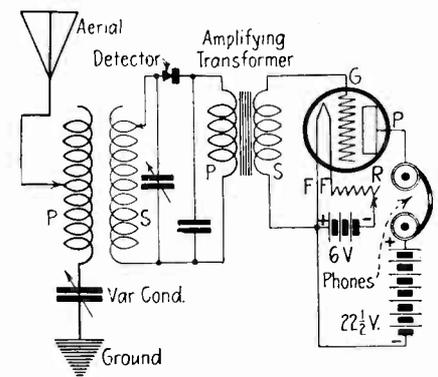
Loose coupler with wiring diagram. By adjusting the primary or the secondary taps, tuning qualities will be obtained. Suggested by Fred. Chas. Ehlert. Drawn by F. Newman.

or they may be "tapped" and connected to a switch. The secondary is arranged on a rod which allows it to slide in and out of the primary. Thus it is possible to tune in two ways: by changing the number of turns or by changing the position of one coil with respect to the other. This feature makes the loose-coupler more valuable where much interference from other sending stations is encountered.

Crystal Receiver and One-Step Amplifier

MANY amateurs wonder if it is possible to use a one-step amplifier with a crystal receiver. Of course, when one is a crystal and the other a tube-amplifier, it would appear to the fan that it is impossible to use them together. However, experienced radio men have proved to us that it can be done.

According to the accompanying diagram, if the amateur purchases the necessary equipment and hooks up the material according to the circuit,



Circuit employing a crystal detector and a one-step tube amplifier. They work fairly well in conjunction with each other. Suggested by Fred. Chas. Ehlert. Drawn by F. J. Newman.

he will find that satisfactory results may be obtained. The amateur must not get overexcited and imagine that this is a regenerative set. It is not.

Nevertheless, with this in view, reliable signal strength may be secured. One drawback will be the proper upkeep of a good point on the crystal, and if this is always obtained, with the proper voltages on filament and plate, signals should be easily heard.

List of Radio Calls

Every radio amateur should have a copy of the pamphlets "Amateur Radio Stations of the United States," and "Commercial and Government Radio Stations of the United States." The price of these pamphlets is fifteen cents, and orders should be sent to the Superintendent of Documents, Washington, D. C. These pamphlets contain lists of the amateur, and commercial and Government transmitting stations in the United States, and of the call letters assigned to the stations; a new edition of each pamphlet is published on June 30 of each year.

Answers to Readers

I enclose a rough diagram of a hook-up I am using. The antenna consists of three No. 14, B & S bare-copper wires, equally spaced on spreaders about 4 feet in length, elevated to a height of from 35 to 40 feet; and well insulated. With this outfit I have been able to hear clearly such stations as Newark, N. J., Pittsburgh, Tarrytown, N. Y., Deal Beach, N. J., and a Western Electric Company station. I often experience considerable difficulty, however, in trying to tune some of the oscillations which I pick up. When attempting to adjust the condensers, I get a lot of howling and cannot seem to eliminate it in order to bring in the signals clearly. At times, this howling occurs as soon as I put my hand anywhere near the coils or condensers.

Can you suggest any improvement in the connections, or advise me what would remedy the above conditions?—F. H. W., Spring Valley, N. Y.

Evidently it seems that you are satisfied with the reception of the concerts with the drawback of what is termed capacity or body effects. To overcome these so-called capacity or body effects and possibly increase the signal strength, sheath your set. That is, line the inside of your cabinet with copper or some metal sheath, grounding one end of it to your ground-binding post. This should answer your problem. When lining, you must remove your instruments, line it up, place back instruments—cutting holes in sheath to allow projecting shafts to come through panel—and then, once again, don't forget to ground it inside your cabinet to ground post. The writer has just noticed that you show a U. V. 201 tube which is an amplifying tube. We suggest that you use a U. V. 200 which is a detector tube.

* * *

How many miles from Newark, New Jersey are the following stations?—WJX, WDT, WVP, WCJ, WBZ, WRW?—E. P. S., Downtown Club, Newark, N. J.

The distances are given as follows: WJX, 25 miles; WDT, 20 miles; WVP, 20 miles; WCJ, 50 miles; WBZ, 125 miles; WRW, 50 miles.

* * *

I have a short-wave regenerative set with a range of about 1,000 meters. I would like to take in the concerts given by the Fort Wood station at Bedloe's Island, New York, on 1,450 meters. What shall I need to increase my wave-length?—J. M. B., Nyack, N. Y.

Use a duo-lateral coil, size 100, which will cost you about \$1.75, and connect in series with antenna.

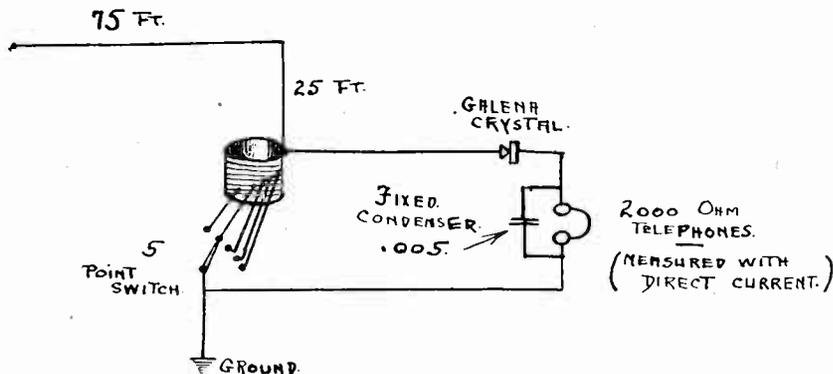


Diagram illustrating reply to R. A. B. A hook-up showing a circuit whereby no dry cells are employed. Merely a galena-crystal pair of phones and coil make up the receiver.

Radio World Will Help You Solve Your Problems

THE editors of RADIO WORLD will be glad to answer inquiries from readers. If you are experiencing any trouble with your receiving apparatus, write us. Tell us what your trouble is, what kind of apparatus you are using and any other facts that seem necessary. If you wish to install a receiving set and need advice, write us; but state whether you live in an apartment or a private house and your distance from the nearest broadcasting station. Questions of general interest will be fully answered in this department.

**Inquiry Editor, RADIO WORLD,
1493 Broadway, New York City.**

Will a variocoupler with both the primary and secondary wound with No. 22 enamelled wire work all right? In a variometer, should the rotor and stator have the same number of turns on it?—G. M., Washington, District of Columbia.

This type variocoupler will work all right with this size wire. The rotor and stator of a variometer should have the same number of turns of wire.

* * *

Will a honeycomb coil with 8 taps, 4 layers to a tap, an inch wide, increase the wave length of a regenerative set consisting of a variocoupler and a forty-three-plate condenser with a vacuum-tube detector? Give me hook-up of above.—Charles B. Farmer, Richmond Hill, N. Y.

Honeycomb units are made with primary, secondary and tickler for regeneration. Would advise you to forget about tapped coils and look at a list of different sized coils for various wave lengths. A hook-up sketch of honeycomb coils in this issue shows you the three coils, condensers, and vacuum-tube detector. Any increase in wave length can be accomplished by just shifting to other coils.

* * *

Give me a simple hook-up using dry cells for receiving WJZ.—R. A. B., Jersey City, N. J.

Do not use dry cells. You need nothing but a galena crystal, a tuning coil, a fixed condenser and a pair of 2,000-ohm headphones. See the accompanying diagram.

Can I stop a nearby amateur from sending out spark messages?—E. V. E., Staunton, Virginia.

It is impossible for you to stop any amateur from sending if he is legally working on 200 meters and has a licensed station. Don't forget that he has as much right to the air as you have, that there are many amateurs who have been in the game for years and, no doubt, some of these men are carrying on some very important relay traffic messages. It is only fair to the beginner to remember that many amateurs whom they are blaming for this interference are the very ones who made the radiotelephone possible as well as the receivers. A little courtesy on both sides will tend to clear up the misunderstanding.

* * *

I live in Brooklyn, and cannot hear anything but code messages. I have a crystal receiver. What is the source of trouble?—G. S., Brooklyn.

Evidently you are located where it is impossible to hear music unless you employ a vacuum tube.

* * *

Is the cost of installing a radio set prohibitive?—O. J., Rye, N. Y.

The general advice given by those who have had radio sets for some time, may be misleading in regard to what is required in the way of equipment. The result may be an apparently prohibitive cost. Actually, a simple receiving-set which will copy commercial stations from a distance of 500 miles or more, is quite small. If all necessary instruments are purchased, the cost should be under \$25. When made by the experimenter himself, the cost of material will come to less.

There is no use buying elaborate or expensive instruments at the start. The more costly the equipment the greater the difficulty to operate. There is more pleasure in connecting up a few simple instruments and hearing signals than worrying with elaborate apparatus and getting no results.

Experimenters who are really interested in "What it does and how it does it," find the most satisfaction in mastering the details and operation of each instrument as they add to their stations. That is the way of the logical mind and, under cover of providing for real indoor sport, radio work offers to the younger minds valuable development in logical and analytical thinking—more effective than schoolbook methods since it is accomplished by real entertainment.

* * *

What is static?—R. M. New York City.

This term, as used by radio engineers, refers to atmospheric electric effects which produce in radio receiving circuits, currents of a nature to interfere with, or disturb, incoming radio-telegraph and radio-telephone signal. The Standardization Committee of the Institute of Radio Engineers, of which Mr. Donald McNicol is chairman, has defined static thus: "Static is conduction or charging current in the antenna system resulting from physical contact between the antenna and charged bodies or masses of gas."

Owing to the large number of questions received from readers it is impossible to answer all in this number. Your replies will appear in the next or future numbers of Radio World.

The Rosy Future for Radio

By C. W. Horn

Radio Service Department, Westinghouse Electric & Manufacturing Co.

THE present stage of radio broadcasting, while it may seem to the uninitiated to be quite advanced, is really in its infancy.

So far, radio-broadcasting has confined itself to sending out at regular periods some musical entertainments, or perhaps, occasionally some market reports in which, probably, but a small percentage of the listeners are interested. At periods, they broadcast speeches by prominent men and connect into theaters and other places of amusement and broadcast their programs. All this is very interesting, but something more definite will have to come out of all this in order to put broadcasting on its feet and make it part of our everyday life.

Undoubtedly, the business man of the future will glance up at the clock and note that it is 3 o'clock, at which time the stock market has closed, and being interested in a few different issues of stock will throw a small switch and go on with his work while a loud speaker will be reading off the stock reports at the closing of that day's business. When he hears the stocks or bonds, or other securities in

which he is interested he will make a note and when he is through, switch off the apparatus. I firmly believe that in the future a regular ticker service will be inaugurated which will broadcast all sorts of financial and business news on fixed schedules. All that will be required to pick up this information will be a radio receiver installed with a push button to start and stop it.

The future holds much in store for this field of endeavor, and as newspapers and other news agencies are aware. I firmly believe that it will not be many years before people throughout the country will know what is transpiring at Washington and other seats of government; will hear their representatives in the Congress on questions in which they are vitally interested. When this time arrives it will be possible for the constituents of a Senator or Representative to know just how their servant in Congress is behaving himself and whether he is really and truly representing his district, and not merely serving his own ends. Perhaps, and this, I firmly believe, it will really lead up to that ideal point for which we have all

striven, and which was so ably expressed by Abraham Lincoln, "Government of the people, by the people and for the people." When the large portion of the population is fully acquainted with, and keeps itself advised of the activities of its Representatives, and of the questions that come before our government bodies, there will be less tendency toward race prejudice, class wars, etc. The average man knowing what is transpiring, expresses himself in some way or other. The large body of voters, if they should come to the point where they will know what is occurring will likewise express themselves through the ballot, which will result in cleaner government.

"Already radio apparatus has been designed by the Westinghouse Company, which does not require an antenna. Within a few years this apparatus will, undoubtedly, be developed so that it will receive remarkable distances clearly and distinctly, and will be able to avail itself of the privilege of listening in to any desired broadcasting station at will, whenever he feels like it.

Contestants for the First Women's Speed Contest



(c. Sport Commercial, N. Y.)

Competitors for the First Women's Amateur Speed Contest Prize offered at the recent radio exhibition held in the Pennsylvania Hotel, New York. From left to right: Miss Abby Morrison, Mrs. Eleanor Regan, Miss Ruby Yelland, Miss Sonia Soberg, Miss Marion C. Chicken, Miss Beatrice W. Nathan. Miss Yelland was the winner, copying 30½ words per minute without making an error. Miss Chicken was awarded the second prize. Her record was 30½ words per minute, with 4 errors. Learning to read the International Morse Code, better known as the Continental Code, promises to be an attractive occupation for women. Most of them learn the code by means of the key and buzzer system, after graduating into a class where the sounds are picked up and translated through the standard radio head-phones.

RADIO WORLD

PUBLISHED EVERY WEDNESDAY (DATED SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE, 1493 BROADWAY, NEW YORK, N. Y.

BY RADIO WORLD COMPANY

BOLAND BURKE HENNESSY, Editor and Proprietor - - - - - 1493 Broadway, New York
FRED S. CLARK, Manager - - - - - 1493 Broadway, New York

ASSOCIATE EDITORS:

ROBERT MACKAY - - - - - FRED. CHAS. EHLERT
CENTRAL-WESTERN ADVERTISING REPRESENTATIVES:
W. B. ZIFF CO., 608 S. Dearborn St., Chicago

SUBSCRIPTION RATES

Fifteen cents a copy. \$6.00 a year. \$3.00 for six months. \$1.50 for three months.
Add \$1.00 a year extra for postage to Canada and foreign countries.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order and payment therefor.

ADVERTISING INFORMATION

MECHANICAL REQUIREMENTS:

Size of page: 12 inches deep—9 inches wide.
Size of type page: 10½ inches deep—7¼ inches wide.
Three columns, 147 lines each—441 lines to the page.

CUTS:

All plates should be mounted. We can use screens up to and including 133. We prefer 120 screen half tone. We cannot use matrices.

ADVERTISING RATES:

One page: One time—\$150.00.
Half, Quarter, Third and Two-thirds pages at proportional rates.
One inch, one time—\$5.00. Per agate line, \$0.40.
On four consecutive issues, 10% discount.
On thirteen consecutive issues, 15% discount.
Terms: 30 days Net. 2% 10 days.

CLASSIFIED ADVERTISEMENTS:

Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Cover and preferred-position rates made known on application

Application for Second Class Privilege Applied for through Post Office, New York, N. Y.

IMPORTANT NOTICE:

While every possible care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher hereby disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy over matters over which the publisher cannot possibly have control.

Radiotorials

Beware of Stock Jobbers

RADIO, with its marvelous growth and numberless ramifications, is, of course, too good a thing for the stock jobbing fraternity to let pass without at least an effort to cash in.

Already there are signs indicating that the smooth gentlemen who deal in stock certificates are endeavoring to make hay while the sun shines.

It is said that a number of curb concerns are trying to induce various companies engaged in the manufacture or handling of radio goods to form new corporations running up into the millions and to place stock on the market for general consumption. There is no reason in the world why legitimate concerns should not organize and sell stock. There are, however, many reasons why the slick gentlemen of the curb should be kept out of the radio field for the good of the science and the business.

It is pretty hard to sell oil stocks just now. In fact, the public is very diffident about investing its money in stocks of any kind, but the brigands of Wall Street hope to be able to get in on the radio craze and to get out again before they are caught.

The legitimate corporations, concerns and individuals having anything

to do with radio at the present time should take particular pains to see that the stock bucaners do not bring discredit on this new line of human activities that is arousing the interest of the whole world. Every stock-selling radio proposition should be thoroughly investigated at its very inception and, if given a clean bill of health, be permitted to continue in the business. But those that do not pass muster and which are being formed merely for the purpose of selling stock without any hope of returns, should be put immediately up to the District Attorney before the public is fleeced.

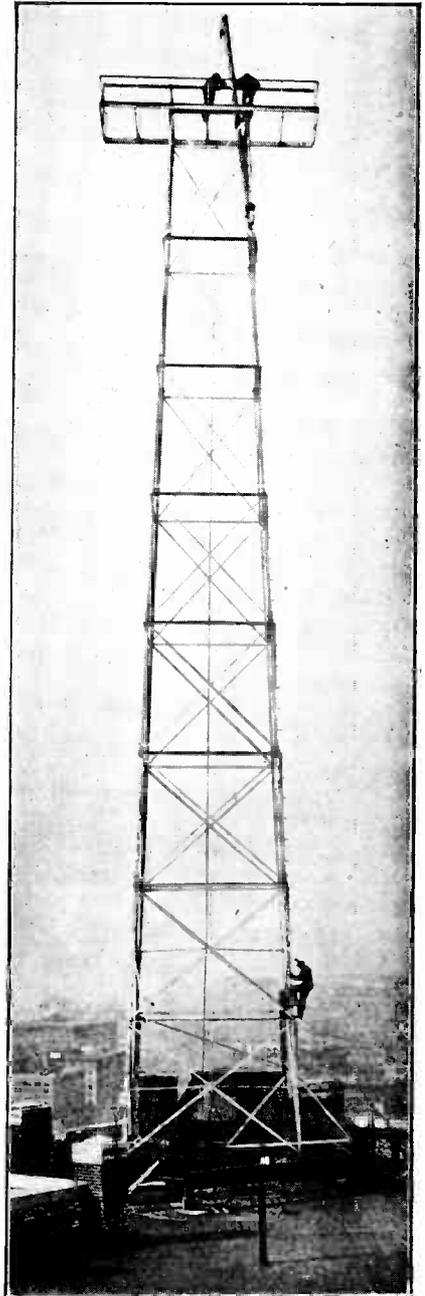
All this for the honor and dignity of the science and the business.

For Every Member of the Family

Radio is such an extraordinary thing in its relation to American life that RADIO WORLD decided from the first to make each issue of interest to every member of the family. Fathers and mothers, sisters and brothers, large and small, enthusiastic beginner and the seasoned expert, will find in our pages something that is interesting and informative.

We want to regard our thousands

Radio Station on New York Skyscraper



(c. International.)

On the roof of the Telephone Building, 24 Walker Street, New York, this 80-foot aerial tower is first being completed. The telephone company is inaugurating a system of radiotelephony particularly for long-distance work. The Telephone Building is one of the tallest skyscrapers in the metropolis.

of readers as part of our editorial staff. RADIO WORLD is for you. Let us have your ideas. They are valuable to us. We know our business so well that we are ready and willing to take heed of what our readers want, and then try to give it to them. Enter our editorial council, take a seat at the table and share your ideas with us. You will find we are receptive. You know our address.

Come along!

The "Wireless Hound" Is a Live One



(c. Fotograms, N. Y.)

Mr. Glavin exhibiting his invention at the Hippodrome.

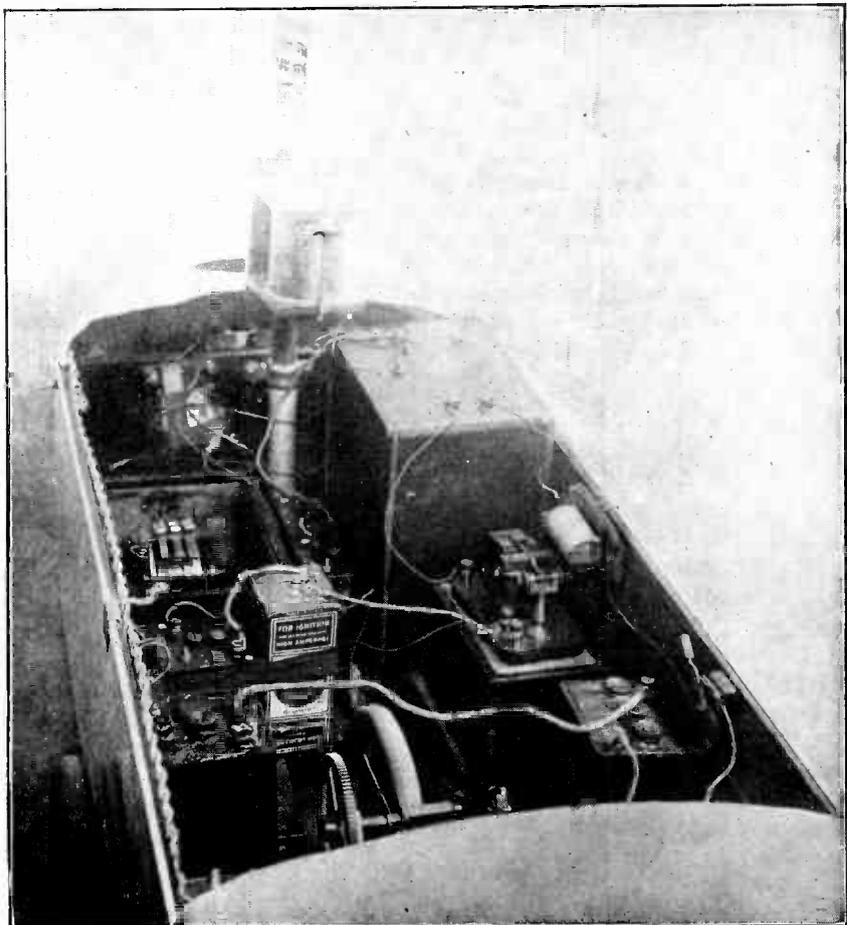
SOME months ago, the "Scientific American" devoted considerable space to an odd little vehicle which since has attracted considerable attention at radio exhibitions, and is now "doing a specialty act" at the Hippodrome, New York. The "hound" is nothing less than a radio-controlled vehicle. It is the invention of Edward S. Glavin, of Yonkers, New York, one of the men who—after Marconi succeeded in getting a coherer to work by means of wireless waves so that distant circles might be controlled as desired—began to experiment in radio-controlled craft. Mr. Glavin's invention represents nine years of constant experimenting and bitter disappointments before he produced a model that actually worked. Applying radio control to a land vehicle found more obstructions than if the craft had been designed for water.

The "wireless hound," says the "Scientific American," is driven by electric motor. The vehicle has four wheels—one in front which does the steering, two wheels which turn freely on a fixed axle, and a center driving-wheel. The electric motor is mounted on a pivoted frame in such a manner that its weight is brought to bear on its rubber-faced pulley pressing down on the driving wheel. Storage batteries furnish the current for the motor as well as for other purposes.

"The control station consists of the usual tuned transmitter—a spark coil, telegraph key, oscillating circuit, and aerial. Each time the key

is depressed, a train of signals is sent out to the aerial of the wireless hound. Each train of signals causes the detector to respond, operating a relay and closing a secondary circuit in a conventional way. The secondary circuit makes use of a control or contact drum carrying various brass strips which, when turned, make various combinations of circuits in conjunction with the brushes or fingers pressing down on them. Thus in the first position the contact or control drum may make the necessary connections for starting the motor. The next position operates part of the electromagnets controlling the steering-wheel, so as to turn the vehicle to the left, while the next position restores the steering-wheel to the normal position and the vehicle straightens its course. The next two positions turn the vehicle to the right and straighten it out. Perhaps the next position stops the vehicle. At any rate that is the way the control operates."

The car moves in any direction in response to signals given by the hand of Mr. Glavin. These signals are translated into electromagnetic radio waves by an assistant.



(c. Keystone View Co.)

Close-up showing details of the interior of the "wireless hound."

Radio Merchandising

A Department of Service for Dealers
Selling Campaigns and Problems

Radio Dealers, Organize!

A PROMINENT radio merchandiser, engineer, and manufacturer, sends RADIO WORLD the following.

"Why not an association of radio dealers? You men, who depend upon radio merchandising for a living, do you believe an angry and hungry unorganized mob can succeed in this great selling-field without your neighbors' co-operation?"

"Are you selling on a close margin, poor discounts, forced heavy overhead demanded by the non-technical radioman known as the radio novice? It costs money and time, lots of it, to sell him and on discounts 10 per cent. and 25 per cent. and so on. Should there be a system in our dealings with the manufacturer and distributors? Whose fault is it that the market is unsettled and remains so—without co-operation? Whose job is it to organize?"

"We have radio exhibitions and conventions of radio amateur associations. Why not a convention of a representative from each dealer in the country. 'Afraid of a monopoly?' is the answer many give. Why not use RADIO WORLD as our medium of dealer-inter-communication. The writer will gladly lend his support toward such an organization, though it may be small and yet helpful."

Will this be the start of the much-needed organization of radio dealers?

There is no doubt that the radio business is growing with such leaps and bounds that an organization, such as our correspondent suggests will be necessary sooner or later.

I. R. C. Newark, Organized

Another nightly wireless entertainment will be broadcasted from Newark, New Jersey, within a few weeks, according to Elmer T. Weight, president of the International Radio Corporation, organized recently with the backing of a group of New York business men.

This corporation, organized under Brooklyn, N. Y.

the State laws of New York and Delaware, proposes to engage in the manufacture of wireless apparatus, the establishment of a laboratory for the development of new wireless inventions and the improvement of present apparatus, the broadcasting of news and entertainment and the establishment of a nation-wide chain of retail wireless-apparatus stores.

It will broadcast under the call "I. R. C." One of the features will be a series of lectures on the operation of wireless receiving and sending sets.

The International Radio Corporation has absorbed the P. W. P. Manufacturing Company, wireless-apparatus manufacturers, and has taken over the building at 42-46 Bramford Place, Newark, to which it has moved its manufacturing plant.

The directors are as follows: Elmer E. Weight, president; Irving K. Partelow, vice-president, a radio engineer; Gerald W. Knight, treasurer; radio and industrial engineer; Thomas Berger, consulting engineer of the Seaboard Construction Company; James H. Curtin, director of the Empire Circuit; John T. McEvoy, diamond importer; Harry D. Burrell of the Russian War Relief, who was formerly associated with the firm of J. P. Morgan and Company; Herman Reiger, Rochester, New York, pulp manufacturer.

Wants Business

A brother-in-law, M. Krauss, The Cincinnati Gas and Electric Supplies Co., 114 West 6th St., N., Cincinnati, has requested that I look up for him local publishers devoted solely to radio and how to erect outfits.

His establishment located for many years in the heart of the shopping district, will, I am sure, afford a good outlet for publications in connection with his new radio department.

Reference: Any prominent local gas and fixture or appliance manufacturer, or your own rating book.

Hoping you will communicate directly with Mr. Krause at your very earliest, sending him sample, prices and particulars, I am, with thanks for immediate attention.—S. S. WOLFF,

Radio Red Book Soon

About May 1 an interesting catalogue, listing dealers who carry radio sets and parts will make its appearance.

The book contains instructions for making three types of radio receiving sets, a map of the broadcasting stations, hints on the care of radio apparatus, the code, how to learn the code easily, symbols, and other interesting data.

Radio Red Book will be published quarterly at twenty-five cents a copy.

Another Big Show

for Brooklyn

The First Annual Radio and Electrical Exposition, under the auspices of the Electrical Contractors Association of the boroughs of Brooklyn and Queens, Greater New York will be held at the Brooklyn Ice Palace, Bedford and Atlantic Avenues, May 6 to May 20, inclusive. Arrangements have been made to install a 2,000-foot aerial so that every exhibitor may be taken care of properly. Manufacturers and dealers at this exhibition will be in direct touch with the buying public and will be privileged to sell their products over the counter.

Complete Outfit for Homes

Editor, RADIO WORLD:

I am in position to place the better radio sets in the better homes. I want to offer the complete outfit. The kind that sounds like a cheap phonograph would not be wanted by the people I have in mind. I know little or nothing about the radio game, and that is why I ask your advise. I want to get started right and can give all my time to the business. I can furnish the best of references.—C. H. McKeown, 505 Bangor Building, Cleveland.

Can Turn Out Wireless Sets

Editor, RADIO WORLD: I have a factory which is adapted to manufacturing for wireless. Can you place me in touch with parties who might take my output. Can rig up to make anything in his line.

G. W. HERBERT
Alexander Hotel, Kittanning, Pa.

Radio Merchandising (Continued)

Will All New Firms Join This List?

RADIO WORLD wants to keep its Radio Merchandising Department right up to the minute in order that it will be of value to all engaged in every phase of the radio trade—a trade that is increasing daily, that will engage millions in capital create huge payrolls for skilled workers of both sexes, and draw considerable money from the fast-growing army of radio fans; for the day is certain to dawn when, so far as the American home is concerned, radio will be as popular as the phonograph, if not more so.

We begin in this number the publication of a list of dealers and jobbers in radio supplies in the United States. The list is classified by geographical sections, beginning with New England States. This list will be continued from week to week until the entire country has been covered. Watch for the name of your firm in your particular territory. If it is not recorded here, send it in for publication. It may mean business to you. Also send along any trade notes of interest—anything that may be of value to the radio trade.

Simply address your letter: "Editor RADIO WORLD, 1493 Broadway, New York City."

New England States

Atlantic Radio Co., 15 Temple St., Portland, Me.

Mack's Radio Shop, Ansonia, Conn.

Rocheleau's Store, Baltic, Conn.

American Hardware Stores, Bridgeport, Conn.

J. Edw. Brown, Glenbrook, Conn.

C. S. Tuska Co., 265 High St., Hartford, Conn.

L. Zimmerman, Box 155, Milford, Conn.
Ark Radio Supply, 97 Hill St., Shelton, Conn.

Electric Specialty Co., 211 South St., Stamford, Conn.

Atlantic Radio Co., 727 Boylston St., Boston, Mass.

Eastern Radio Institute, 899 Boylston St., Boston, Mass.

Setn W. Fuller Co., Boston, Mass.

New England Radio Co., Boston, Mass.

F. D. Pitts Co., 12 Park Square, Boston, Mass.

Radio Equipment Co., 630 Washington St., Boston, Mass.

Somerville Radio Laboratories, 178 Washington St., Boston, Mass.

Teco Radio Co., P. O. Box 3362, Boston, Mass.

Ajax Elec. Co. 38 Palmer St., Cambridge, Mass.

Geo. Hill Co., Inc., Framingham, Mass.

Lester L. Jenkins, New Bedford, Mass.

P. J. Stockwell, Box 157-C., Reading, Mass.

Radio Development Corp., 14 Dwight St., Springfield, Mass.

Enfield Radio Laboratories, West Upton, Mass.

W. D. Kendall Co., Worcester, Mass.

Geo. H. Chase, Newport, R. I.

Delancey-Felch & Co., Pawtucket, R. I.

R. I. Elec. Co., 45 Washington St., Providence, R. I.

Whitall Elec. Co., Westerly, R. I.

North Atlantic States

Wilmington Elec. Specialty Co., 705 Adams St., Wilmington, Del.

Eastern Radio & Electric Co., 1405 Florida Ave., N. W., Washington, D. C.

National Radio Institute, Washington, D. C.

Pearlman's Book Shop, Washington, D. C.

Radio Instrument Co., Washington, D. C.

Service Radio School, Washington, D. C.

White & Boyer Co., Washington, D. C.

Jones Elec. & Radio Mfg. Co., 120 E. Lexington St., Baltimore, Md.

Jas. M. Zamoiski Co., 19 N. Liberty St., Baltimore, Md.

Van Dyke Electrical Co., Asbury Park.

Paramount Radio Supply Co., Arkansas and Pacific Ave., Atlantic City, N. J.

L. H. Robertson, The Radio Shop, Bloomfield, N. J.

James B. Howell, Cedarville, N. J.

Economy Radio Supplies Co., 232 Sanford St., E. Orange, N. J.

Paramount Radio Laboratories, Glen Ridge, N. J.

Eagan Radio School, 66 Hudson St., Hoboken, N. J.

N. J. Radio Equipment & Installation Co., 120 Bidwell Ave., Jersey City, N. J.

Atlantic & Pacific Radio Supplies Co., 8 Kirk Place, Newark, N. J.

I. Bamberger & Co., Newark, N. J.

A. H. Corwin & Co., 4 W. Park St., Newark, N. J.

Newark Wireless Exchange, 87 Halsey St., Newark, N. J.

N. J. Wireless Telephone Co., 587 Broad St., Newark, N. J.

Paragon Elec. Co., 215 N. 6th St., B., Newark, N. J.

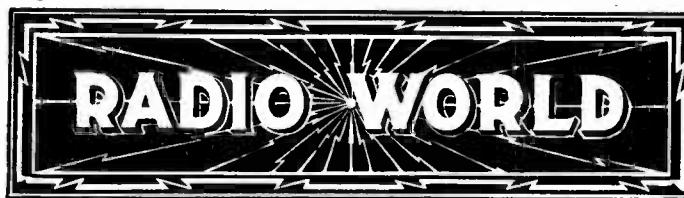
Radio Distributing Co., Newark, N. J.

Storm-Lee Radio Apparatus Co., 742 Highland Ave., Newark, N. J.

Geo. N. DeLaplaine, 306 George St., New Brunswick, N. J.

(To be continued next week)

SUBSCRIPTION BLANK



RADIO WORLD CO.,

Putnam Building,

1493 Broadway, New York City.

Please send me RADIO WORLD for.....months, for which

please find enclosed \$.....

SUBSCRIPTION RATES:

Single Copy\$.15

Three Months 1.50

Six Months 3.00

One Year (including

Special Nos.) 6.00

Postage Paid.

Add \$1.00 a Year for Foreign

and Canadian Postage.

Clothing Firm Opens Radio Department

The Saks and Company of Washington, D. C., sister concern of the New York establishment of Saks and Company, clothing dealers, have established a complete radio-department under the management of Harvey H. Mitchell. Mr. Mitchell, well-known in the commercial and merchandising radio field is well qualified for the managership, having served in the United States Naval Radio service NAA at Arlington and many other important navy stations. He was formerly instructor of theory and operating at The United States Naval Radio School, Great Lakes Training Station, Illinois, a member of many radio and technical associations and clubs. Charles C. Tessier of Los Angeles, California, has come as Mr. Mitchell's assistant.

The Saks and Company of Washington wish to announce to the radio merchandising field that they are in the market for equipment.

In the Front Line

Editor, RADIO WORLD: I bought the first edition of RADIO WORLD today, and have just finished reading it. I believe your magazine, in a few months, will be in the front line of the radio publications.

I have always wished for a weekly publication on radio and it has come,

LAWRENCE R. NIELSEN

Brooklyn, N. Y.

Radio Merchandising (Continued)

New Radio Corporations and Firms

Benson Co., Wilmington, Del., radio equipment, \$100,000. (Corporation Trust Co. of America.)

Beaumont Radiophone Corp., Wilmington, Del., apparatus, \$250,000. (Corporation Trust Co. of America.)

Allen D. Cardwell Mfg. Corp., Brooklyn, N. Y., make radio apparatus, \$500,000; F. L. Carver, C. E. Prettyman, M. M. Messinger. (Attorneys, Zarbiskie, Sage, Gray & Todd, 49 Wall St., New York, N. Y.)

Manhattan Radio Sales Co., Manhattan, \$10,000; R. Lichtenberg, I. Katz. (Attorney, M. E. Levine, 299 Broadway, New York, N. Y.)

Radio Apparatus Development Corp., Manhattan, \$20,000; G. E. Brown, M. Kraemer. (Attorney, J. J. Hegt, 126 Liberty St., New York, U. Y.)

Rochester Radio Corp., Rochester, N. Y., \$45,000; H. B. Graves, Jr., J. V. Harrison, A. H. Holman. (Attorney, A. Neary, Rochester.)

American Radio Exhibitors Association, Wilmington, Del., \$100,000. (Corporation Trust Company of America.)

New Era Wireless Corp., Manhattan, \$300,000; C. R. Collins, R. Wright, A. G. Werther. (Attorneys, LaGuardia, Sapinsky & Amster, 276 5th Ave., New York City.)

Radio Sales and Service Co., Wilmington, Del., apparatus, \$100,000. (Corporation Trust Company of America.)

J. Roy Hunt, Queens, radio equipment, \$25,000; J. R. Hunt, S. F. Katz, A. G. Steiner. (Attorneys, Ernst, Fox & Kane, 25 West 42nd St., New York, N. Y.)

Oneonta Storage Battery Corp., Oneonta, N. Y., \$250,000; E. W. Elmore, D. Franklin, A. A. Hobbs. (Attorney, O. C. Becker, Oneonta, N. Y.)

Omnus Electric Corp., Brooklyn, electric parts and radio machines, \$50,000; B. E. Steinbeck, L. Sherman. (Attorney, J. J. Porte, 1540 Broadway, New York, N. Y.)

Victor Radio Corp., Manhattan, \$10,000, A. and A. Lyons, E. G. Schloss. (Attorneys Lind & Pfeffer, 46 Cedar St., New York, Star Radio Corp., Bronx, \$10,000; J. O. and O. A. Pedersen. (Attorney, O. E. Davis, 3208 Third Ave., New York, N. Y.)

Aerophone Radio Corp., Wilmington, Del., apparatus, \$1,000,000. (Delaware Registration Trust Co.)

Schenectady Radio Corp., Schenectady, N. Y., \$7,500; J. B. Underhill, W. W. Wemple, Jr., A. V. V. Ball. (Attorneys, Wemple & Veeder, Schenectady.)

Dolith Radio Mfg. Corp., Manhattan, \$5,000; R. S. Barthelmess, C. E. Doll, H. M. Smith. (Attorney, C. S. Flanders, 342 Madison Ave., New York, N. Y.)

Clabert Radio Co., Wilmington, Del., apparatus, \$10,000. (Corporation Trust Co. of America.)

American Electrical Appliances and Equipment Corp., Manhattan, \$10,000; C. B. Hayward, A. S. Smith, F. Sheppard. (Attorneys, Begg, Begg & Begg, 220 Broadway, New York, N. Y.)

Radio Electric Co., Manhattan, \$1,000 to \$275,000.

Spark Electric Corp., Manhattan, \$5,000; H. B. Birnbaum, P. J. Candean Jr. (Attorney, J. P. Mottur, 111 Broadway.)

William Thomas, 7740 Santa Monica Boulevard, Hollywood, Calif.

Coast Electric Co., J. Frank Munro, Ralph J. Zink, and Hans S. Onstad, incorporators, San Diego, Calif.

Central Electric Supply Company, Inc., care of Whitehead & Vogle, 315 Colorado Building, Denver, Colo. E. V. Beck and others.

Charles H. Stratton and Perry Davis, Main St., Nicholasville, Jessamine Co., Ky.

Herbert Hall, Sanford, York Co., Me. Bought out Bodwell Brothers electrical business which he will continue.

Pearl Ignition Co., 207 West Newton St., Boston.

Boston Automatic Electric Service Corp. Albert A. Gouldhardt, 9-A Monument Square, Charlestown, Mass.

Louis Schremser, 46 Deslaurier Ave., Webster, Worcester Co., Mass.

R. Engles, Forest Lake, Washington Co., Minn. G. Engles.

Thor Electric Shop, 830 Nicollet Ave., Minneapolis, Minn.

R. E. Parsons, 1322 Main St., Kansas City, Mo.

Incandescent Supply Company, 1118 Olive St., St. Louis, Mo.

Asbury Park Electric Supply Co., 604 Bangs Ave., Asbury Park, N. J. E. Jones, Bradley Beach, N. J., and others.

Waterbury Electric Company, 187 North Main St., Waterbury, Conn., now conducted by Solomon Leone, who established business some years ago and from which Max Baruche has recently retired.

Electrical Contracting & Supply Co., 119 North Mywan St., Rockford, Ill.

Hoosier-Hydro-Electric Co. John A. Shafer, 310 Odd Fellows Building, and others, Indianapolis, Ind.

Noble Electric Shop. Charles Noble, 731 Lincoln Way, South Bend, Ind.

James Cusack Electric Co., 313 Third Ave., Cedar Rapids, Iowa.

Home Electric Appliance Company, 15 Main St., Zanesville, O., successor to Herschel Jackson and Herbert Horn, who are still associated with the company. P. H. Ludman, president; F. J. Albert, vice-president; B. T. Jackson, second vice-president; Herbert F. Horn, secretary; Herschel Jackson, general manager.

Interurban Electric Company, Mount Eaton, Wayne Co., O. Old concern, recently incorporated with capital stock of \$100,000. Also power plant.

Gross Electric Fixture Company, 136 Summit St., Toledo, O. Incorporators, George and Sam Gross, Albert Vandenplas, William H. McLellan and S. L. Geeleerd. Also manufacturers.

Morrow Radio Company, Springfield, O. Incorporators, Lorentz A. Morrow, Richard McNett, Louis E. Bauer, William Bruce, Jr., John Morrow.

A. S. Reed Electric Company, 42 Center St., Rutland, Vt. Company has taken over a three story building, and enlarged quarters.

Dodge Sound Amplifiers, Brooklyn, wireless apparatus, \$50,000; C. J. Dodge, E. F. Quinn. (Attorney, H. McInness, 63 Wall St.)

Commonwealth Radio Corp., Wilmington, Del., apparatus, \$500,000. (American Guarantee and Trust Co.)

Annual Report of Radio Corporation

THE trans-atlantic circuits of the Radio Corporation of America are now carrying 20 per cent. of the international message traffic between the United States and Europe. This is announced in the annual report of the corporation to the stockholders made public April 12.

Out of a gross income of \$4,160,844, in 1921, the corporation made a net profit of \$426,799, which amount was applied against reserves for depreciation of patents. This amount, in the opinion of the directors, was inadequate. The balance sheet as of December 31, 1921, shows a book value for the common stock of \$2.11 a share. The corporation has, outstanding, 3,955,974 shares of preferred stock (par value \$5) and 5,732,000 shares of common stock of no par value.

"The year 1921," the corporation reports, "was largely devoted to increasing the efficiency and capacity of our existing

communication channels and to extending, through present European correspondents, connections with other countries by wire telegraph, and thus there has been provided indirect service to almost the entire world, except South America."

Six direct international radio-communication circuits are now in operation by the Radio Corporation of America: Great Britain, opened March 1, 1920; Norway, opened May 17, 1920; Germany, two circuits, the first opened August 1, 1920, and the second May 19, 1921; France, opened December 14, 1920; Hawaii and Japan, opened March 1, 1920.

At the beginning of 1921, the corporation had in operation two trans-atlantic high-power transmitting stations, one at New Brunswick, New Jersey, and the other at Marion, Mass. The station at Tuckerton, New Jersey, originally constructed by a German company, was of unsatisfactory design to meet the demands of transatlantic

service. The reconstruction of this station by the Radio Corporation of America made it ready for commercial traffic in January, 1921. The Tuckerton station now furnishes two transmitters for use on two distinct European circuits.

At Radio Central, Rocky Point, Long Island, construction work, commenced during the previous year, was completed to such a point that, on November 5, 1921, the station was officially opened. When completed, this station will be a multiple station of twelve units, each consisting of a complete transmitter, and an antenna nearly one and a half miles long, supported by six steel towers, each 400 feet in height.

The first unit of Radio Central was formerly opened by President Harding. The message was acknowledged by nineteen countries of the world, including Japan, Australia and New Zealand.

The installation of high-power stations in South America has been inaugurated, by

(Continued from Preceding Page)
 joint arrangement with the French, German, and English companies, under which the interests of the four companies are trusted, with an American chairman chosen by the Radio Corporation of America. A station is now being erected in Argentine, and a concession has been obtained and financial commitments made in Brazil. At Warsaw, Poland, the Radio Corporation of America is now erecting a high-power station. One-half of the necessary radio equipment has been forwarded to Poland from the United States, and American engineers are making the installation.

The new receiving-station for trans-Atlantic radiograms is at Riverhead, Long Island, where the one antenna consists of two copper wires nine miles long strung on telephone poles, and receives simultaneously messages from Europe.

Trans-Atlantic transmission and reception of radiograms is now concentrated in one room in the central radio office at 64 Broad Street, New York, providing direct communication between the financial district and the European stations. "Radiogram travel at the speed of light," the report explains. For communication with ships on the Atlantic and Pacific, six marine radio stations are now in operation: Chatham, and Siasconset, Massachusetts; New London, Connecticut; New York; Cape May, New Jersey; and San Francisco. In addition to the regular commercial service, these marine stations also provide a daily news service to ocean liners, daily public reports of the positions of ships at sea, and, in co-operation with the United States Public Health Service and the Seamen's Church Institute, free medical advice for mariners. Recent tests have

given telephone communication between ships and shore over distance of 400 miles, while radiograms are sent to ocean liners up to 2,500 to 3,000 miles.

As a result of the erection of radiotelephone broadcasting-stations in various parts of the United States, the Radio Corporation reports a very great demand for radiotelephone receiving-apparatus. "The demand," the report states, "came up very much overnight and no apparatus had been developed which lent itself to quantity production. Radio as an art is advancing very rapidly. Due to the continuous research that has been carried on, apparatus embodying the latest improvements and of a character suited for general use, has now been developed for manufacture in large quantities, and it is believed by the officers of the corporation that the demand, large though it may be, will soon be filled."

The corporation's operating account for 1921 shows gross income from transoceanic communication, \$2,138,625; from sales, \$1,468,919; from marine service, \$533,298. Total, \$4,160,844. The operating and administrative expenses, depreciation of plant and cost of sales totalled \$3,762,231. Other income amounted to \$28,186. The net profit, applied against amortization of patents, was \$426,799.

The corporation's balance sheet shows assets of \$35,712,084, as follows: plant and equipment, \$12,702,086; patents, patent rights, contracts, goodwill, etc., \$16,584,845; stocks of subsidiary and associated companies, \$598,000; current assets, \$4,910,923; deferred charges, \$916,228. The liabilities are: preferred stock (\$5 par value) \$19,779,870; common stock (no par value) \$12,039,607; current liabilities, \$954,471; deferred liability, \$620,000; reserves for depreciation, \$2,318,135.

Encourage your boys to own a MAGNAVOX Radio



We are entering upon a Wireless Telephony Age

YOUR boy is living in the dawn of a new day!

Widen his mental horizon — stimulate his ambition — increase his sense of responsibility — by giving him the use of the "world's greatest tool of progress," a wireless telephone.

Thanks to the Magnavox Radio, any receiving set will now serve the entire family — reproducing loud and clear the splendid programs broadcasted daily in all parts of the country.

Without a Magnavox Radio no wireless receiving set is complete.

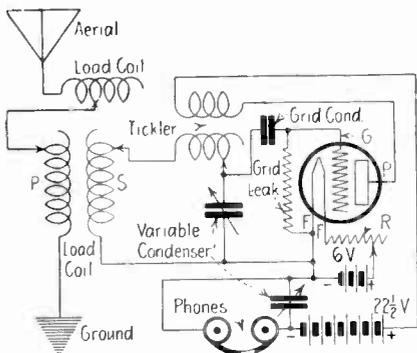
Any radio dealer will demonstrate for you, or write to us for descriptive booklet and name of nearest dealer.

The Magnavox Co.
 Oakland, California
 N. Y. Office: 370 Seventh Ave.
 Penn. Terminal Bldg.

"Radio brings it MAGNAVOX tells it"

Receiver for Long Waves

THE accompanying diagram illustrates a regenerative circuit for long waves. Without a question as to the diagram and story, the writer



Regenerative circuit employing tickler coil and loading coil for long waves. Suggested by Fred. Chas. Ehlert. Drawn by F. Newman.

knows that, many amateurs are looking for some receiver along these lines. The circuit represents a long-wave regenerative circuit. A loading coil is connected in series to the primary of the primary circuit while in series with the grid of the secondary circuit, employed on tickler coupling. The corresponding tickler coil is shown in the plate circuit. With the proper

coupling of the tickler coils, undamped and regenerative waves are produced. This is an exceptionally good Armstrong long-wave hook-up for the radio experimenter who wants a good workable, efficient receiver.

Radio and Sea Planes

Radio has saved thousands of lives on the sea, says the "Mail," New York. In 1902, the S. S. "Philadelphia" was provided with radio for emergency. In 1912, a law was passed that made it necessary for ocean-going vessels to carry a radio station.

Last week, a seaplane set out from Miami, Fla., to Bimini. It carried seven persons. The plane developed trouble en route, as planes often do, and it had to alight upon troubled waters. In a few hours it was at the mercy of a restless sea.

What happened to its wireless apparatus? It did not have any! If it had been provided with a low-power transmitter, all of the passengers would have been saved. A few SOS signals would have brought plenty of assistance.

Does Mr. Hoover know that seaplanes are allowed to carry passengers over forty miles of watery waste without a radio outfit?

RADIO OUTFITS AND SUPPLIES

On hand for immediate
delivery:

Western Electric Head Phones.
23 Plate Variable Condensers, \$3.50
43 Plate Variable Condensers, \$4.25

PARAGON PARTS

Loading Coils — 1500 Meters
which will bring in all broadcastings
within 1500 meters, including Fort
Wood 1450.

Special Service

to those interested in building their
own sets. We assist and render
honest engineering advice.

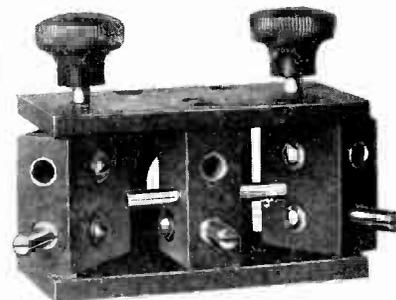
THOMAS J. WARD

117 WEST 33rd ST.
Opposite Gimbel Bros.

They All Advertise

A hen is not supposed to have
Much common sense or tact,
Yet every time she lays an egg,
She cackles forth the fact.
A rooster hasn't got a lot
Of intellect to show,
But none the less most roosters have
Enough good sense to crow.
The mule, the most despised of beasts,
Has a persistent way
Of letting folks know he's around
By his insistent bray.
The busy little bees they buzz,
Bulls bellow and cows moo,
The watchdogs bark, the ganders quack,
And doves and pigeons coo.
The peacock spreads his tail and squaks,
Pigs squeal and robins sing
And even serpents know enough
To hiss before they sting.
But man, the greatest masterpiece
That nature could devise,
Will often stop and hesitate
Before he'll advertise.

—From *Ad-vents*.



Triple Honey Comb Coil Mounting
\$4.50

We have all Radio Supplies on
Hand.

Beacon Radio and Elec. Co.
246 Greenwich St., New York City

100% BETTER RESULTS

WITH

"AEROPLANE" WIRE

For Aerials

19 strand silicon bronze—each
strand tinned.

The Wire used by the U. S. Army
and Navy during the War.

HOOK UP BLUEPRINTS

These prints are clearly drawn and
each is accompanied with instruc-
tions in plain English so that any
layman may readily understand
them.

Dealers Write For Proposition.

HINTZE BROS. Inc.,

459 CENTRAL AVENUE
NEWARK, N. J.

It is a Wonder!

EDITOR RADIO WORLD: Having just
finished reading my copy of RADIO
WORLD, I would take the liberty of
letting you know that I think it is a
wonder.

Waiting for the next number, and
hoping you will keep up the good
work, I remain,

FREDERICK J. RUMFORD,
A. M., A. I. E. E.
Roxbury, Mass.

Change in Call Letter

Governors Island, N. Y.

Editor, RADIO WORLD,

In connection with the Fort Wood
Signal Corps Station radiophone
broadcast, you are advised that the
call letter of this station, formerly
"W Y C B" has been changed to
"W V P."

Upon receipt of this communica-
tion, it is requested that the caption
"W Y C B" no longer be used and in
lieu thereof, call letters "W V P" be
inserted at the head of each broad-
cast program.

The above change in call letters was
made effective March 17, 1922, at
1:00 A. M.

Thanking you for past favors and
trusting that the corrections will be
made in the columns of your paper.

Yours very truly,

C. J. McBREARTY,
Secretary

**Do not make any payments for
subscriptions to persons with
whom you are not personally ac-
quainted, unless they carry sub-
scription authorizations signed by
RADIO WORLD COMPANY,
1493 Broadway, New York, N. Y.**

HOYT'S

Reliable RADIO Apparatus

HEADSETS, CONDENSERS
18-23-43 Plate

BALDWIN VARIOMETERS

TUBES, VARIOCOUPERS

FREE TECHNICAL ADVICE

Complete Sets and Parts Sold or Installed

Hoyt Electric Company

686 Lexington Ave. Bet. 56-57th Sts.
Telephone Plaza 5866-7

RADIO STORES CORPORATION

PENN ARCADE
STORE No. 16

146-150 West 34th Street
N. Y. C.—Tel. Fitzroy 4655

IMMEDIATE DELIVERY
FEDERAL JR. and AMPLIFIERS
HEADS SETS IN STOCK

Western Electric — Federal
Dictograph — Everett
De Forest Equipment
Tubes
All Parts

RADIO SUPPLIES

Immediate Delivery

Binding Posts	.....	50c.	doz.
Variometers, Mahogany	.....	\$5.00,	each
Vario Couplers	.....	\$4.50,	each
Galena Tested Crystal	.....	15c.,	each
Switch Points	.....	35c.,	doz.
Dials	.....	\$1.00,	each
Galena Cup	.....	10c.,	each

Other Supplies

Money Order Must Accompany
Order.

BURT B. BARSOOK

Brevort Hotel, CHICAGO, ILL.
Dealers Write For Prices.

Get Our Prices First

On

Variometers
Vario-couplers
Variable condensers and
Cabinets

Mail orders promptly attended to

MARTIN MFG. CO.

942 JEFFERSON AVENUE
BROOKLYN, N. Y.

Phone: **Bushwick 6793**

FOR IMMEDIATE DELIVERY

We offer the following items of our
own manufacture:

Variable and Fixed Condensers.
Mounted Crystals. Crystal Detectors.

Distributors for—Grebe, De For-
rest, Federal, Acme, Thordarson,
Fada.

WHOLESALE ONLY—LARGE STOCKS
RADIO SHOP of NEWARK

(Telephone Market 9607)

41 SOUTH ORANGE AVE.
NEWARK, N. J.

Dealers: Forward Your Inquiries Promptly

IF YOU ARE LOOKING FOR

RADIO Sets or
Supplies

Visit **MODELL'S**

191 FULTON ST.
Cor. Church, New York

Carrying Power of C. W.

THE new form of radio transmission, known as the "Continuous-wave" or "C. W." method is described by Pierre Boucheron, in an article entitled "At the Sending End of Radio" in the "Scientific American."

"This new system," writes Mr. Boucheron, has made great strides within the past year, owing to its remarkable carrying powers, selectivity, simplicity and low cost, as compared with the older spark type transmitter.

Briefly, the difference between the continuous-wave and the discontinuous or damped-wave method is this: In C. W. we have a system of transmission which generates and propagates a perfectly uniform wave of constant amplitude. Such a wave, after leaving the antenna, travels through space without losing its form. The distance this kind of wave will travel is, of course, entirely dependent upon the amount of power at the initial source. Modern C. W. may be obtained by several distinctly different methods. The most popular method, at least among amateurs, is realized through the use of the oscillating vacuum tube. Here we have the somewhat magical performance of a glowing incandescent lamp generating a constant supply of high-frequency oscillations, which is ideally suited to radiation purposes through the simple expedient of controlling the electronic flow occurring between the lighted filament and a surrounding plate charged with positive electricity.

In the discontinuous or damped method the emitted wave is not continuous in its passage through the ether. Furthermore, the amplitude of its oscillations is not constant. Instead, after such waves have been given their first send-off by the initial power stroke of the transmitter, they rise to sudden great height and gradually fall lower and lower in amplitude until damped out completely. The next stroke of transmitter energy causes them to rise again, and the rising and falling process keeps on indefinitely, depending on the amount of energy back of it. Thus this sort of discontinuous or damped wave, as it is technically called, travels through space until exhausted: likewise, its "carrying" powers are entirely proportional of its initial amount of energy. It is produced by the spark type of transmitter and has been in use ever since the inception of wireless communication.

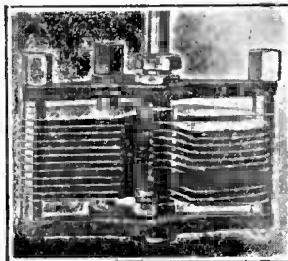
MAKE HAY WHILE THE SUN SHINES

DEALERS AND DISTRIBUTORS

Place your orders now for prompt delivery for

THE GRIN

VARIABLE CONDENSER



.001 M. F.

43 Plate

\$4.75

.0005 M. F.

23 Plate

\$4.25

A CONDENSER BUILT TO SATISFY GROWING DEMANDS

VIZZO PRODUCTS CO.

THOS. PELLEGRIN, Sales Manager

1263 BEDFORD AVE., SALES OFFICE: BROOKLYN, N. Y.

FACTORY: SHELTON, CONN.

WISDOM.

Everything in Radio Is Available Here—We Are Manufacturers and Distributors of High Grade Parts and Complete Equipment.

"It is good business wisdom to place your full requirements with us"

Prompt Shipments Await Your Orders On:

"Nerco" 2200 Ohm Phones
Crystal Detectors
Variable Condensers
(23 and 43 Plates)
Fixed Condensers
Dials and Knobs
Variocouplers
Variometers

Binding Posts
Stops
Galena Cups
Arm Contact Switches
Switch contact points
Insulators
Magnet wire
Tuning coils—with two sliders

De Forest Sets Complete Including the M R 6's.

Federal Sets Complete With Phones.

ASK US about our little set complete with "Nerco" phones

Listed at **\$11.50** It's a Marvel

Wiener Wireless Specialty Co.

Telephone—Market 5668

21 ACADEMY STREET
NEWARK, NEW JERSEY

DEALERS

Send for free samples of our Window Display Signs and Cartoons featuring RADIO EQUIPMENT.

Attractive, snappy result getters.

Merchants Signs Service Co.,
48 Zabriskie St., Jersey City, N. J.

PHONES—

OUTFITS and PARTS
On Hand.

"C" RADIO JACK
158 Fulton St., N. Y. C.

RADIO WORLD'S QUICK ACTION CLASSIFIED ADS

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio field. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get a five-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands five days after copy reaches us.

The rate for this RADIO WORLD QUICK ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads., If copy is received at this office before 4 P. M. on any Thursday preceding date of publication. RADIO WORLD CO., 1493 Broadway, New York City. (Phone, Bryant 4796.)

A-1 GALENA—perfect; tested and guaranteed; imbedded in special metal; price 35c; AA-1 GALENA (Genuine) 50c postpaid. NATIONAL SPECIAL-TIES, 32 Union Square, N. Y. C.

ROGERS RECEIVING RADIOMETER: New patented variometer for panel mounting. Simple, compact, efficient, \$4.00. Build your own receiver. Two radiometers one variable condenser, directions and wiring diagram, mailed upon receipt money order \$10.00. Rogers Radio Company, 5133 Woodworth St., Pittsburgh, Penna.

Government Positions. Men, women, 18, over. Wanted for Railway Mail, Postoffice, other Government positions. Examination soon. Salary \$1,400-\$1,500 year. Experience unnecessary. Particulars free. Write Columbia School of Civil Service, 383 Pope Bldg., Washington, D. C.

BLUE PRINT DIAGRAMS—Make your own wireless apparatus. 2 slide tuning coil. Fix Loose Coupler and a Variable condenser. Easy to read. Full directions on each blue print. Sent for 50c. Dealers supplied. John E. Givens, 14 Summit St., Newark, N. J.

HIGH GRADE ANTENNA WIRE. Best quality, 7 strand No. 22 trimmed copper, non corrosive antenna wire. Only 19 per foot. The Kehler Radio Laboratories. Dept. W. Abilene, Kansas.

Get Music from the air. We have in stock a reliable crystal receiving set that will receive broadcasting up to 30 miles. Write for circular. A. Dalstrom, 25 Atlantic St., Jersey City, N. J.

Regenerative Receiver, Tubes, Batteries, Cabinet. Complete. \$100. Telephone. Write. Bridgman, Lyndhurst, N. J.

Mr. Radio Fan: Do you want a good receiving set at a real bargain price? We have them at almost any price you want to pay, either new or used ones. Our used apparatus is absolutely guaranteed and will be inspected thoroughly before shipping. Upon receipt of 25c, you receive a membership card and be placed on the mailing list to receive our bi-monthly bulletins which list all the used radio apparatus that our members have for sale. This membership card entitles you to a special catalog of incomparable prices. Join Now. The Radio Exchange, 804 Helen St., Sioux City, Ia.

We buy old gold, silver, platinum, coins and stamps. Walters Co. 1540 North 58th St., Philadelphia, Pa.

Detector Tubes — Double filament "audiotrons" \$4.450. Write B. R. Eyth, 14 Wood Pl. Yonkers, N. Y.

**KEEP "IN THE AIR!"
BY READING
RADIO WORLD
ON SALE EVERY WEDNESDAY
15 CTS. A COPY**

HAVE YOU A RADIO SET?—If not try my system in getting one. I sell at reduced prices, batteries, tools, sporting goods, merchandise of all kinds. Try me. Anderson, 340 Park Ave., N. Y.

CODE CHARTS—Containing alphabet, numbers, punctuation and Q abbreviations. Two sizes, 12 x 16 @ 25 cents and 24 x 30 @ 50 cents. If your dealer does not handle them, we will mail them postpaid upon receipt of price. H. C. Wiley, 48 Monroe St., Hartford, Conn.

Plans, instructions in wiring, tuning and receiving. cost of each part, sent for 5 cents. This information will save you many dollars and much time. No amateur can afford to be without it. Explained in very simple terms. Radio Engineers, Box 354, Hornell, N. Y.

Battery Charging Panel Including Volt and Amp. Meters, Circuit Breaker. Will give 30 Amp. Charge \$50. 151 Grates Ave., B'klyn. Tel. Prospect 9144.

WE BUY second hand radio goods, any description. Columbus Shop, 874 Columbus Ave. (103d). Open evenings to 10 o'clock.

Radio Circuits on Blueprints are Convenient. Our VT circuits, each on a separate blue print, enable you to try out a large range of proven hook-ups. Set of twelve, receiving or phone and combination transmitting, 50c. Complete set of 24 for \$1. The Plan Bureau, 1929 McCausland Avenue, St. Louis, Mo.

FOR SALE—Complete Radio Receiving Set. Three amplifiers. Baldwin phones, batteries, aerial, etc. \$175. Drawer C. Salisbury, Conn.

NEWSDEALERS ATTENTION!

Many of your customers will want the first three issues of Radio World. Your wholesaler may have a few copies on hand. Inquire. If you cannot get back numbers write us and we will try to supply you so that your customers will have a complete file of Radio World from the first issue.

If you happen to have a few copies on hand, keep and display them and you will find that they will sell. Very shortly it will be impossible to get back numbers of these earlier issues.

Radio World, 1493 Broadway,
New York City.

Only Exclusive Amateur Radio Dealers in Western Canada. We handle complete line of standard Amateur Radio supplies, specializing in Mail Orders. Send stamp for list. WESTERN CANADA RADIO SUPPLY, 919 Fort Street, Victoria, B. C.

Handbooks for Electricians and Experimenters, 20c. Joe Tillberg, Proctor, Vermont.

Buy Direct From Manufacturerr, mahogany cabinet containing short wave tuner with detector. \$30 with one stage amplification, \$45; two stage, \$60; three stages (Use loop), \$80. No jacks. Rear connections. Rogers Radio Company, 5133 Woodworth St., Pittsburgh, Pa.

Will Exchange \$250 professional movie home projector complete with ten reels of film for a loud speaking outfit. Wm. Salks, 2378 8th Ave., New York City.

We Buy and Sell back issues of Radio Amateur News and Electrical Experimenter. Boston Magazine Exchange, 109 Mountfort St., Boston, Mass.

Stop! Look! Act! V. T.'s and accessories!—With each of the listed tubes Radiotron U. V. 200, \$5 and A. P. detectors, \$5; radiotron U. V. 201, \$6.50 and A. P. amplifiers, \$6.50. We will supply free of charge your choice of either of these five premiums—latest Fada rheostat, \$1, No. 810 Remler smooth running rheostat, \$1; Paragon V. T. socket, \$1; Murdock V. T. socket improved contact type, \$1, or Crosley porcelain panel or base mounting V. T. socket, \$0.60. Either of the Federal single, closed or double circuit jacks listed respectively at \$0.70, \$0.85 and \$1 will be given as premiums with each Federal 226W amplifying transformer, \$7 or R. C. of A. U. V. 712, \$7, and the U. V. 1714 radio frequency amplifying transformer. Fada 5 ampere Nichrome power rheostats, \$1.35 or R. C. of A. U. R. 542 porcelain V. T. socket supplied free of charge with each \$8 U. V. 202 5-watt power tube, for C. W. or radiophone transmission. We absolutely guarantee the foregoing apparatus. Only new and high grade equipment carried in stock. Unsatisfactory goods subject to return within five days. Twelve hour service. Postage and insurance prepaid by us, thereby saving time and money. Remember us. The Kehler Radio Laboratories, Dept. R, Abilene, Kansas.

Audion receivers direct from manufacturer, handsome cabinet, bakelite panel and dials, 150 meters to 3,000 meters. \$29.50 unassembled \$20 postpaid. Crystal sets in cabinet \$10 unassembled \$7 postpaid. Stamp for full details of these and other outfits, dealers supplied, agents wanted. Edward T. Collins, 8522-101 Richmond Hill, L. I., N. Y.

LEUMITE the ultra-sensitive detector crystal, postpaid 25c. LEUMAS LABORATORIES, 311B Fifth Ave., New York.

I have a complete radiophone for sale, 150-1000 meters. Three vacuum tubes, batteries, phones. Fischer, 979 Second Ave., New York.

AMPERITE

AUTOMATIC FILAMENT CURRENT ADJUSTER

Eliminates Rheostats. Guaranteed to make the efficient operation of your vacuum tubes absolutely fool proof.

ASK YOUR DEALER

or if unsupplied advise Manufacturers

RADIALL COMPANY

99 Warren Street, New York City

RADI-O-PLATE

The popular black composition board for panels—dielectric strength unaffected by dampness.

SIZES	
6x12x $\frac{1}{4}$	\$.60
12x12x $\frac{1}{4}$	.85
7x18x $\frac{1}{4}$	.90
12x18x $\frac{1}{4}$	1.25

Mail orders filled

TRINITY ELECTRIC CO.

42 Greenwich St.
New York City
Bowling Green 7512

RICHMOND ELECTRIC CO.

Auto, Electric and Magnet Wires, Electrical Specialties

Wholesale Only

181 McDougal St.,
Brooklyn, N. Y.

RADIO CABINETS

Manufactured

in any Style, Size or Quantity

A. E. CHERNACK & CO., INC.

314 E. 75th St., NEW YORK
Phone Rhinlander 2747

PAPER TUBES FOR WIRELESS

ALL SIZES ON HAND
FOR IMMEDIATE DELIVERY
WHOLESALE AND RETAIL
BAEHM PAPER CO., INC.
219 FULTON STREET NEW YORK
Bet. Church and Greenwich Sts.

Radio Sets and Supplies

Head Sets, Vacuum Tubes, Acme Transformers, Dials, Switch Points, "B" Batteries, Insulators, Etc.

N. Y. RADIO PHONE CO.

32 Union Square New York City

WAVE LENGTH INCREASED 75 to 1,000 Meters

Our new graduated coil brings in the new long wave stations loud and clear. In handsome cabinet with panel, switch, etc. complete, also suitable for making crystal set by adding detector. Sent prepaid for \$8.00.

Oliver Yarrington
135 W. 83rd Street, New York

J. A. SPAVENTOY

RADIO EQUIPMENT and
INSTALLATIONS

Distributor

Marko Storage Battery

90 Flatbush Ave., Ext., Brooklyn.

RADIO PANELS

Cut exactly to size and shipped within 12 hours. $\frac{1}{4}$ inch thick, \$.01 $\frac{1}{2}$ c. per square inch; $\frac{5}{16}$ inch, .02c. Made of the highest grade black fibre. This material possesses high dielectric strength, is inexpensive, unbreakable, easy to work and takes a nice finish. Special offer 6x6x $\frac{1}{4}$, 50c. We pay postage.

RADIO INSTRUMENT & PANEL CO.
Box 75, Cicero, Illinois

BOYS

Earn Money after school
Most every one is interested
in RADIO and will subscribe
for RADIO WORLD, the only weekly radio paper. 15 cents a copy. Send us a reference from your teacher or minister, and we will show you how to easily earn the money for a fine Radio Outfit of your own. Write RADIO WORLD CO., 1493 Broadway, New York.

Wireless "B" Battery

For Wireless

No wires used in any of its construction

ENCO

Variable and Refillable

"B" BATTERY

For refills use standard flashlight unit cells, 17 cents, each

Write for Descriptive Circular

**ENCO ELECTRIC NOVELTY
COMPANY, INC.**

603 W. 130th St., New York City

RADIO

"The Popular National Radio Journal"

All that its name implies

Get a copy from your radio dealer or news stand today—20c.

PUBLISHED BY

Pacific Radio Pub. Co., Inc.
Pacific Bldg., San Francisco

READY FOR DELIVERY

SUPER ENCO "B" REFILLABLE BATTERY

Marvelous as the Radio-
phone itself.

17c For a Renewal in-
stead of \$2 to \$3
for a new battery.

BATTERY METERS

Special **50c**
At Each
By Mail 10c Extra

Corubia Electric House

145-147 EAST 23rd ST.

Bet. Lexington & 3rd Ave., N. Y. C.



THE HOME RADIO

HOW TO MAKE AND USE IT

By A. Hyatt Verrill

At last! A simple explanation of the making and use of a home radio outfit. Every step in construction is carefully directed and illustrated with numerous working diagrams. Get your copy to-day. Clothbound book. Postpaid for 75 cents.

Radio Educational Service
200 5th Ave., R. 416, New Lbrk City

Select your supplies from our complete stock of radio parts. All standard makes at popular prices.

Complete sets from

\$15.00 up

**PARK ROW CYCLE
& RADIO CO.**

29 Park Row, N. Y. C.

Opp. Post Office Basement Store

RECEIVING SETS

Bought from us are installed by experts assuring you most satisfactory results.

RADIO CO. of NEW YORK

1674 BROADWAY
Cor. 52nd St., New York City.

Receiver Magnets Remagnetized While You Wait

If your ear pieces are weak you can not hear the concerts distinctly. Let us remagnetize them for you. Single phones 35c.; double, 50c. Any type radio equipment repaired. Complete sets and parts built to order.

P. RICHARDS

204 W. 76th St., Near Broadway
Phone Schuyler 0140

Expert Radio Wiring and Installations

Complete Line of Receiving Sets and
Radio Apparatus

K. R. SCHULLSTROM

30 E. 59th St., Bet. 5th and Madison Ave.
Phone Plaza 9425-9426

RADIO PHONE \$20. & 25. RECEIVERS

Complete, including phone and aerial. Guaranteed clear, and distinct. Made by radio experts. Coils only \$1.25. Mail orders filled promptly.

RADIO PHONE SUPPLY CO.
804 Ninth Avenue, New York
Phone Circle 2470

Naco Radio Receiving Sets

\$20.00
complete without
condenser



\$25.00
complete with
condenser

For clear hearing and pleasing tone use a NACO set.

Naco Radio Accessories

Telephones. Knocked down sets. NACO long distance sets are of the highest quality.

STATE MANAGERS WANTED.

"We are building our radio business for the future, not only for today. Courtesy and discretionate prices prevail"

National Motor Accessories Corporation

1446-1448 Woolworth Bldg., NEW YORK CITY



Radio Batteries Ready for Delivery

WE are ready to deliver radio batteries (A type only) 6 volt from 40 to 120 amperes for single orders, dealer quantities, or distributor quotas where we are not already represented by distributor.

These are not the ordinary automobile batteries. They are specially built for radio work with heavy plates and heavy separators and fully guaranteed.

In writing be sure to state whether this is an individual order or whether you are a dealer with quantity demand or whether you want a distributor's quota.

PERFECTION BATTERY MFG. CORP.
2300 S. LaSalle St., Chicago, Ill.

VARIOMETERS

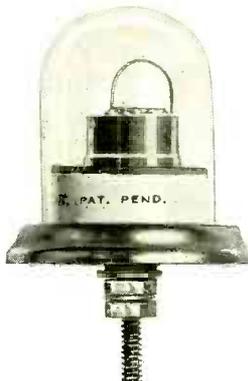
(Unwired)

Unwired Variometer blocks. Wood turned Cup Mahogany, Ball made of white wood. Nicely trimmed and ready for wiring. Can be had in all sizes varying from 200 meters to 500, especially adapted for Short wave reception. Prices upon request in any size lots, also sold separately. Workmanship guaranteed.

The Ever Ready Woodworking Co.

810-12 EAST 5th STREET NEW YORK

Telephone Orchard 5585



(Actual Size)

IN USING

THE "GREWOL" RADIO DETECTOR

All Troubles Are Eliminated

This Detector Is Always Set and Ready

PRICE, \$2.00

Dealers write for proposition.

RANDEL WIRELESS CO.

9 CENTRAL AVENUE, NEWARK, N. J.

Sole United States Distributors