RADIO WORLD

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. 2. April 8, 1922 15c. per copy, $6.00 a year

A Joyous Apology

The editors and publishers of RADIO WORLD offer, herewith, an apology to the American public.

An unusually large edition of the first issue of RADIO WORLD was printed. A[illegible] made ready for additional orders from the news trade.

Our first delivery to [illegible]erican News Company was swept off the [illegible] mediately after[illegible]

[illegible]s Company, its [illegible] twenty-four [illegible]

(c. Underwood & Underwood.)
Miss Ethel Hart awaiting her morning social call by radio, in her room at the Hotel McAlpin, New York.

APRIL EIGHTH 1922

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3 mos., 1.50

In this issue:

Radio Definitions *and* **Radio Primer** *for Beginners*

Special Articles by Experts

OUR AIM IS SERVICE

IS RADIOTELEPHONY DEPENDABLE? By O. C. ROOS (Fellow I.R.E.)

MURDOCK RE… so sh…
back" basis for …
production that there a… at so low a price.

The latest Murdock achie… No. 56 Receiver, is a highly sensitive instrument which retains all the rugged strength of previous types. Important features are, the improved comfortable headband, the "Murdock-Moulded" ear pieces shaped to exclude outside noise, and the moulding of all parts into one durable unit.

All models of Murdock receivers are sold with free trial offer and money back guarantee. Use them in direct comparison to any other phones for 14 days. Make any test you wish. Then at the end of the two weeks, if the Murdock Phones are not entirely satisfactory, return them and your money will be refunded!

Many of the complete "ready-to-operate" wireless sets now on the market include Murdock Phones as standard equipment. If the set you buy does not, be sure you get a set of Murdock receivers to complete your station. We strongly urge you to go to your dealer and convince yourself of the quality of Murdock receivers, by actual examination, before you buy. Prices $4.50 to $6.

Murdock Phones are the standard bearer for a complete line of "Made-by-Murdock" radio parts and instruments. This includes the famous Murdock condensers, couplers and variometers, and the new Murdock Rheostat at $1.00.

Buy Murdock Radio Apparatus From Your Dealer

WM. J. MURDOCK CO.

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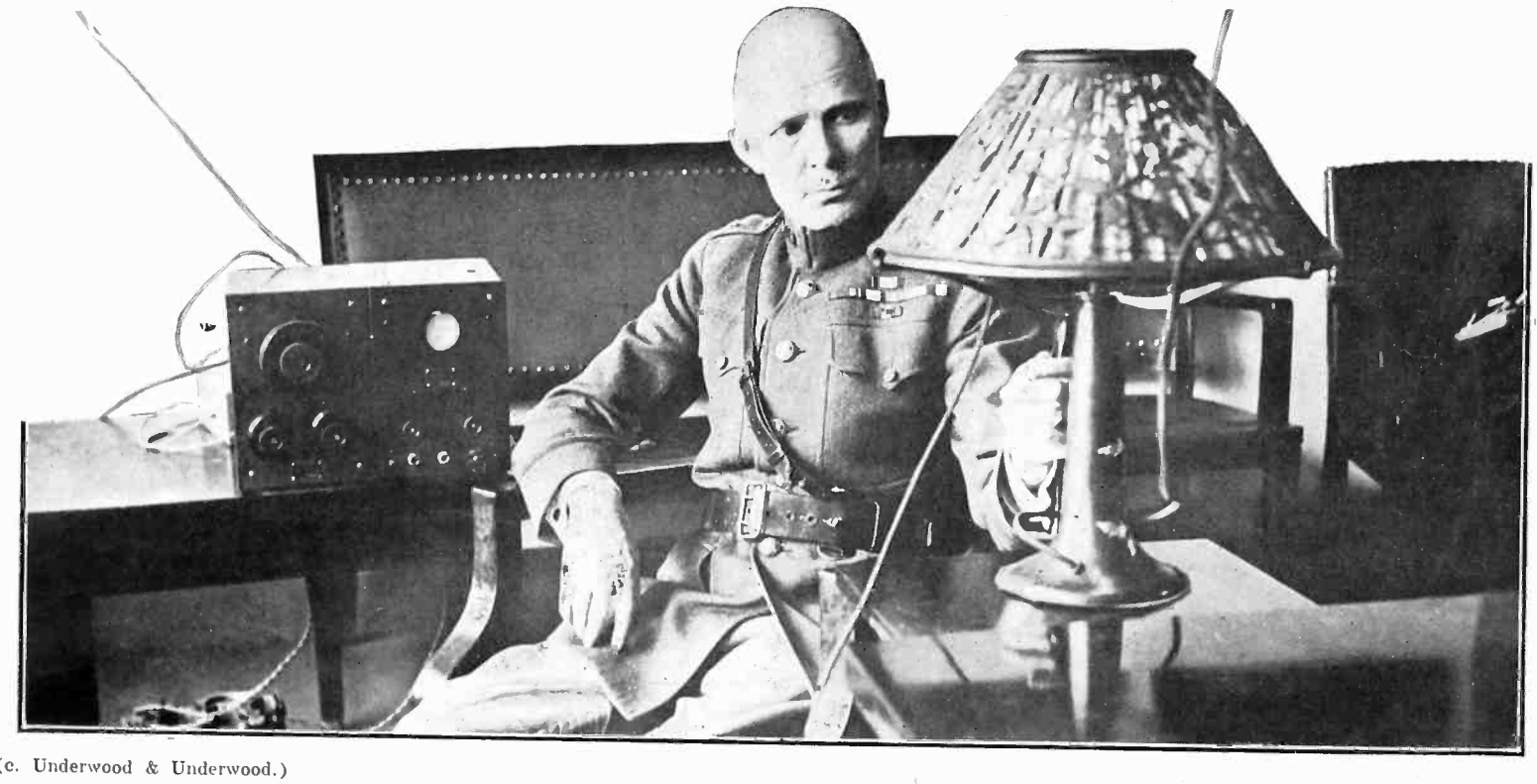
Hence our apology for not printing a much larger edition.

This is written within twenty-four hours after our first issue went on sale, and orders continue to pour in—orders which, we regret to say, we cannot fill.

We promise to do our level best to supply the full demand for this second issue in your hands.

PUBLISHER of RADIO WORLD.



(c. Underwood & Underwood.)

Major-General George O. Squiers, U. S. A., by an invention of his own, receives messages without aerials. The receiving set is attached to the lamp on his office desk, the electric supply forming a receiving source.

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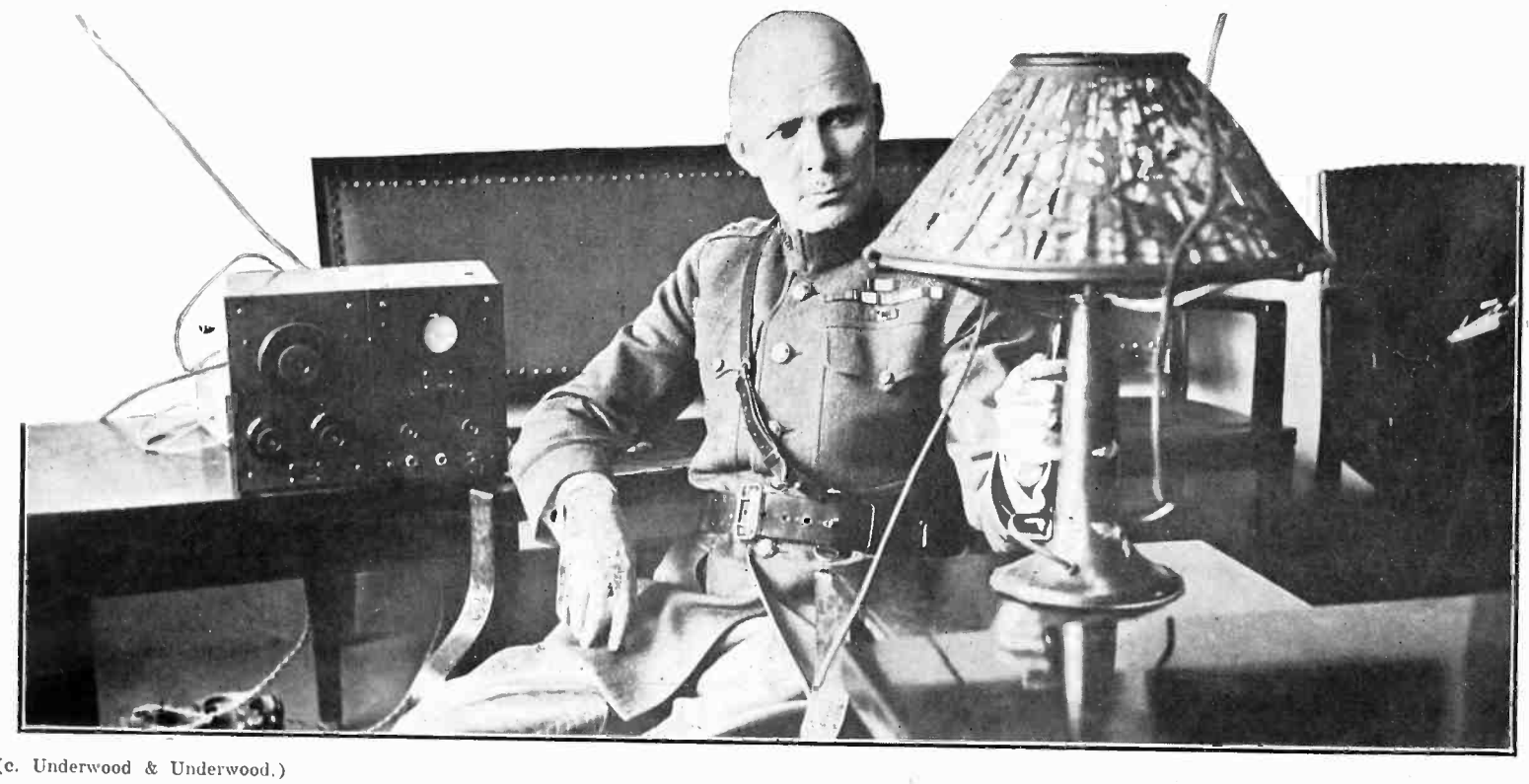

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Major-General George O. Squiers, U. S. A., by an invention of his own, receives messages without aerials. The receiving set is attached to the lamp on his office desk, the electric supply forming a receiving source.

Hoover Takes Time to "Listen In"

(c. Underwood & Underwood.)

Herbert R. Hoover, Secretary of Commerce in President Harding's cabinet, is one of the most enthusiastic or radio fans and one of the leading workers in the Radio Conference now being held in Washington to regulate wireless affairs throughout the country. His office is equipped with a radio set. Whenever opportunity offers, the Secretary of Commerce clamps on his head-gear and "listens in"—particularly when there is music in the air.

Storage Batteries for Radio

By Fred. Chas. Ehlert

ALL radio receiving-sets now on the market, equipped with a vacuum tube, require two batteries, technically known in radio as "A" and "B" batteries. The "A" battery is a storage battery of relatively low voltage and high amperage. The "B" battery is a dry battery of relatively high voltage and low amperage.

Certain storage batteries are designed especially for radio apparatus and have characteristics which differ from the storage batteries manufactured for automobiles, telephones, railroad signals, and other special work. Any good storage battery of the required voltage, usually 6 volts, and having a capacity of 40 or more ampere hours, regardless of the work for which it was designed, may be used with radio receiving sets. But such batteries should not be expected to give a satisfactory service as batteries which are designed especially for radio work.

There are a large number of reputable storage-batteries now being made especially for use with the radio sets, and it is very important that the instructions given with them be carried out in detail.

The capacity of a storage battery is governed very largely by the quantity and quality of lead and oxide of lead used in its construction. The amount of service obtained from a charge will depend on the size of the charge and the current drain. You cannot take out of a storage battery any more current than you put into it. Test your "A" battery frequently. There is one method—a very easy one—to estimate the condition of your battery; and that is the use of what is known as a hydrometer. In a storage battery, on discharge, the sulphuric acid of the electrolyte is constantly forming lead sulphate. This thins the electrolyte, which indicates that when the electrolyte is the strongest, the battery will be fully charged; and when the electrolyte is weak, the battery is discharged.

(*The next issue of* RADIO WORLD *will contain further information on storage batteries.*)

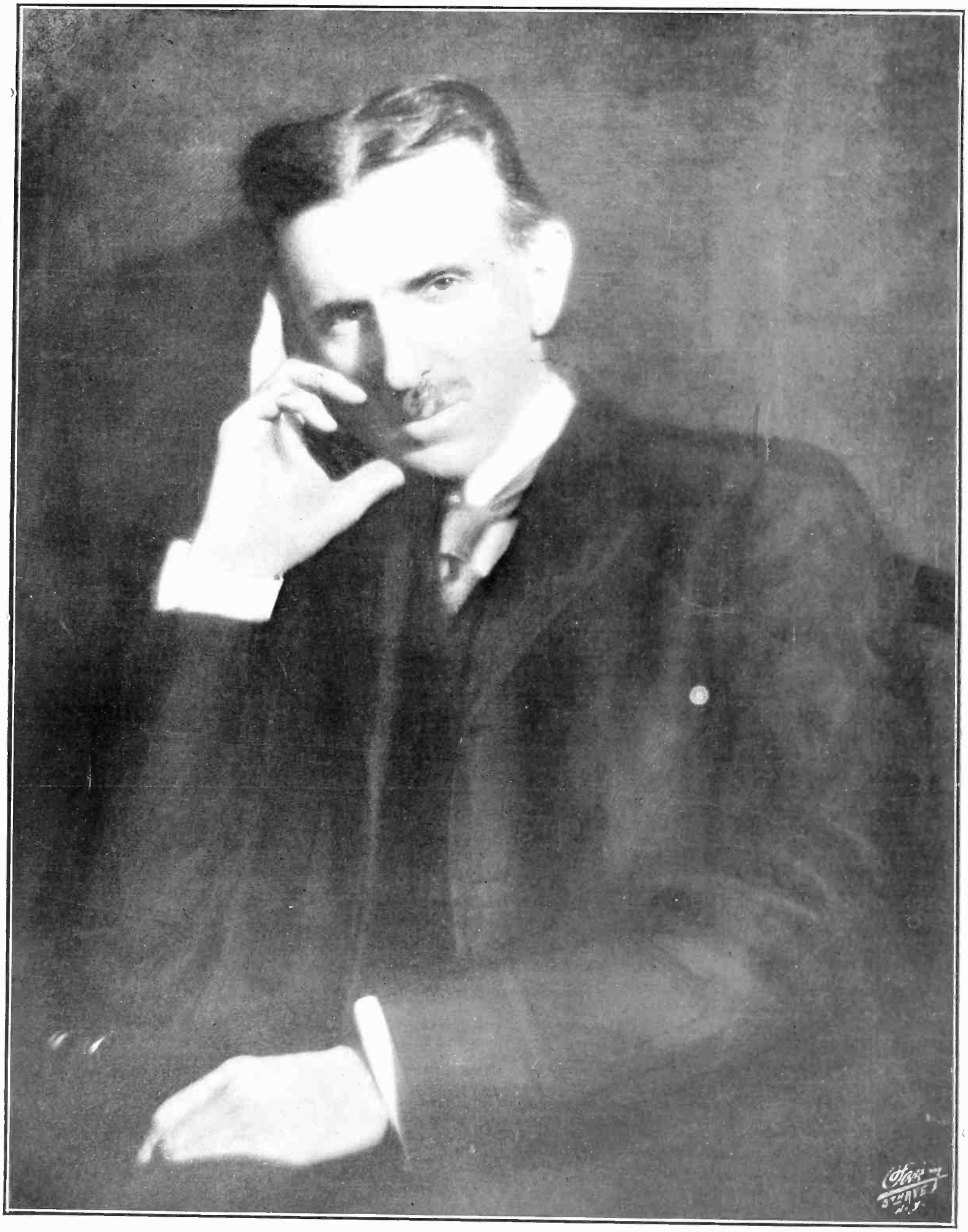
Theater Assembly to Have Radio

The Theater Assembly spring luncheon will take place Saturday, April 29, at the Hotel Astor. The leading feature will be concert numbers by radio. The ballroom will be wired so the singers may be heard clearly by all of the 1,200 guests.

Expensive Sets

Radiotelephone transmitting sets, as a rule, are much more expensive than radiotelegraph equipment covering the same range, and require for their proper adjustment and operation the supervision of an experienced operator.

Radio World's Hall of Fame



NIKOLA TESLA

whose inventions are the foundation of all up-to-date wireless transmission—one of the first men to predict the success and popularity of radio.

The Radio Primer

The A. B. C. of Radio for the Novice Who Wants His Facts Put Plainly and Tersely

Radio Definitions

B and C

BATTERY—A much abused word, being often used incorrectly for "cell." Careful distinction should be made between the two terms. A battery consists of two or more cells joined together so as to form a single unit.

BRUSH DISCHARGE — The brushlike appearance of luminous rays diverging from a pointed electrified body.

CONVERTER—A machine used to convert direct current to alternating or vice versa.

COUNTERPOISE—An artificial ground. A large amount of sheet metal or wire spread out and insulated from the ground.

COUPLING—A non-metal connection between two radio-circuits formed by two coils of wire. One may be placed inside the other or near it.

CODE—Combination of dots and dashes to form the letters of the alphabet.

CORE—The steel or soft iron center of an electro-magnet.

CONDENSER— (Variable) — A condenser with a variable condenser for storing up electric current.

CIRCUIT—A complete metal path for conveying an electric current.

CYCLE—Two complete alternations of an alternating current.

CRYSTAL DETECTOR—A device used to rectify the radio frequency currents to direct impulses which effect the diaphragm of the receiver.

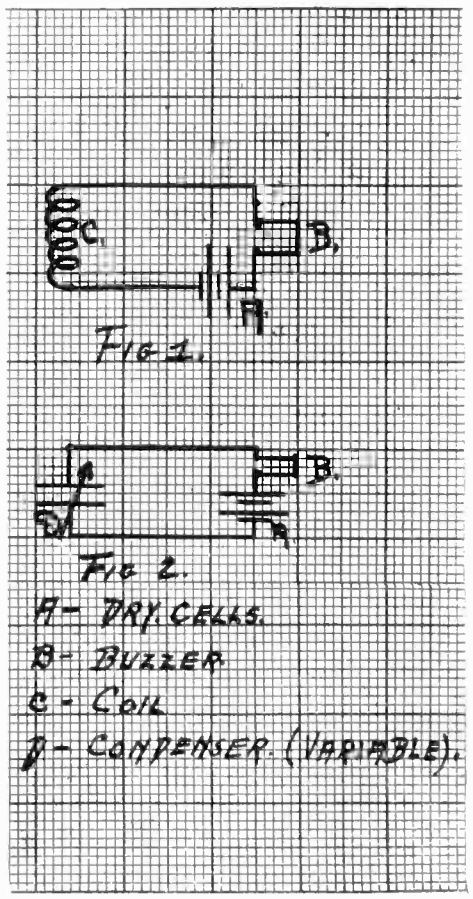
CHOPPER—A motor driven interrupter used with C. W., transmitters.

"Radio Definitions" appears in each issue of RADIO WORLD. Save your copies, for this department will comprise a complete glossary of radio terms.

Testing Trouble in Receiving Sets

With the increased amount of amateurs making their own sets, one of the worst drawbacks the amateur faces is the proper connection of a set. In many cases, when a set has been finished and is set up it is found that the receiver fails to work. Every little connection may appear to be intact but—just one little loose wire makes the whole set absolutely useless for operation.

Troubles may occur most anywhere in the set; but the proper thing to do is to test the complete set: that is to say, each unit should be tested individually. Fig. 1 shows one method which may be applied to test with. Insert in series with the coil to be tested, a buzzer and two dry cells. If the coil is not broken the buzzer will buzz; but if no buzz is heard, it is certain that there is a broken connection somewhere on the coil. Inspect the coil very carefully and, no doubt, you will locate your connection. If the coil is tapped and a switch arm with contacts are used, the method is the same. Testing condensers is somewhat different. Connect the condenser in series with the battery in the same manner as before, connect one side of the circuit to the movable set of plates, and the other side to the fixed set of plates. Continue now to turn the condenser, bringing the movable plates inside the fixed plates. If any buzz is heard, then somewhere a short circuit is taking place, and the tester will have to examine it very closely again. As he turns, particular attention should be given in order to locate where the plates touch. If the short is found, the plate should be opened so as not to touch another plate. When no buzz is heard, the condenser is O.K. Fig. 2 illustrates the testing of the condenser.



Diagrams showing instruments for test trouble as described in the accompanying article.

How to Tell Good from Bad Galena

The crystal is the very heart of a radio set, and on it depends the whole workings of a set. There are many minerals that may be used for the crystal; but up to the present time, galena is the best that can be obtained. Galena comes in many different grades,, and it is impossible to tell the good from the bad quality. The best way to tell is to buy several large chunks and break them up with a hammer. Experiment with the pieces until a good piece is found. Do not handle the mineral any more than possible as a coating of oil forms on the crystal which will cause insulating qualities. This will cut down the sensitiveness of the crystal and may render it entirely inoperative.

Lighting the Vacuum Tube by Storage Battery

A frequent question is: What is the proper source of supply for lighting vacuum tubes? It is almost needless to say that we advise the use of a good storage battery. The average vacuum tube draws about one ampere per hour with a given voltage of approximately six volts, and with a strain of one ampere on it, dry cells would last only a short time, when they soon would have to be replaced again.

The storage battery on the other hand has a much longer life and when it becomes low can be easily charged up.

It is well to remember that storage batteries are rated by the number of volts they will give and the number of amperes they will deliver. You will find that there are many different kinds of ratings on storage batteries

Tufts College Has First Radio Faculty

(c. Underwood & Underwood.)

The first wireless college in the world! This distinction is claimed by Tufts College, Massachusetts. Thirteen members of the faculty have volunteered to give lectures on their subjects through radio at the American Radio and Research Corporation plant. The lectures will reach as far west as Wisconsin and as far south as Florida. In the photograph (reading from right to left) are Dr. Arthur I. Andrews, who will speak on "Changes In Europe;" Professor Edward H. Rockwell. "The Story of the Bridge Builder:" Dean Gardner C. Anthony, "The Story of Engineering," and Professor Albert H. Gilmer, "The Modern Drama."

(*Continued from preceding page*)

running from twenty ampere hours upward. The desirable thing is to have this rating as high as possible.

The battery will deliver one or more amperes for so many hours, depending, of course, upon the rating of the battery. Hence, the saying "eighty ampere hours," means it will deliver one ampere for eighty hours, or two amperes for forty hours and so on. If more than one vacuum tube is employed, the current drawn could be in proportion to the nmber of vacuum tubes used. As you will never use the battery for the full forty or eighty hours continuously, it will have a tendency to recuperate during the time it is not in use. Of course, it will never come back to full capacity but will rise slightly. Never let the battery get fully discharged or even low, as this is bad for it and in time will ruin it entirely.

More Radio Symbols Shown at a Glance

"Wired Wireless"

Major-General George O. Squier, U. S. A., announces an invention which will make it possible to attach the usual receiving set to an electric-lamp socket, by which the programs sent out from broadcasting stations may be received. This will eliminate the ordinary antenna. General Squiers gave the first demonstration of his new appliance at the Signal Corps headquarters, Washington, D. C., this week. It has already been christened "Wired Wireless." The general simply removed the bulb from the electric light on his desk, and inserting the plug of the receiver, completed the installation. The broadcasting station was connected at another point to the electric-lighting circuit. If this invention does all that is claimed, it will put the aerials in the discard and relieve congestion in the air.

Radio to Catch What Congress Says

By Vincent M. Brennan

U. S. Representative from Michigan

IN introducing the resolution to equip the Capitol with a Radio Telephone, one of the purposes I had in mind was to place this new and most promising method of communication under the actual and close observation of Congress. Already a number of bills have been introduced looking to the development and controll of radio communication. Soon Congress will be asked to set upon the recommendations of the Radio Conference recently in session at the Department of Commerce. Congress, I believe, is alive to the amazing developments of this science within the past few months. But few of the members have had an opportunity of observing at first hand the working of the apparatus or of coming into actual contact with the practical problems of transmission which they will soon be asked to legislate upon. Actual observation of the apparatus in practice and personal use of it will make it possible for Congress to study the problems presented with intelligence and to base its legislation on personal and practical knowledge.

Furthermore, the development of the art today is the result chiefly of the experiments and study of amateurs. The amateurs are entitled to the encouragement and help which will necessarily follow from the official recognition and use of the apparatus by the national legislative body. As the limitations and defects of the present devices are disclosed, Congress will readily appreciate the necessity for adequate appropriations to enable the scientific departments of the government to study and, if possible, to overcome the difficulties presented.

A permanent and beneficial result of this application of the radio will be re-awakening of public interest in the doings of Congress. It is generally conceded that Congress would function better if the public took a keener interest in its proceedings. Few people nowadays have the time or the inclination to wade through the daily issues of the Congressional Record. Many, however, would be glad to keep informed if the activities of Congress could be presented to them in the attractive form of actual reproduction. Again it would encourage the youth of the country to keep in touch with the activities of the government. It is the young people who are making most general use of the radio now. Many of them are already writing to Congress asking for fair legislation upon this subject. I believe that many who now find the study of government uninteresting when confined to the pages of a text book would welcome the opportunity of pursuing the same study first hand from their own receiving instrument and at the same time gain some practical knowledge of forensic debate.

Congressman Brennan, of Michigan, who has introduced a bill to have the Capitol equipped with radio, so that every word our law makers utter may be correctly recorded and sent broadcast to their constituents.

National legislation each year is becoming of more and more importance to the American people. Many business houses find it desirable to be informed the moment an important bill is passed or a vote is taken. The action of Congress, and particularly the time when it is taken, frequently affects investments involving millions. The time when a tariff bill goes into effect is of vital interest to a ship at sea bringing imports to the country. The time when a bill restricting immigration goes into effect is of equal interest to the trans-Atlantic liner carrying immigrants to our shores.

Complaint is frequently made that the Congressional Record does not accurately record the proceedings of Congress. Each member is permitted to correct his remarks and frequently to extend them. If a radio telephone is installed in the legislative halls, constituents will be able to learn accurately what is said by their representatives on the floor.

While it is true that much of the debate upon the floors of Congress is not of great public interest, it is also true that frequently addresses of the greatest national importance are made. Now that the President has resumed the custom of delivering his addresses to Congress in person, it would be possible for the people also to hear these history-making messages. Many of our people would like to have the opportunity of hearing debates on the all important topics of disarmament, taxation, etc. Many of them are now denied this opportunity because of inability personally to visit Washington. The possibilities are almost limitless.

For instance, individual members might find it desirable to install receiving apparatus in their own offices. Visitors to the Congressional galleries often express amazement when they find only thirty or forty out of the four hundred thirty-five members of Congress in attendance on the floor. It is almost invariably true that perhaps three hundred and fifty of the missing four hundred are busily engaged upon official business in their offices or in the departments. The correspondence of Congressmen has been increasing year by year, particularly since the war, and since the public has come to recognize the value of propaganda in urging or opposing legislation. Frequently a member is not able to leave his office during an entire day, being kept busy dictating, receiving constituents, or telephoning departments. At intervals he calls the Capitol and is given a general idea of what is going on but often he misses a debate which he was desirous of hearing or participating in. With a radio receiver in his office he would have the means of keeping in constant touch with the proceedings on the floor. He could at all times be in a position to judge for himself whether the debate of the moment required his presence.

It is even conceivable that, in time, the various Government Departments would install receiving instruments. When a member of Congress would find himself obliged to wait for an hour or more in the outer office of a cabinet member, he could improve his time by "listening in" on the proceedings in the Capitol.

(Continued on next page)

He Pilots Ships Through Fog by Radio

(c. International.)

Commander Reily F. McConnell at his post aboard the U. S. destroyer "Semmes," operating a new and important radio invention—a piloting cable which enables vessels entering New York harbor to proceed up Ambrose Channel to Quarantine through fog of any density, so that no time will be lost. Heretofore trans-Atlantic steamers entering New York have been held up for hours—frequently days—by fog. Today, aided by radio, no time is lost; a distinct advantage to mails and passengers.

Equipping both Senate and House sides of the Capitol with transmitters would further make it possible for Senators to keep in close touch with the doings of the House and members of the lower house with the proceedings of the Senate.

The uses and applications of a Capitol Radio would be equally valuable and varied. It would seem that Congress should lose no time in establishing this most promising innovation.

Here is the complete text of Congressman Brennan's bill:

IN THE HOUSE OF REPRESENTATIVES

FEBRUARY 27, 1922.

MR. BRENNAN introduced the following joint resolution; which was referred to the Committee on the Merchant Marine and Fisheries and ordered to be printed.

JOINT RESOLUTION

Providing for the installation and operation of radio-telephone transmitting apparatus for the purpose of transmitting the proceedings and debates of the Senate and the House of Representatives, and for other purposes.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Navy be, and he hereby is, authorized and directed to have installed, from stock now on hand in the Navy Department or avilable, and to maintain radio-telephone transmitting apparatus in the Capitol Building, Washington, or at the naval radio station, Radio, Virginia, with connection to the Capitol Building, and suitable for transmitting for the greatest practicable distance the proceedings and debates of the Senate and House of Representatives. The Secretary of the Navy is further authorized and directed to furnish sufficient personnel from the Navy Department to operate such apparatus for the purposes herein mentioned.

Sec. 2. That such apparatus, when installed, shall be used to transmit the entire proceedings and debates of the Senate and of the House of Representatives in so far as may be practicable. When the Senate is not in actual session the President of the Senate shall have authority to designate any committee of the Senate to have the use of such apparatus in transmitting its hearings and proceedings, and the Speaker of the House of Representatives shall have corresponding authority with reference to committees of the House of Representatives.

Sec. 3. That such amount as may be necessary for the above purpose is hereby appropriated out of any money in the Treasury not otherwise appropriated.

Receiving Circuits of European Amateurs

The object of this paper is to give a brief summary of just what our European amateur friends are accomplishing in receiving circuits. American fans would do well to study some of these circuits and try them out. Of course, this is preferably for radiophone reception.

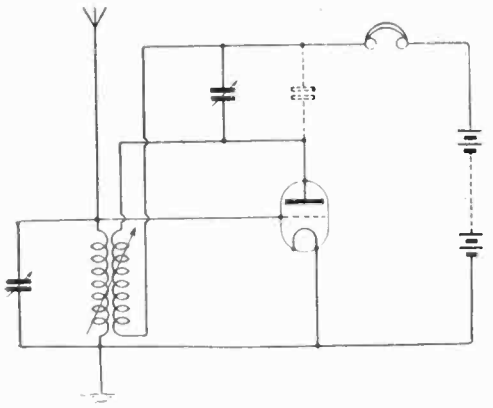


Fig. 1.—A circuit found available for the best all-around results.

The question is often asked: "What is the best circuit for good results, or why is one circuit better than some other particular circuit?" Well, practically any circuit you sit down to draw out may seem advisable, and may work out, that is to say, work within reason and under favorable conditions. But the question is whether it works efficiently. To be more exact, would it work efficiently on the particular wave length you wish to receive on, or for that particular purpose you most desire. Different circuits give different results, so we have for the amateur three circuits sketched herewith.

Fig. 1 is a circuit which was found adaptable to give the best all-around results. It readily oscillates on any wave length between 400 and 20,000 meters, but is simple to adjust and to keep in adjustment. It is equally good for undamped as well as damped waves. Its only disadvantage lies in the fact that it will not readily rectify on short waves.

Fig. 2 shows a much simpler set, using a resistance capacity coupling. This two-audion circuit was found most successful. Values are given as follows: C1 equals .0001 Microfarade, anode resistance 85000 ohms, C2 equals .0004 Microfarads. (preferably variable). and B Battery from 25 to 45 volts. The points of interest in this circuit are that the resistance should be small, have as little capacity to earth and to other instruments as possible. The same remarks apply to C2, since C1, is only necessary for short wave work. This circuit is particularly suitable for telephony reception, as it is quite easy to get just off of the oscillation point, and with tight coupling it readily "howls," which is not conductive to the long life of the tubes, and gives very serious annoyance to your wireless neighbors.

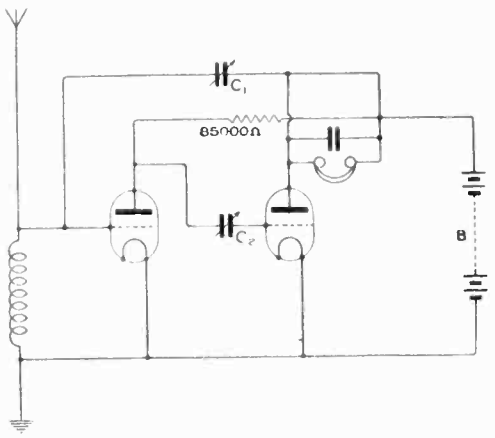


Fig. 2.—A simpler set with a resistance-capacity coupling.

Fig. 3 is a development of Fig. 2, but by experience gives somewhat better results. A critical point will be found just off the tube when it does not oscillate, but with the arrival of a C. W. signal starts it off. A spark signal will not start it oscillating, unless it is good and strong. However, in using this circuit with a two step amplifier and loud speaker, signals are very strong.

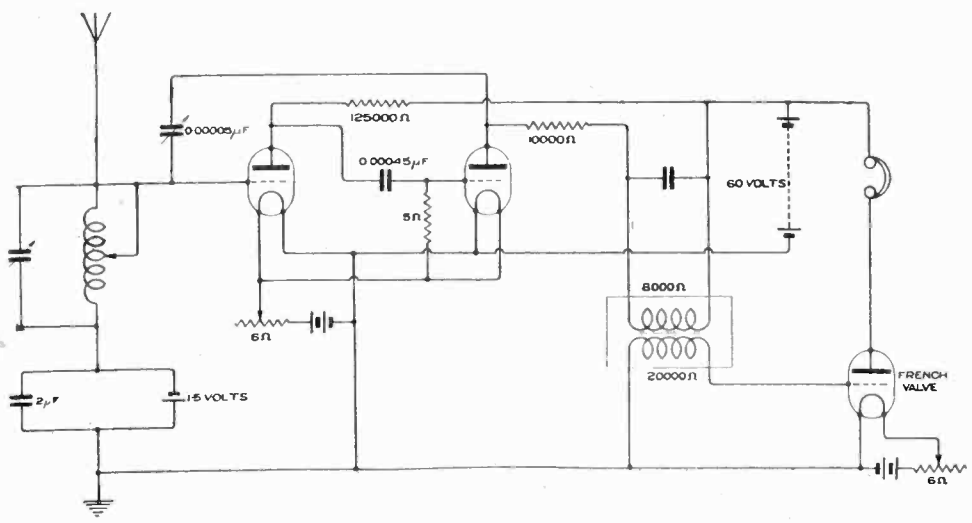


Fig. 3.—A development of Fig. 2, which gives much better results.

High-Grade Apparatus for Amateurs

The various makes of high-grade, reasonably priced, radio apparatus now on the market make it unnecessary for the amateur to construct any of his own instruments, and enable even the inexperienced operator to obtain good results. The requirements in the design and construction of an efficient radiophone receiving set are more rigid than those for a receiver to be used merely for spark reception, on account of the sharp tuning required for telephone signals, as well as the desirability of regeneration. The experienced amateur who so desires, however, may construct some of the apparatus himself, and thus not only effect a saving in cost, but also incorporate in the apparatus his own ideas and preferences. Instructions for the construction of various radio instruments may be found in the various radio books and periodicals.

For those who prefer to assemble their own sets from standard parts, the instructions and diagrams contained in the catalogs of several manufacturers and dealers of radio instruments will prove valuable.

Locating Signals

This is accomplished by careful variation of the tuning while using an excessive value of tickler coupling or plate inductance, i. e., just within the "hissing" region. Continuous wave telegraph signals will now be heard, and phone signals can be recognized by the steady, whistle-like beat note which their carrier wave produces. To "clear up" the voice or music, the tuning should be maintained to give the beat note of lowest pitch, while the regeneration is gradually decreased until the beat note just fades out, and the radiophone signals alone remain. Distortion or whistling at this point is usually eliminated by a very careful further reduction in regeneraation, with a slight readjustment of the tuning circuit for maximum signal intensity. The tuning of distant radio telephone signals is critical, and will be learned by the beginner only after some practice.

Licensed Broadcasting Stations

RADIO WORLD has secured a list of all stations throughout the country licensed by the United States Government to broadcast music, news, market reports and all other matter. All of these stations operate on either a 360-meter wave or a 485-meter wave. In order to tune into any of these stations, only slight variations are necessary.

Atlantic

Call Letters	Station	State	Operated by
WJZ	Newark	N. J.	Westinghuose Co.
WNO	Jersey City	N. J.	Wireless Telephone Co.
WOR	Newark,	N. J.	L. Bamberger & Co.
WJX	New York	N. Y.	De Forest Radio Co.
WDT	New York	N. Y.	Ship Owners Radio Service
WVP	Fort Wood	N. Y.	U. S. (Amateur Radio Reserve)
WCJ	New Haven	Conn.	A. C. Gilbert Co.
WBZ	Springfield	Mass.	Westinghouse Co.
WGI	Medford Hillside	Mass.	American Radio Research Co.
WDN	Washington	D. C.	Church of the Covenant
WDW	Washington	D. C.	Radio Construction Co.
WJH	Washington	D. C.	White & Boyer Co.
NOF	Washington	D.C.	U. S. Public Health Service
WRW	Tarrytown	N. Y.	Tarrytown Radio Research Laboratory
4CD	Atlanta	Ga.	Carter Electric Co.

Middle West

KDKA	Pittsburgh	Pa.	Westnnghouse Co.
WPB	Pittsburgh	Pa.	Newspaper Printing Co.
WLK	Indianapolis	Ind.	Hamilton Manufacturing Co.
WDZ	Toledo	Ohio	Marshall Gerken Co.
WMH	Cincinnati	Ohio	Precision Equipment Co.
WBL	Detroit	Mich.	Detroit News
KYW	Chicago	Il..	Westinghouse Co.
WHA	Madison	Wis.	University of Wisconsin
WOU	Omaha	Neb.	R. B. Howell
WLB	Minneapolis	Minn.	University of Minnesota
9ZAB	Kansas City	Mo.	Western Radio Co.
9YY	Lincoln	Neb.	State University

Pacific

9ZAF	Denver	Col.	Reynolds Radio Co.
KLB	Los Altos	Calif.	Colin B. Kennedy Co.
KLB.	Pasadena	Calif.	J. J. Dunn & Co.
KQL	Los Angeles	Calif.	Arno A. Kinge
KZC	Los Angeles	Calif.	Leo J. Meyberg Co.
KZC	Los Angeles	Calif.	Western Radio Electric Co.
KGC	Hollywood	Calif.	Electric Lighting Co.
KZM	Oakland	Calif.	Preston D. Allen
KZY	Oakland	Calif.	Atlantic & Pacific Radio Sup.
KVQ	Sacramento	Calif.	J. C. Hobrecht
KDN	San Francisco	Calif.	Leo J. Meyberg Co.
KGB	San Francisco	Calif.	Edwin L. Lorden
KYY	San Francisco	Calif.	Radio Telephone Shop
KQW	San Jose	Calif.	Charles D. Herrold
KJQ	Stockton	Calif.	C. O. Gould
KWG	Stockton	Calif.	Portable Wireless Tel. Co.
KJJ	Sunnyvale	Calif.	The Radio Shop
KFC	Seattle	Wash.	Northern Radio Electric Co.

Gulf

WRR	Dallas	Tex.	Police Department
5ZU	Austin	Tex.	State University

The First Broadcaster

RADIO telephone broadcasting station KDKA of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pennsylvania, occupies the unique position of being the first broadcasting station in the world operated entirely for the transmitting of radio concerts and features for the public. This station, which started December 23, 1920 to broadcast regularly, during its term of operation, has created a speaking acquaintance, literally, with more people than any other radio station. Practically none of its friends had a radio receiver in their homes until 1921.

Since its creation, the radio telephone has grown from the baby of the amateur to a giant entering thousands of homes. When Westinghouse started broadcasting from East Pittsburgh, its concerts were heard by a comparatively small circle, th ereason being that only a few amateurs had receiving stations, the greater number being boys without a sending license. A few antennas had been strung on roof tops by boys interested in radio.

To-day any traveler looking out of his car window as he enters the Pittsburgh district can see the progress of radio. There is hardly a housetop in the suburban districts that does not have its antenna on the roof. Even in the downtown section the familiar wires may be seen.

When KDKA was started, a few letters were received daily telling of the concerts. The volume of letters gradually grew larger until, one day in January of this year, some 1,600 letters were received. These letters were from points all over the United States, Canada, and even Cuba.

KDKA, being the pioneer station of its kind, had to experiment quite a bit at first. For some time, phonograph records were used exclusively for music. There was also an announcer who spoke into the transmitter, telling of local news and weather reports. This lasted for a month when it was decided that real singers should be substituted. The radio division had to offer original entertainment after the amateur's first flush of rapture had worn off, to hold him.

KDKA was the first station in the world to broadcast church services. It was also the first to broadcast the speeches of public men, sporting events, and grand opera.

Useful Tables

To find the natural period of any wave length, in meters, of an aerial the following formalae may be applied:

$$W = \frac{Lx4.2}{3}$$

WL=Wave length in meters or natural period of an antenna.

L=Length of aerial wire, plus lead in wire and ground wire, in feet.

The following formulae may be used in finding the capacity of a condenser:

$$C = \frac{AxK}{4x3.1416xTx900{,}000.}$$

C=Capacity in microfarads.

A=Area in square centimeters of surface of plates.

K=Dielectric constant or specific inductive capacity of the dielectric used.

T=Thickness of dielectric used between plates.

From Nebraska

Editor Radio World,

Dear Sir:

Our daily schedule for broadcasting is at 10:10 a. m. The report consists of line stock and grain markets and a weather forecast.

Our musical programs have been irregular and so we do not publish a program.

Yours truly,

(Signed) H. V. Hein

For the University of Nebraska

Wireless Telephone to Link Hotel Chain

(c. International.)

Here is the station on the roof of the new Ritz-Carlton Hotel, Atlantic City, New Jersey, where a radio telephone has been installed which will make it comparatively easy for the guests of this hostelry to talk with the guests of any other Ritz-Carlton hotel in the world. This photograph shows the interior of the station and the operator awaiting a message.

Do You Know Your Receiving Equipment?

What Each Part Stands for—and Why

By James D. Gordon

The Antenna

Many types of antenna are in general use. The particular type of antenna used, and its exact location, will in general be determined by the local conditions, such as dimensions of the property, location of convenient high supports, avoidance of interfering trees, etc. Where an equal choice between several antenna locations exists, and it is desired to make use of the slight directional characteristics of the average inverted "L" type of antenna, the free end of the antenna should point away from the station which is to be received most efficiently.

A good form of receiving antenna for general radiophone reception consists of a single wire, 100 to 250 feet long, and 30 feet or more above the ground. The antenna should be as far as possible from all surrounding objects, and not run parallel to nearby electric wires. In general, the more free the antenna is, i. e., the higher it is above surrounding objects, the better it will receive. Great height, however, is not essential, and satisfactory reception has been accomplished even on wires strung inside the attic of small dwellings. Where it is preferred to make the antenna less than 100 feet in length, it should consist of two or more parallel wires, held apart by wooden spreader at each end. The usual conductor for an antenna consists of 7 strand No. 22 hard drawn copper wire, or of No. 14 bare hard drawn copper. Where a great safety factor of strength is desirable, as in commercial installations, or where a long span is used, or the antenna crosses power lines, it is better to employ 7 strand No. 22 or No. 18 Phosphor Bronze or Silicon Bronze wire.

Each end of the antenna should be insulated from its support by means of an insulator of electrose, porcelain, glass, or other material. Small insulators, having a creepage path of several inches, will suffice for receiving purposes. The insulator is preferably attached to its support by means of a few feet of rope or sash cord; if a wire is used, a second small insulator is best inserted near the other end of this wire, so as to separate effectively the antenna from the grounded portion of the wire.

A pulley at one or both ends of the antenna will be found convenient for raising or lowering this part of the equipment when desired.

In the case of the single-wire antenna, one end of the antenna is usually continued straight down from the insulator to form the "Lead-in," which connects the antenna with the instruments. Where a multiple-wire antenna is employed, a separate lead-in wire should be attached at, or near, the end of each antenna wire. These lead-in wires may be bunched together a short way down from the antenna, or may all remain separate until they reach the point where they enter the building.

All electrical connections in the antenna, as well as in the ground system, should be soldered to avoid poor contacts due to corrosion.

The lead-in is led into the building through a lead-in bushing or insulator. This may consist of a special electrose insulator, or of an ordinary porcelain tube, as used in house wiring. Inside the house, the wiring should be as short and direct as possible, and not near other wires, piping, girders, etc. To avoid electrical losses, it is best to locate the appara-

tus within a few feet of where the lead-in enters the house.

Where conditions prevent the erection of an outdoor type antenna, good results are often achieved with antenna wires strung inside the building, preferably in the attic. Where a long span is not available, an increased number of wires should be used (six, eight, or more). These wires should be kept away from and not run parallel to nearby electric light wiring, piping, or other grounded metallic objects. In the case of indoor antenna dry wood will generally give sufficient insulation.

In some cases, where the installation is of a temporary nature, it is even found possible to use the eavesthrough or gutter-pipe for the reception of signals.

Indoor coils or loop-antennae are generally not found practicable unless used with many stages of amplification.

Ground Connection

A sufficient ground connection is generally afforded by the water supply system. Where a steam or hot water pipe is more convenient, it may be found to give satisfactory results.

The wiring from the tuner to the ground connection should be no longer than necessary. For short leads the wire should not be smaller than No. 18; a larger size wire is preferable, especially for connections exceeding a few yards in length.

To insure good electrical contact with the ground system, both the pipe and the wire connecting to it should be well scraped, and the connection preferably soldered.

The Tuner

The function of the TUNER is to permit the signals from the desired station to be received to the best advantage, i. e., to be "tuned in," while all other signals are kept out in so far as possible. The electric impulses received are then converted into currents suitable to actuate the diaphragms of the head receivers, by means of the DETECTOR. If desired, increased signal intensity is obtained by insertion of an AMPLIFIER between the detector and the 'phones.

The Detector

Until recently, the crystal or mineral detector was in quite general use in radio reception. This simple type of detector consists of a metallic contact ("point" or "catwhisker"), resting lightly upon a small piece of galena (lead ore), silicon, or carborundum. When this type of detector is employed, a test buzzer circuit with dry cell is essential to show when the detector contact is in the proper sensitive adjustment.

Where the facilities permit, more

Smallest Radio Outfit Known

(c. Underwood & Underwood.)

A youthful genius, Kenneth R. Hinman, twelve years old, has invented a wireless apparatus that fits neatly into a safety match box. With this instrument, and pair of ordinary receivers, the juvenile inventor is able to catch not only telegraph signals but the regular broadcasting programs from stations twenty and thirty miles distant. This shows Kenneth Hinman and Mayor Charles E. Loizeau, of Plainfield, New Jersey.

sensitive detectors of the electron tube type now employed. ("Vacuum tube" or "Audion" detectors.) This type of detector consists of an incandescent electric bulb, which requires a source of filament current, called the "A" battery, usually a six volt storage battery. A "B" battery is also required to furnish the plate potential; this usually consists of a number of small dry cells, assembled in a unit. Either a gas-content tube ("soft" tube), or a highly evacuated tube ("hard" tube), may be used for detection purposes. The gas-content detector tubes are generally more sensitive, but require delicate adjustment of plate battery voltage and filament current for proper operation, while the less sensitive "hard" tubes are non-critical in their adjustments, and, therefore, are preferred by many operators.

While storage batteries have been found to be the most satisfactory source for lighting the filaments of the common electron receiving tubes, they necessarily require charging facilities. Most electron tubes used for reception require a filament current of approximately one ampere; hence a six volt, 60 ampere-hour storage battery, for example, supplying filament current for a detector and two-stage amplifier, would require a complete charge after every twenty hours of operation, or oftener.

For intermittent operation of electron tube detectors, large size (No. 6) dry cells have been employed. It is very desirable, however, in such cases to employ two or three sections in parallel for each bulb used, each section in turn consisting of four cells connected in series. Thus the operation of a single-tube receiver would take eight or twelve dry cells, preferably of a type designed especially for lighting service.

The Westinghouse Co. has recently placed on the market a simple, portable receiving set which utilizes a small detector tube of special design, the filament of which is supplied from a self-contained dry battery.

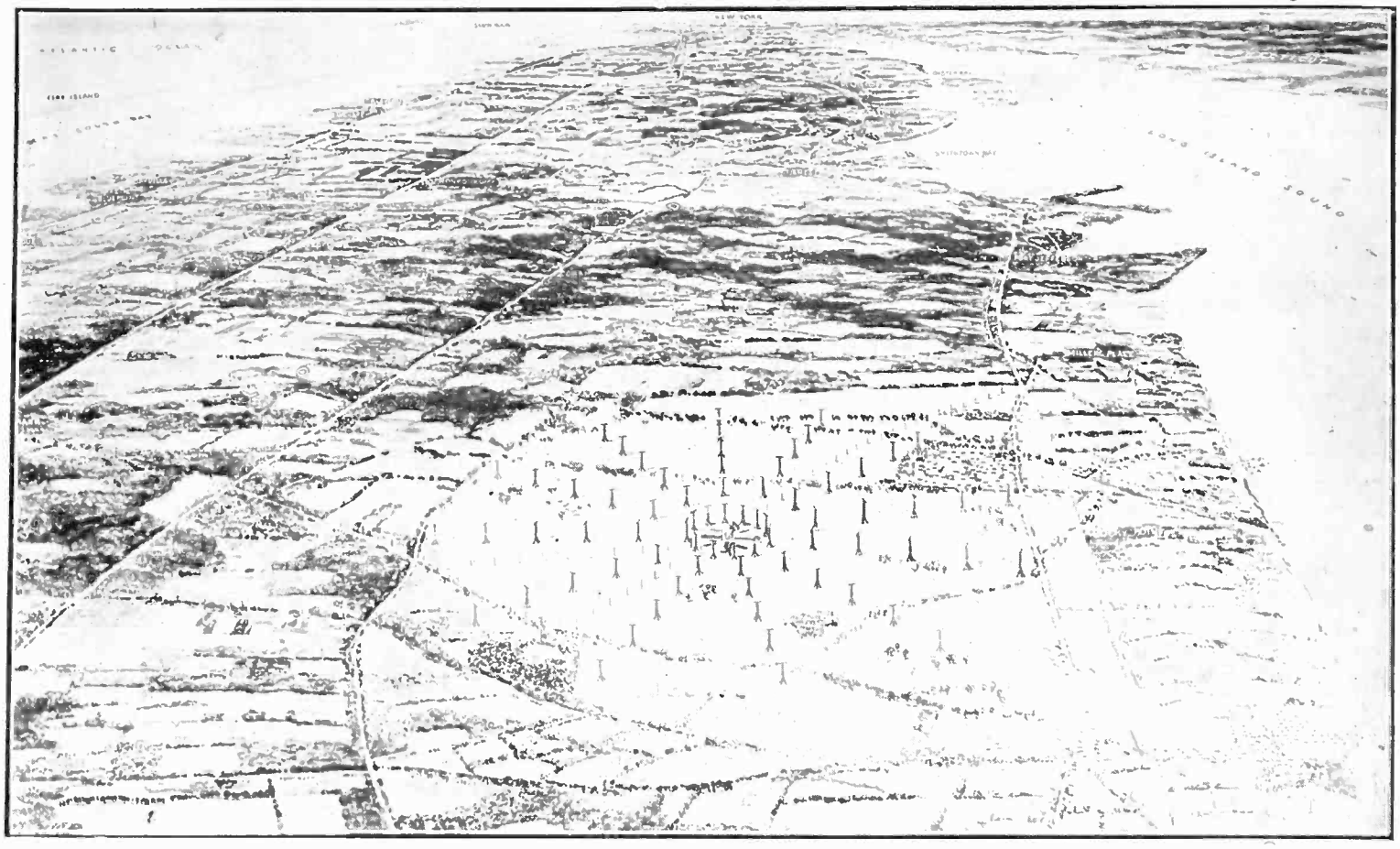
Where the utmost sensitivity is desired, it has been found possible to amplify the received impulses BEFORE they reach the detector, by means of special RADIO AMPLIFIERS. The use of radio frequency amplifiers for short wave reception is still in the development stage, however, and cannot at the present time be recommended to beginners.

The tuner and the detector, combined, are generally spoken of as the receiver, although sometimes this term is used to include the amplifier also, and again is sometimes used to denote the tuner only.

The tuner contains one or more electric circuits which are adjusted to respond to oscillations of the desired wave length only. The simplest form

(Continued on next page)

Hub of World-Wide Communicatoin



(c. Underwood & Underwood.)

The first unit of the largest radio station in the world is well under way at Port Jefferson, Long Island, New York, the plant of the Radio Corporation of America, will be ready for operation about the first week in September. Twelve steel towers, each 400 feet high, comprise the first unit of the station which will have the appearance of a giant wheel when completed. The circumference formed by the twelve towers towers will be about three miles. This new station, it is now declared, will be the future hub of International radio communication. It will be equipped with the Alexanderson high-frequency alternators, the machines which have made wireless across the oceans possible. Port Jefferson was selected for the station because its situation, near Oyster Bay, is particularly attractive. It is close to Long Island Sound on a high stretch of unobstructed ground-level and open. No other spot on the Atlantic Coast affords so perfect a position. It is a busy bustling place; skilled workmen toiling throughout the bright spring days to get the big station in working condition. Here messages will come from the faraway plateaus of the Andes, from the sunny isles of Hawaii, from the busy marts of Europe. The radio enthusiasts who have played, eaten, and talked radio for the past fifteen years—men, not so long ago boys, who have seen Marconi's crude 10-inch spark coil and the unreliable coherer grow into the highly effective present-day vacuum tube, transmitter and receiver, point with the keenest pride to the gigantic creation now under way at Port Jefferson.

(*Continued from preceding page*)

of tuner consists of a cylindrical coil of wire, with one or more sliding contacts.

There are two general classes of tuners in use, the single-circuit and the multi-circuit tuners. The single-circuit tuners are the more easily operated, and generally less expensive. The multi-circuit tuners are preferred by many experienced operators, since they give increased selectivity (freedom from interference), but their operation considerably more skill and experience. So-called REGENERATIVE TUNERS, of either the single-circuit or the multi-circuit type, have an additional feed-back adjustment, for use in connection with electron tube detectors.

Head Receivers

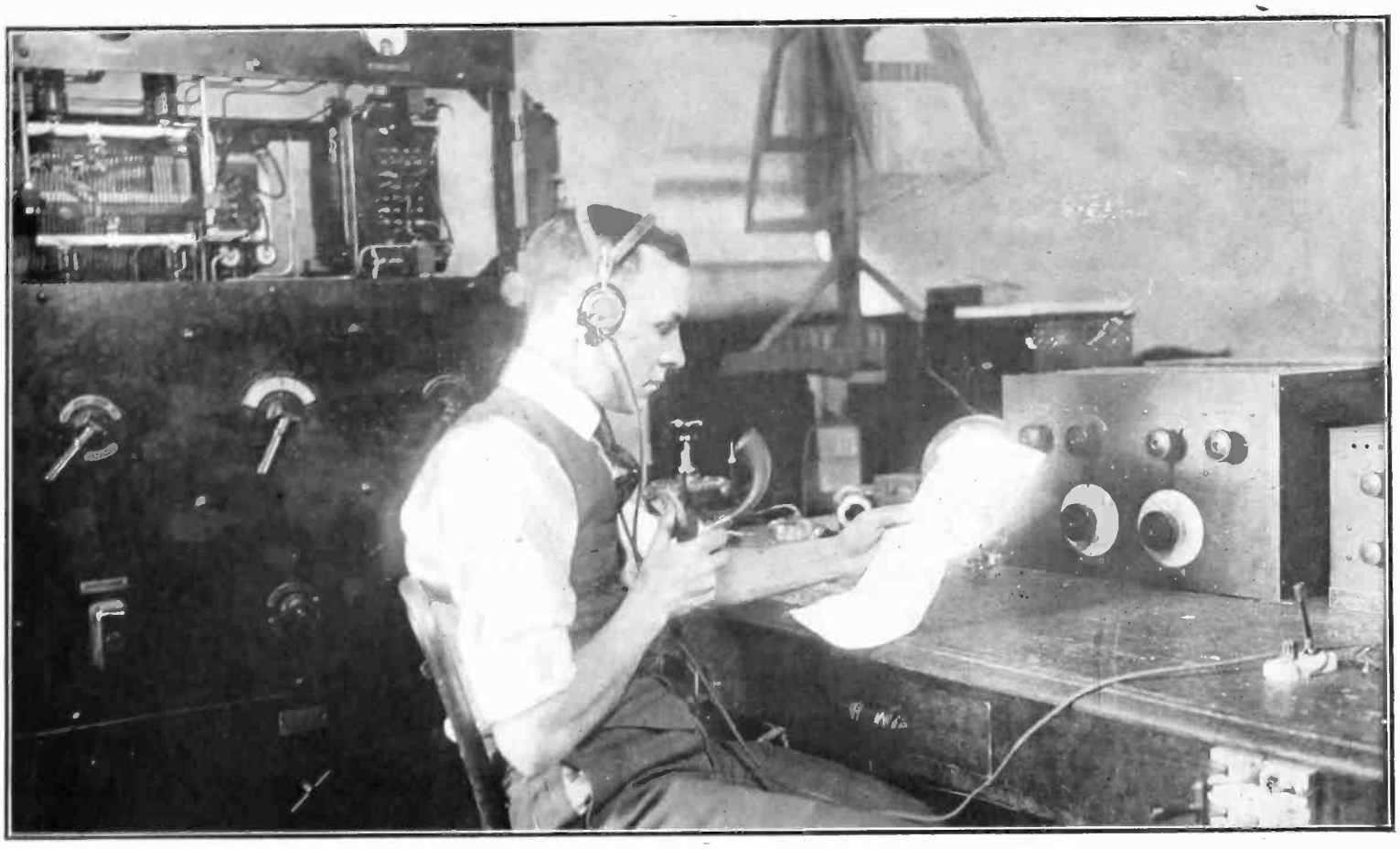
Telephone receivers used for receiving radiotelephone messages are essentially the same as the standard telephone receiver with which everyone is familiar, the distinctive features being their form and construction. They are usually constructed in the watch case form and attached to bands which pass over the head. From this comes the name—head receivers. In construction the parts are lighter and many more turns of wire are wound around the magnetic poles. The lightness of the moving parts enables them to follow and respond to rapid pulsations of current. The large number of turns of wire causes a relatively large magnetic field to be produced by a feeble current. The combined effect gives a very sensitive receiving device. Inasmuch as the size of wire used is always about the same, the number of turns is usually designated indirectly by stating the coils. Comparatively high resistance number of ohms resistance of the is desirable and receivers of fair sensitiveness have 1,000 ohms in each receiver while the better ones usually have 1,500 to 2,000 ohms per receiver. The two receivers are usually connected in series.

Amplifiers

The strength of the signals received and hence the range to which the receiving set will pick up signals, may be further increased by the use of one or more stages of amplification, each of which requires an additional electron tube circuit. The amplifier tube filaments may be operated from the same "A" battery as is the detector tube filament. Likewise, a common "B" battery may be employed for detector and amplifiers if proper connections are made.

Generally, not more than two stages of audio frequency amplification are employed, except where exceptional signal intensity is required, as for operation of large loud "speakers."

Fans! Get Acquainted With This Man



(c. Underwood & Underwood.)

Here is one of the most important men in the radio service. He is T. C. Gale, and he is shown here in his corner in the Post Office Department, Washington, D. C., broadcasting weather and crop reports. The messages he sends out are entrusted to him for exact delivery by the most important departments of the government. It is up to him not to make a mistake. Mr. Gale talks to one of the largest audiences in the world.

Why a Crystal is Called a Rectifier

How It Acts To Make Undamped Radio Currents Audible

By Walter Emmett

The crystal cuts out every alternate half vibration and enables the telephone to respond to even the radio freqency for 200 meters. This is 1,500,000 cycles or double vibrations per second. The other extreme in radio frequency is found at the present time in Lafayette (Ly) at Bordeaux France which send out a wave which has only 13,630 double vibrations per second. There are many persons who can hear acoustic vibrations of this frequency and for them this 22,100 meter wave could be amplified at the receiver and put into specially designed phones with a very small thin diaphragm and received *directly without any crystal or other "rectifier" such as the audion being used at all!*

It is thus evident that we generally need two things to happen to the radio frequency currents before they get to the phones.

1st.—They must be allowed to move the diaphragm of the telephone.

2nd.—They must move it at audible frequencies—below, say 4,000 cycles per second which is the top note on a piano.

The passage of a very small current of 4,000 cycles or less will vibrate the telephone diaphragm. The passage of a current of 20,000 cycles will scarcely affect it since the telephone windings offer a great impedance to such currents, the more rapidly they change their direction. When we come to 750,000 cycles, approximately, as found in broadcasting waves. The telephone would give no sign at all; the diaphragm can not follow the current in the phones fast enough as its natural period is only about 900 cycles per second, and the current is cut down.

The crystal causes all currents in the phones to *pulsate in one direction only* giving a practically steady *pull* in one direction to the telephone diaphragm. If this pull is interrupted by the cutting off of the sending wave, by the form or telegraphic dots and dashes we have a corresponding series of clicks on the phone, but this would not be satisfactory.

The transmitting telegraph current or received current must be interrupted at regular repeated intervals—or cyclically as it is termed—at a high enough rate to give an audible singing vibration to the phone diaphragm. This can be done by a chopper at the sending end giving 1,000 interruptions per second or a chopper called a "ticker" at the receiving end.

Difference of Location

Geological conditions and other factors not hitherto explained appear to have some influence on radio signals. Some locations appear to give better results for radio transmission and reception than others, without any obvious reason.

Radio and the Woman

(c. International.)

Miss Rosalind Kendall, of New York, in the midst of a chess game with her chum, Miss Beth Weber of Chicago.

A WOMAN friend remarked to me the other day that she expected to enjoy her vacation this year, because, instead of having to spend her evenings on some hotel piazza listening to a rehashed phonograph record or thumping on the piano, she can select, as her stopping-place, a hotel in which a radiophone has been installed and in this way get new stuff she wants to hear, and get it "right off the griddle," as she expressed it.

* * *

It must have proved to be an interesting event, that which took place at a noted physician's home on West Eighty-fifth Street, where, by means of radio telephone service, his friends gathered round and listened in on Dr. Stires's vesper service which was broadcast from the Westinghouse station. Some idea of a quiet hour, eh?

* * *

I passed a friend in the street. There was a dewy look about her eyes, and when I spoke she drew me aside a bit while she explained that she'd just received a letter from an invalid soldier, who, obliged to lie flat on his back and with only the use of head and hands left him, had been presented with a radiophone which someone had installed for him and which had brought him into touch with the world again. He'd felt he'd been away a long time, you see; he'd written that it was good to be back.

* * *

She's a very famous person; you'd recognize her name in an instant if I mentioned it. I met her on the street quite by accident. She looks about seventeen, though her age is nearly twice that. A beautiful, elflike child held her hand.

We discussed the usual conventionalities until she asked if I'd heard how the child's life had been saved last year. I hadn't, so she told me about it. She was scheduled to sing one night at a broadcasting station in a distant city, and, quite unknown to her, the little girl had been taken suddenly ill. The mother had been travelling alone and none of the relatives at home knew just where to reach her. Fortunately, just an hour or so before the crisis was expected, a letter came from her in which she mentioned the fact that she was singing that night and which instructed her folks how to get "in touch" so "baby can hear."

It happened to be the very thing that was needed. The child had been fretting for her dreadfully. When she heard her mother's voice over the radiophone and caught the familiar little love words—the fever quickly abated.

As my friend finished talking, the child laughed and looked up. Our glances met and said: "It's a blessed, lifegiving thing, isn't it!"

* * *

When I paused near the glove counter in the big department store, it never occurred to me that I was "listening in."

The attractive blonde girl there, was saying to the little dark-eyed one:

"'An if you'll go with us you'll get a swell automobile ride, and maybe a dance."

"Dark-eyes" answered negatively:

"Aw—who wants to dance when they've been on their feet all day. Come on and go home with me. We've got something at my boarding house that throws those joints in the shade!"

The blonde lady smiled disdainfully.

"My God! The front parlor of a boarding-house!"

"Dark-eyes" took note of her.

"Yer don't know what yer missin'" she said haughtily. "We've got a radiophone."

That was all I caught. A third saleswoman came up and spoke to me and helped me select some gloves. As

(c. International.)

The Chicago Board of Education, realizing that the commercial future of wireless is of such importance that it should become as much a part of the coming generation as any other accepted high school course, has inaugurated a department of radio. The photograph shows Miss Elizabeth A. Bergner, radio instructor at the Lane Technical High School, Chicago.

she went away to wrap them, I noticed the other two had their heads together. I had moved away but their voices floated across:

"And what time does it begin?" the blonde one asked.

"Six-thirty."

They looked at each other. The blonde girl shrugged.

"Gee! Those guys'll be sore," she said, "but me fer the boardin'-house!"

* * *

Miss Gladys Meyers, of Elizabeth, New Jersey, derives considerable pleasure from a radio ring. The ring, when attached to an ordinary parasol, as shown in the photograph reproduced on this page, with a wire dropping to earth to act as a ground, anything else in the form of wireless will receive messages, concerts, or conversation that happens to be in the air. The ring measures one inch in diameter, five-eighths of an inch in width, and seven-sixteenths in thickness. It is said to be the smallest radio-set in existence, and was made by Alfred G. Rinehart, nineteen years old, of Elizabeth.

* * *

If you have been playing your favorite game—be it chess or pinochle—with one person, continuously, it is something of a shock to be separated from that person and the game rudely broken up. Miss Beth Weber and Miss Rosalind Kendall of Chicago, were chess enthusiasts. Miss Kendall moved to New York, and the chess games were interrupted until she came across a big idea. She told her chum all about it and their radio chess-games began to be a regular weekly event. In the illustration on the opposite page, Miss Kendall is calling off her move and awaiting Miss Weber's response from Chicago.

* * *

That very sensible adage, "An ounce of prevention is worth a pound of cure" is being forcibly recalled in the five-minute health talks which the division of public-health education of the State Department of Health is broadcasting from WGY, the General Electric Company's station at Schenectady. What a boon to physician-fearing folks these talks will be!

* * *

I was an invited guest at a dinner party at the home of a friend. "Come early enough to watch the children as they listen to their bedtime stories," she had said. I marveled at the devoted mother who, while supervising a sumptious dinner, would not, for that one evening, at least, omit the usual 'kiddie story;' but when I arrived and saw the three pairs of shining eyes that were turned attentively to the loud-speaker horn connected with the wireless instrument just beneath the window, I understood how it was possible, and I'm sure, I enjoyed Mr. Cory's "Little Jack Rabbit in the Briar Patch" and "Uncle Lucky's Left Hind Foot" just as much as those blessed babies did.

(c. Underwood & Underwood.)

Miss Gladys Myers, Elizabeth, New Jersey, with the latest radio-receiving contrivance—a ring and a parasol.

** * *

Are the rhinestone pins, shaped and fashioned in the form of a brilliant flash, which we women are wearing in our headgear, forerunners of radio designs to come? It will be interesting to note the effect of wireless on the world's famous costumers.

* * *

Methinks that the great American novel which has been promised us for so long a time, has been awaiting just such a theme as radio. In the hands of an inspired author, think what a story could be written around the derelict who, unconsciously influenced by soul-stirring radio voices, has regained a grip on his better self. And what a play a really great producer could make of this!

* * *

There is a certain woman I know, who is blind. Naturally, because of this great affliction, she has been forced to miss much that is worth while in life. Can't you imagine what a recently installed radiophone is going to mean to her!

* * *

One of the best things I have listened in on recently, was the program of Old English, French, Italian, and operatic arias sung by Luelia Melius, coloratura soprano. This singer's voice seems particularly suited to the radiophone.

* * *

You folks who possess old phonograph horns had better dispose of them before certain enterprising radiophone manufacturers begin making improved ones. R. R. G.

Is Radiotelephony Dependable?

It Will Be—After a Number of Little Kinks Described Here Have Been Straightened Out

By O. C. ROOS (Fellow I. R. E.)

SUCH might be the fatal question asked of many a wireless Odipus by the financial Sphinx who determines the amount of Radio expenditures. A false answer means toying with ineffective remembrances instead of building new technical opportunities. A plan of experimental development must not ignore the interest limitations in a even one's own pet piece of apparatus.

The student who telegraphs with undamped waves for 150 miles in daylight finds that he usually is not getting more than 50 miles when he telephones. He measures his highest antenna voltage and finds it is the same in both cases, but his antenna current has a lower average value. Hence he must expect a lower range.

The story, however, does not end here, it merely commences with the fact that to telephone even with the most efficient system, we are compelled to waste energy in the voice modulator which must be used. Without it no speech can be transmitted but merely interruptions in a broad sense.

Hence with the same or greater energy input the radio telephone is apparently doomed to a relatively smaller range, other things being equal, than the radiotelegraph.

There is another "fly-in-the-ointment" which is going to call for patience and adaptability on the part of radiotel phone "fans" this summer. None other than our mutual friend "old man static"—"Q. R. N."—for short.

There are numerous hook-ups for slightly reducing Q. R. N. by the use of undamped waves with a single frequency or electrical "tone" for signalizing, but radiotelephoning consists of a whole "band" of undamped waves or "tones" and all of these must be "tuned in" *at once*. They must also be tuned in so that the sound will not be distorted, just as a horn or telephone exaggerates certain tones unless these tones are weakened to offset this fact.

There is no such bother in radiotelegraph work with C. W. (continuous waves).

These waves issue from the radiotelegraph transmitter in just one single steady tone which is usually too high for most human ears to hear.

When this single tone from the C. W., radiotelegraph transmitter is broken up by a chopper we get 1,000 or so interruptions per second, and this sound can be tuned in while static is eagerly squeezed out of the receiving apparatus to a large extent by mechanical, electrical or acoustical treatment. There are several promising apparatus now being tested along these lines, but they are not so good for the radiotelephone.

In the radiotelephone problem there are now two ways out:

First—use short waves. This leads to less static interference and allows smaller aerials. A 2 ft. coil aerial used on 75 to 200 meters will about absorb merely a small fraction of the Q. R. N. gobbled up by a 20 ft. loop used to receive 24,000 meter waves. Continuous wave telegraphy at 75 meters with .1 watt up to 16 volts overland using loop transmitters was tested during the war successfully. This is a fine record and really showed to those "in the know" that the amateur had obtained a much more favorable "deal" than his critics in the pre-war period gave him credit for—when he complained about his "little 200 meters."

Second—use loop aerials, guarded by static-absorbing conductors and detuned so as to respond best at (say) two-thirds of the carrier-wave frequency, as the transmitter wave is called in radiotelephony. The signal will be weakened but radiofrequency amplification or several stages will bring it back to a practical intensity.

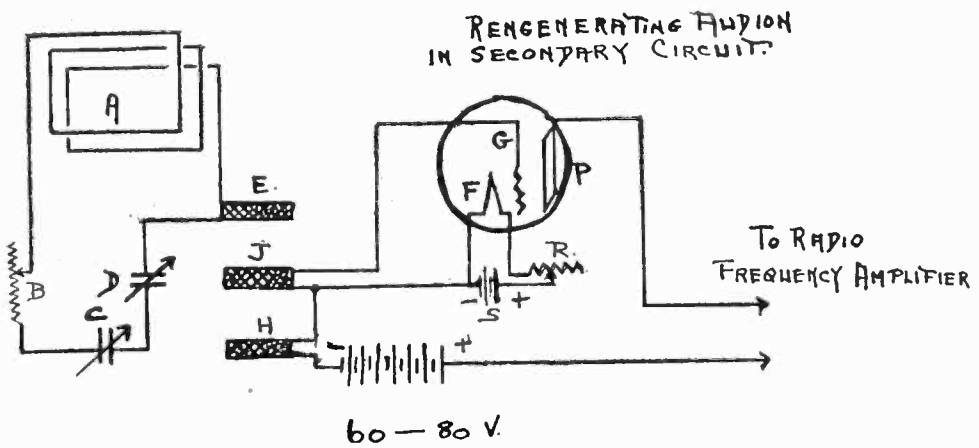
These methods do not include special arrangements where newly developed properties of circuits, based on the elimination of resistance; stationary waves or directional methods are used.

Any amateur can try out the following idea which is based on work actually accomplished by the use of regenerative circuits powerful enough to oscillate through several thousand ohms. A circuit which can do this has an effective negative resistance and if used just at the point of filament current increase or plate voltage increase at which a spark signal "mushes" it will be regenerating.

Take a fine wire loop to reduce loop-capacity with a fundamental of about 240 meters. Insert 5,000 to 50,000 ohms in it or else make it up with resistance wire. This is to make it the worst oscillator possible where static strikes it and its series tuning condenser. For coupling purposes insert a series circuit tuned to the rest of the primary circuit; this will not alter the previous "tune." It should be noted that the carrier or broadcasting wave is 360 meters and the natural "wave" of the loop itself with any external condenser is roughly 240 meters. There are other possible arrangements but this is convenient.

Now the question comes up—can we make this "wave-killing" circuit—which is sure death to most oscillations excited therein by "static", neighboring sparks, etc.—a good humble servant for some particular frequency? We can! Pupin & Armstrong have invented a system for suppressing this resistance at certain frequencies!

By regenerating in a second inductively coupled circuit at the signal or



The small loop (A) and honeycomb coils (E. J. H.,) which enable the regenerative circuit in a radiotelephone to be as powerful as desired.

Mounting Crystals in Your Detector

By E. L. Bragdon

NOT everyone will find it convenient to buy a piece of galena or silicon snugly bedded in solder in a little brass cup. Many will secure the crystal and mount it themselves. In doing so there are several points worth considering, otherwise the sensitiveness of the crystal will be seriously impaired.

In the first place, a steel or iron cup should not be used for the holder. Iron because of its effect on electric circuits carrying current should never be used unless the design calls for it, such as in the cores of amplifying transformers and the diaphragm of head phones. Either brass or copper should be substituted.

There are several possible sources of crystal cups. The end connectors on cartridge fuses; the brass cap on the carbon electrode of certain makes of dry cells; or ferrules from old canes; any of these may be used provided they are of brass or copper.

After the holder has been secured, and before the crystal is soldered permanently in place, the galena or silicon should be tested for sensitiveness. It would never do to solder the crystal in place only to find that the sensitive spots were on the sides hidden beneath the solder. To test crystals, it will be necessary to rig up a miniature transmitting station—one with a range of about ten feet. This is constructed by taking a dry battery, a door bell and a few feet of bell wire. It is assumed that the beginner has made or bought his tuning coil and phones and that they are connected in the right manner. Hook the battery to the bell in the usual way, leaving one of the wires disconnected at the bell for making-and-breaking the circuit tests.

Finally, connect one end of the bell wire to the buzzer point of the bell, and lead the other end to the tuning coil. Wind it five or six times around the tuner, but leave the end free: that is, do not connect it to any part of the tuning coil. If the set is now correctly connected and the detector is sensitive, a buzz will be heard in the phones when the bell is made to ring. Although there is no direct connection between buzzer and coil, there is an inductive connection and this creates the minute waves that produce sounds in the receivers.

Everything is ready for the crystal tests. Take some shreds of tin-foil. Place the crystal in the cup and pack

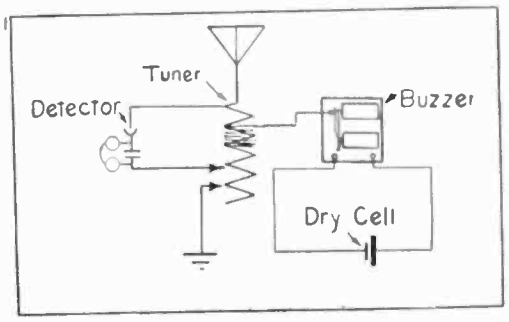


Diagram of simple method used in the selection of detector crystals. The same hook-up can be employed to assist in the adjustment of the set

the tin-foil around it. Place the "cat-whisker" on one spot after another and test with the buzzer. If the sound in the receivers is really loud, the spot is a good one. Try this same method on all sides of the crystal and find the side with the greatest number of responsive spots. This is the side that should be mounted "up" in the holder.

Crystals can be mounted in tin-foil, packed closely on all sides; but the best way is to use one of the low-melting alloys which can be purchased from a radio-supply store or mixed by the amateur himself. If the soldering alloy is bought, the beginner should be certain that it is either "Wood's metal" or "Rose's metal". Both of these alloys can be melted with an ordinary match. The familiar solder of the plumber or electrician cannot be used because the high heat required to melt them have a bad effect on the detecting ability of the crystals.

If it is desired to mix the solder at home either of the two following formulae may be used to advantage. Formula No. 1 melts at the low temperature of 115 degrees F, about the heat of lukewarm water. No. 2 will melt readily at less than the boiling temperature of water, which is 212 degrees.

Formula No. 1		Formula No. 2	
Mercury	250 parts	Lead	26 parts
Bismuth	50 "	Bismuth	50 "
Tin	25 "	Tin	12 "
Lead	25 "	Cadium	10 "

To solder a crystal in place, melt enough of the alloy to fill the cup and then place the crystal in position with the sensitive side uppermost. Press the crystal into the alloy until the top surfaces of each are almost on the same level, then leave the crystal alone while the alloy cools. Throughout all these operations—from the time the crystal is first picked up to make the tests until it has been anchored in the solder—use extra care that your fingers do not touch the sensitive surfaces any more than is absolutely necessary. After the crystal is in its holder and the latter is in place on the detector stand, wipe the surface with carbon bi-sulphide or carbon tetrachloride. This will remove all oil and other foreign substances.

(*Continued from preceding page*)

"broad-casting" frequency they "wipe out" the effect of the high resistance in the loop and allow the carrier frequency to go thru and also a band of frequencies near it produced by the voice. This depends on the sharpness of tuning in the loop circuit and can be controlled by changing the amount of added resistance mainly. It is more easily controlled this way, when the loop capacity is small. The regenerative circuit can be as powerful as desired and the simple Hartley hook-up is ample. The accompanying sketch gives a schematic diagram of the method.

As a further precaution against static exciting the secondary circuit, the primary circuit can be tuned to 540 meters. The device of detuning can be resorted to if radio frequency amplification is available.

To sum up—use short waves, loop aerials, high resistances in the aerial, powerful regenerative currents, radio-frequency amplification and detuning and you will have gone a long way to meet "old man Q. R. N. on a fair footing next June.

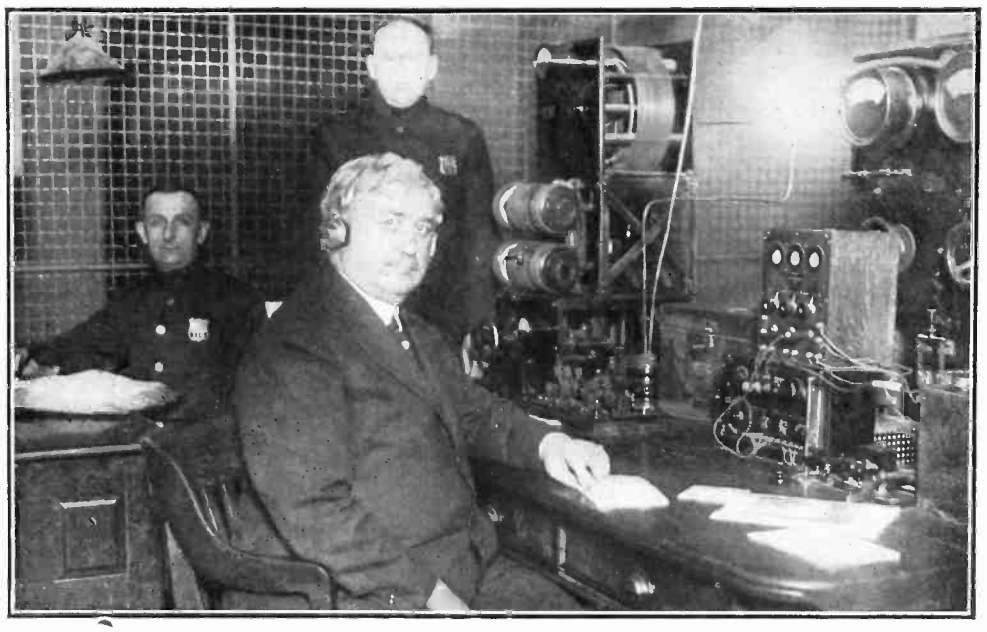
The Sending "Bug"

Paul F. Godley was right when he claimed that 75 per cent. of the amateurs who make or buy their own receiving sets for concerts, get the amateur-sending "bug." The other 25 per cent. are coming along slowly.

P. E. Wiggin, of Pittsburgh, made a pertinent remark when he said that an amateur, in Canada, picked up KDKA on 180 meters just as clearly as on 360 meters. Who was off tune—KDKA or the amateur?

The American Telephone and Telegraph Company has gone into the backwoods even—and installed a wireless phone in a lumber camp in the northern part of North Carolina.

Police Chief Using Radio Receiver



(c. International.)

Commissioner Enright of the New York Police Department Listening in on a Radio Concert Over the Newly Installed Radio Set at Police Headquarters. A New Radio Section of Police Department Has Been Inaugurated and New Ways of Using Radio to Be Used in Apprehending Criminals Are Being Devised.

The Radio World's Log

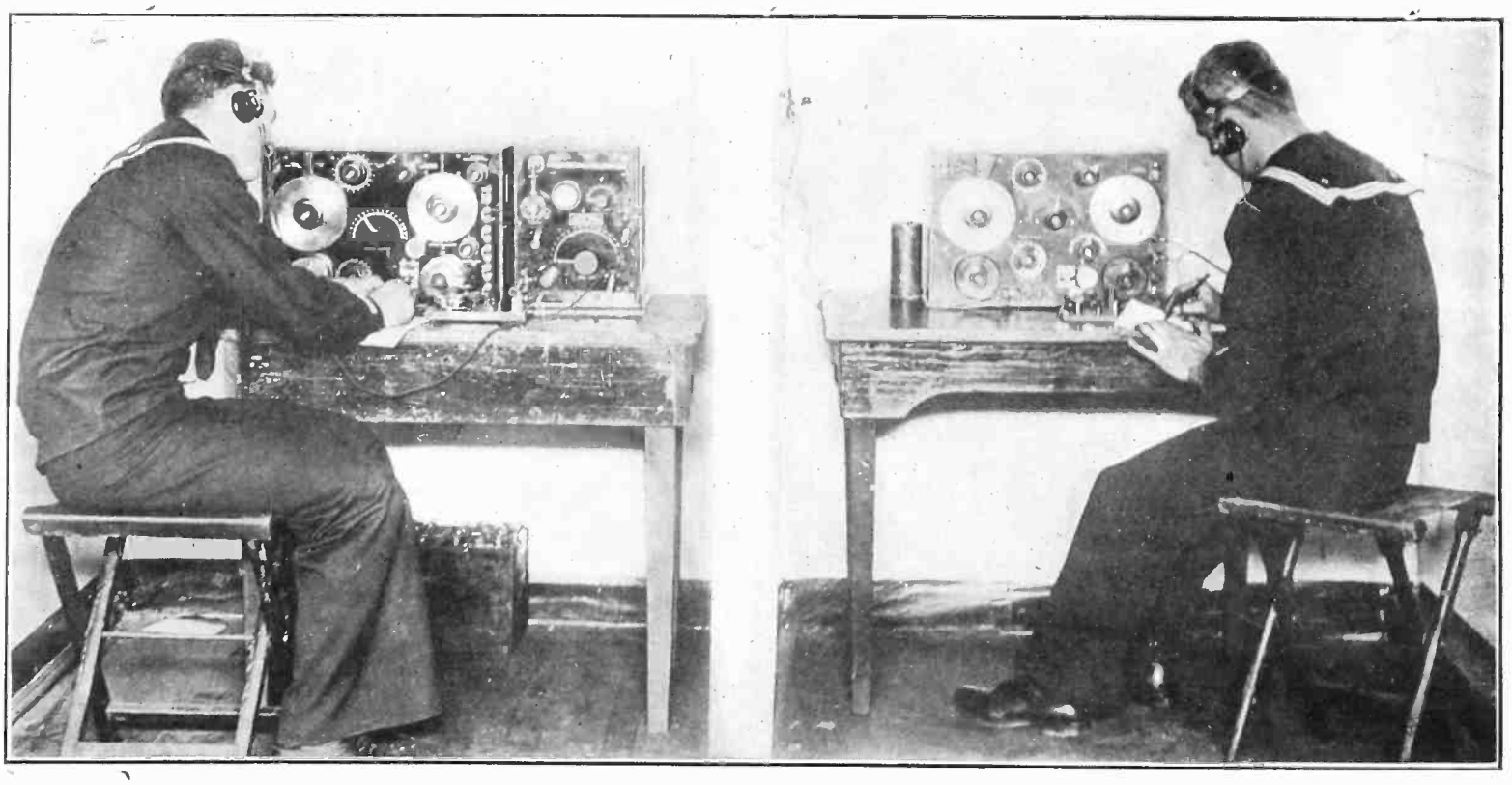
RADIO WORLD will give space to a record of amateur stations heard and worked. This section will be known as The Radio Log, and it is requested that amateurs forward their lists in, with their names and addresses to the Radio Editor, Radio World, 1493 Broadway N. Y. City, N. Y. Those received up to Thursday A. M. of one week will appear in the following week's issue. C. W. and Spark stations should be arranged in two distinct groups.

Regenerative Tuning

Owing to the sharply tuned waves of radio telephone signals, their reception at a distance usually requires careful adjustments of the receiving circuits, and is not accomplished as readily by the novice as is the reception of spark telegraph signals. In view of the differences of manipulation of the various types and makes of receiving sets, it is possible here to give only a general outline of the procedure to be followed.

Signals received are greatly strenghtened by use of a regenerative circuit, properly adjusted. To obtain regenerative action, carefully increase the plate inductance or tickler coupling until a slight hissing or hollow sound is heard in the phones, then move the adjustment back slightly until the hissing just stops. If the circuit is functioning properly, it will be found that phone and spark signals can thus be regenerated and their intensity increased many times. The slight hiss just mentioned indicated that the detector circuit is in a state of oscilliation; this adjustment should be used for receiving continuous wave telegraph signals, and will also be found advantageous initially to "locate" radio telephone signals from distant stations.

Cops of the Air



U. S. Naval operators shown at work while guarding wave lengths in search for breakers of the rules and regulations governing radio communication. (c. by Keystone View Co.)

Human Encyclopedia of Radio

(c. Keystone View Co.)

William B. Terrell, Uncle Sam's chief radio inspector, whose offices are in the Department of Commerce, Washington, D. C., is one of the busiest men in the country. Since radio method of communication became popular, he has been flooded with inquiries from ambitious fans. Chief Terrell cannot possibly reply to all the questions hurled at him, because many are of a distinctly technical nature and require lengthy answers. However, it is not necessary to bother him if you expect an extended reply. Just send your questions to the Inquiry Editor of RADIO WORLD. He will do all in his power to help you.

Radio Advice on Fire Precaution

George B. Muldaur, general agent of the Underwriters Laboratories, gave an interesting address by radiophone, from the Westinghouse broadcasting station at Newark, N. J., on "fire prevention" in the home.

In this country, said Mr. Muldaur, "15,000 human lives and $500,000,000 worth of property are lost yearly in fires. The property loss does not include the cost of fire protection, the maintenance of fire departments and fire-extinguishing apparatus, or the payment of fire departments and fire premiums; but, solely, actual property destroyed."

It is estimated that almost 90 per cent. of the loss is strictly preventable and, perhaps, 75 per cent. is due to carelessness. He suggested several questions which one should not forget:

Where is your nearest fire-alarm box?

Do you know how to operate it?

Does this box need a key to open it? Do you know where key may be found instantly?

When did you last go over your house in order to locate fire dangers?

Are the theatres and motion picture houses you attend properly protected?

"A clean house is a safe house," said Mr. Muldaur, "and an annual house-cleaning, is as slovenly as a weekly bath. If kereosene lamps are used, see that the kereosene is kept in a safe place—away from anything inflammable. Be careful where you throw matches. Keep all rubbish out of cellars and basements and keep all papers in a specially safe place. Protect the walls from the heat of stoves and pipes. Protect all floors under stoves by means of metal or asbestos covering. If your house has wooden shingles, keep them well painted with approved roofing-paint. Old and dried shingled roofs have been known to catch fire from sparks carried more than a mile by the wind."

Bed Springs Radio

Declaring "this wireless business has got to stop", E. C. Beck of Chillicothe, Illinois, said that he has not been able to sleep for two weeks because of hearing voices and music in the air and because of shocks he gets when he goes to bed.

One night, he said, he awakened as in the grasp of a phantom. He says music, lectures, market reports and voices break the silence of his bedroom each night, and he blames it all on a huge radiophone sending set at Bradley College, Illinois.

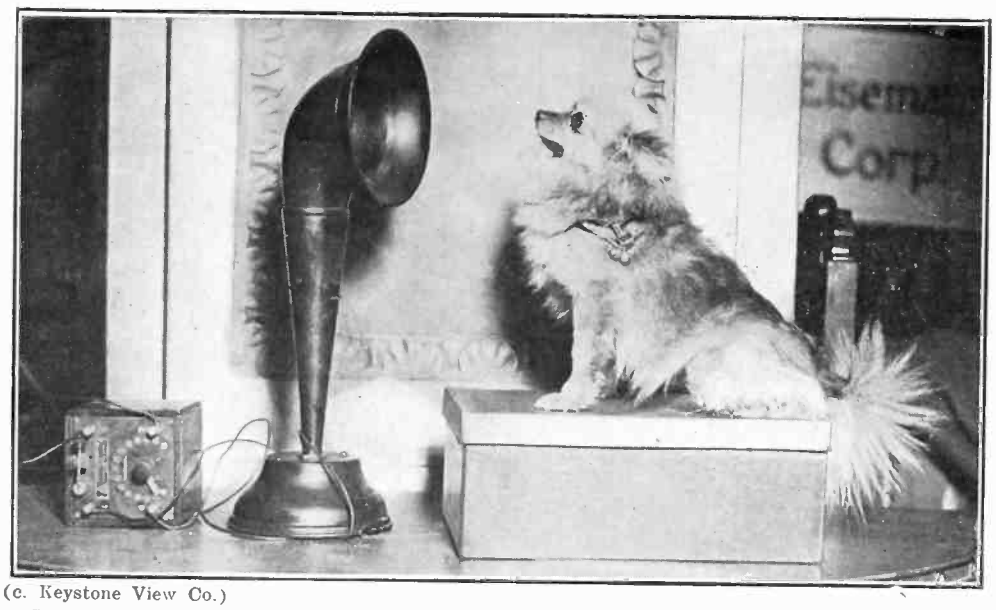
Beck has no radio receiving set; but radio operators say, his bed springs, an ideal wireless aerial, may attract the signals.

A Mystery Solved

The mysterious call WRW, which recently agitated listeners was located at Tarrytown, New York. It is owned and operated by the Tarrytown Radio Research Laboratory, Frederick Koenig in charge. It was an experimental station until government licenses were distributed.

WRW will continue broadcasting, arranging its hours so as not to interfere with WJZ's program. At present it operates between 6:30 and 7:15 p. m., and between 10:15 and 11 p. m., on a 360-meter wave length.

His New "Master's Voice"



(c. Keystone View Co.)

He is known as "Wuffie," the radio dog, and he was one of the novel features at the recent Radio Show at the Hotel Pennsylvania, New York City.

What's Required

In order to receive radio telegraph and radiophone signals, the following equipment is necessary:

Antenna (Aerial)
Ground Connection
Antenna Grounding Switch
Tuner
Detector (With necessary batteries, etc.)
Regenerative circuits
Head telephone receivers.

The following may be used in addition:

Amplifiers, with necessary accessories
Loud speaking horn.

The cost of a complete radio receiving outfit ranges from about $35.00 for a simple set with mineral detector to $200.00 or more for a highly sensitive installation of the best grade. For $125 or less, a very satisfactory complete set may be installed, containing an electron tube detector; additional equipment may then be added at any time to reach the highest sensitivity.

What We Want

RADIO WORLD is in the market for good technical articles and illustrations by men who thoroughly understand the subject. Such material, when submitted by mail, must be accompanied by stamps for return postage.

Her Own Radiophone

A large Radiophone amateur station is being installed at Rye, N. Y., for Rene Riano, of Irving Berlin's "Music Box Revue." This station is for sending and receiving messages. Miss Riano is studying to become an expert operator.

Proper Adjustment of Detector and Amplifier

Before signals can be received, the detector must be in proper adjustment. Mineral detectors are adjusted by varying the pressure and spot of the contact crystal, until the note of the test buzzer is heard most clearly through the 'phones.

Gas-content (soft) detector tubes are adjusted by raising the filament current gradually, until a slight hiss is heard in the 'phones, and then reducing this current until the hiss just stops. Care should be taken during this adjustment to set the regenerative inductance or tickler coil at its minimum value. The plate ("B" battery) voltage at the same time should be so adjusted, by means of variable battery taps, or preferably by means of an "A" battery potentiometer, that this hiss commences at as low a filament current as possible. Most gas-content detector tubes require a critical plate voltage somewhere between 18 and 22 volts. The adjustment is most easily made by the use of an "A" battery potentiometer, which connects the negataive end of the detector plate battery to any desired point between the positive and the negative terminal voltage of the filament "A" battery, thus providing a continuous 6 volt variation.

Many operators who wish to avoid the critical adjustments necessary for operataion of a gas-content detector tube, find it convenient to employ a "hard" tube (amplifier tube) in its place, at a slight loss of sensitivity. These highly evacuated tubes are not critical in adjustment, and have no "hissing point". The best plate voltage for these tubes when used as detectors is best found by trial, but is not critical.

Amplifier tube filaments are burned at just sufficient brilliancy to give maximum signal strength. Any plate voltage from 45 to 90 volts or even higher may be used on amplifiers, the higher values of plate voltage generally giving somewhat increased amplification.

Loud Speaking Horns

Loud speaking appliances are on the market by means of which it is possible to reproduce even weak signals with any intensity desired. Signals received with good intensity in the head receivers may be heard over an ordinary room, by means of one of the low-priced loud speaking horns on the market, or even by the attachment of a simple horn directly to an ordinary ear receiver. WHERE USED AS A PART OF THE GREAT VOLUME OF SOUND IS REQUIRED, SPECIAL ADDITIONAL AMPLIFIERS SHOULD BE LOUD SPEAKING EQUIPMENT. It should be borne in mind that more or less distortion often results from great amplification of signals, especially with improperly designed loud speaker equipment or where such equipment is not properly adjusted. The quality and distinctness of the signals received will, therefore, in general be better when received through the ear receivers, than when reproduced through a loud speaker.

Antenna Grounding Switch

To avoid the accumulation of electrical charges on the antenna, and to prevent damage to the receiving set in case of nearby lightning, a protective device, which provides a direct path from the antenna to ground, should be installed. This may be a small single pole throw switch, used to shunt across the receiving set when not in use, or still better, single pole double throw switch which disconnects the antenna from the receiving set and connects it directly to ground. For use with transmitting stations, the National Underwriters Regulations specify the use of a larger pole, double throw switch, is prescribed, grounding switch, attached outside the building; a 100 ampere, 500 volt single pole, double throw switch, is prescribed, connecting to ground outside the building through a copper wire not smaller than No. 6, B & S gage. Complete grounding equipments suitable for transmitting sets or for large receiving antennae may be purchased from any radio supply house.

Answers to Our Readers

H. W., Rockland, Me.—Can I use a 2 ft. square loop for radiophone concerts?

Yes. There are however several factors to be looked into in your case. You must know the inductance or the fundamental wavelength of the loop. We cannot go into methods of getting this now but will give it consideration in the next number. Get some friend to find it for you. If this wavelength is longer than that of the broadcasting station you must take off turns of wire until it is about two-thirds of it and then add a condenser. Try 8 turns No. 20 D. C. C. ¼ apart.

You must next have at least 2 radio frequency stages of amplification before you reach the detector unless you have a vacuum tube detector and 2 stage amplifier and are within a few blocks of the broadcasting stations.

Of course you will need a 2 stage audio frequency amplifier in any case, as your loop picks up only about 1% of the energy handled by the average 100 ft. single wire antenna.

Please give more detailed data if you wish exact information.

Q. J. F., Jersey City.—Can I get more distance with a "T"-antenna than an "L" inverted?

A. Your facts are too vague for an exact reply. The same horizontal wire used as part of a "T" gives less current when tuned to a given wavelength than when used as part of an inverted "L," using the same lead-in wire. The natural wave length is shorter than that of the antenna when made into an inverted "L." This would require more tuning coil for the "T" and might mean a better coupling to the detector, thus neutralizing the difference between them to some extent. It all depends on the exact conditions given.

Q. S. F., N. Y. C.—How far can a 500-watt set reach over sea in daylight?

A. This depends on wave-length, and antennae at transmitter and receiver ;also location of station. A large concern in New York has a 500 watt output tube set on 300-600 meters which has reached 1,600 miles in daylight over sea and is realiable for 1,000 at all times.

W. M., Scarsdale, N. Y.—Why is a C. W. transmitter less powerful when used as a telephone than a radio telegraph?

A. The radio telephone sends out less energy under the same conditions than the radio telegraph, having the same "peak" voltage on the antenna. "Peak voltage" is the highest measurable voltage at any instant.

A. D. N., Brookline, Mass.—Is there a special reason for using cage antennas?

Yes—electrically they handle a given amount of energy with less rise in voltage and therefore less tendency to leak to ground than any other form This advantage comes especially into play when they are used as transmitters; since Austin, Miller and others have shown that trees, poles, and large insulating masses close to a station often absorb energy from a highly charged wire when the charge reverses rapidly.

There are mechanical advantages afforded by the cage antenna in battle, as a single shot will not bring down a cage antenna owing to the loops distributed thruout its length to separate the wires. The flat top antenna is not protected in this manner.

A. P. R., Mount Vernon.—Is carborundum good to use in a direct coupled set for radiophone work?

If you cannot procure galena or silicon in a hurry and are very close to a broadcasting station, you may get good results. Cheer up, when the big fellows are broadcasting across the continent. That close by with galena and direct coupled antennas will have to use a less sensitive crystal or else a loop instead of the antenna. They may use carborundum as a protection against overwhelming intensities from transcontinental stations. Meanwhile use galena if possible, every dealer keeps it.

Radlo 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.

J. S. C., New York City.—I am experimenting with a harp antenna of 4 wires spaced about 6% of their length apart. Should I get more energy out than with one?

Yes. These four wires have roughly according to an old law called Fleming's rule—about twice the capacity of one and their current is twice as great and their useful energy five times as great. Therefore the equivalent "useful" resistance they introduce into the circuit when you press the key to radiate this energy—is four times as great. This does not mean, however, that you can get four times the energy out of them for receiving that you can with one wire. The conditions are different. In a transmitter you "snap-the-whip" at the base of the antenna. With the receiver the case is different—the incoming waves are like a broad violin bow that "strikes" the antenna from top to bottom at once.

If instead of a transmitting chopper there was a transmitted current changing in value cyclically 1,000 times a second by being modulated through the action of the human voice on a radio telephone transmitter the receiver telephone would vibrate accordingly, since its steady pull would pulsate 1,000 times per second. Similarly other notes between 150 and 2,500 per second would give their responses and since speech is a compound of all of these frequencies you will have a receiver diaphragm reproducing the voice waves.

It is thus seen that a crystal or vacuum tube converts an impossible alternating or reversed pull into a steady pulsating pull.

We Wanted To Know

The following letter explains itself:

Radio World,
1493 Broadway,
New York, N. Y.

Gentlemen:—

At the direction of the Superintendent of Police, I am writing to acknowledge your letter of March 16th, requesting a photograph of a police officer equipped with a radio telephone, and beg to inform you that we have no photograph such as you request.

As a matter of fact, the Department has made no advanced tests of the use of radio phone, and the matter is still in its infancy.

Sincerely yours,
Martin E. Mullen,
Sec'y to Superintendent of Police

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Service to Farmers

The State Agricultural College of Wisconsin was the first institution of its kind to begin broadcasting crop information and prices to famrers, says Wm. Jermane in the "Times" (Seattle, Wash.). It began last fall with three subscribers; today 127 sets of receiving instruments are eagerly taking everything it sends out. The agricultural colleges of New York and Ohio were the next to take up this new work, and their experience has been as successful as that of Wisconsin. The theory is that before long the farmer will have a wireless receiving set just as he now has a telephone, and that it will take the place of the telephone for everything but communications between individuals.

The business possibilities of the new system are great. Already a limited number of farmers are receiving crop and market information just as reliable and as prompt as that which a stock broker gets in his office from his ticker.

Secretary Denby Telephoning a Radio Naval Station

(c. Underwood & Underwood.)

One of the first government offices to be equipped with radio, was that of Secretary of the Navy Denby. By its use, the Secretary is able to keep in touch with all naval stations on the Atlantic Coast. The radio has done much to simplify and condense his work.

U. S. Attorney-General Charges Radio Monopoly

The report from Washington that Attorney-General Daugherty has asked an investigation into a monopoly alleged to control the prices of radio apparatus, and that a bill has been introduced in Congress by Representative Britten, of Illinois, to that effect, caused considerable consternation just as RADIO WORLD was going to press. One of the leading radio corporations informed us by telephone that the charges are absolutely without foundation.

In its next issue, RADIO WORLD will puublish an important article on this subject, based on interviews and information secured from those directly interested.

Great Men Change Accepted Facts

It appears to us that a turn in the habits of thought of many men of science is coming about. They are not seeking the mourners' bench or weeping over their sins or singing revival hymns or even growing orthodox from the standpoint of dogma; but there appears to be coming over a considerable number of leading men of science an enlivened reverence for that which is beyond human knowledge, says "Metallurgical Engineering" (New York). It shows itself in various ways. Sir William Crookes did, and Sir Oliver Lodge does, believe in ghosts. They have not many followers among their colleagues. The tendency is rather toward a less definite quality of mysticism; toward a belief in a greater illumination than is ours. It is not organized and it does not follow creeds or catechisms or articles that were drawn and recorded when, according to the best human understanding, the earth was flat like a cake, when it was the center of the universe, when the sun was a great lamp that was raised in the morning and lowered at night, and the lesser lights, the moon and stars, were little incidents to mitigate the darkness.

Earlier generations accepted orthodoxy. Sir Isaac Newton was a man of unusual piety. Michael Faraday was a sound churchman. Louis Pasteur was among the last of the great men of science to whom the "requirements of faith" were welcome.

The present tendency is independent of dogma. It does not insist on any particulars. It does not condemn. It seeks the Greater Illumination and finds hope and comfort in the quest.

On January 8 last, Professor Michael I. Pupin of Columbia made a memorial address at St. Paul's Chapel on the campus in honor of those who in their lifetime had advanced the honor of Columbia University. Now to such persons as know him casually, the genial professor of electro mechanics would be about the last one they would expect to see in a pulpit preaching a sermon. But his beautiful "Herdsman's View of Human Life" was indeed a sermon. He harked back to the time when, fifty years ago, he had helped the village herdsmen to guard the grazing oxen through the night on the hills of Serbia. The mystic thoughts of ancient reverence that inspired the watching boy have not been killed by the study of science. It was beautiful and reverent and sincere, and it did not offend the understanding. Many will remember the plea for spiritual vision made by Professor Barkerville in his address at the Great Hall of City College during the September joint meeting of the chemical societies. It was his last public utterance, this urgent appeal for the search after light to come from beyond our ken. Dr. Charles P. Steinmetz in his illuminating contribution to the current number of "Harper's Magazine" has approached close to the boundaries of mysticism.

It is an excellent thing to "get down to brass tacks" in our discussions of particular things and in the consideration of principles and processes. But the world is not made up of brass tacks alone. There are vague shapes in the minds of men and women that are potent to build up or to destroy.

Ellabelle May Doolittle

She Reads a New Poem with a Radio Punch

By Bide Dudley

MAYOR CYRUS PERKINS WALKER on his return from Kansas City last week called a public meeting in Hugus Hall for a discussion of the radiophone. The Mayor had listened in on a concert from St. Louis while in Kansas City and wanted to tell his townsmen of this new invention. A large crowd was present.

"The radiophone is a great thing," he said in his opening remarks. "I studied it in Kansas City and am now an authority on it."

"Are you a radiator?" asked Smut Harkins, who is more or less of a sidewalk comedian.

"You keepa still," yelled Tony Borgello, the fruit stand man, who is deeply interested in the subject.

"I do not keep a still," replied Harkins.

The Mayor rapped for order. As he was squaring off to speak again, a slender girl, gowned in swish-cloth, trimmed with imitation jelly-beans, stepped onto the rostrum. She was Ellabelle Mae Doolittle, Delhi's far-famed poetess.

"Excuse me, friends," she began, "but I have here a little poem on the radiophone. Calm your tone; it's all my own. I'll tell you of the radiophone."

The crowd became quiet at once. Many sat with hands on their ears. Miss Doolittle read the following:

Listen to the wireless phone,
Singing on the air.
With you I'll not pick a bone:
Wonderful, I declare!
Tune in on the proper wave
And you will get the message,
For great things the way you pave,
Surely this is not guessage.

My Sister's child, Teeney Ricketts,
Giggled in Sabbath school.
Stop that, you foolish jiggets,
From Sebastapool.
But speaking of the radiophone—
It is some invention.
My dad has a horse for sale—a roan,
A fact I wish you'd mention.

Coming as a surprise the poem struck the crowd dumb with its grandeur,. but only for a moment Soon belam broke loose, as those present applauded with great gusto.

All were pleased.

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 three-day service here—that is, copy received for this department will appear in RADIO WORLD in about three days after copy reaches us.

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

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.

Amateurs Attention—We are 4 blocks from Grand Central station. Variometers & Couplers $6. Regenerative sets mounted, unwired $35. Phones, Tubes, Transformers, Condensors, Aerial Wire Rhoestats in stock. Amplifying units $15. Detector units $12. Sets made to order. Mail orders receive prompt attention. Open to 7 P. M. Vanderbilt 2038-Murray Hill Electric. 214 East 38th St.

Amateurs, Attention.—$6 for Variometers and Variocouplers. Regenerative sets, unwired, $35. Parts of all kinds for sale cheap. Phones, tubes, rheostats and coils. Why go downtown when we are four blocks from Grand CentralC Station. Estimates cheerfully given. 2 BUA. Murray Hill Electric Co., 214 East 38th St. Phone Vanderbilt 2038.

Audion Renewals—Any type single stem, tungsten ,lament, detectors repaired for $2.75; amplifiers as above, $3; 5 watt power tubes, $4; VT-1 oxide filaments and to use 20-35 volts "B," $3.50. Terms cash, or C. O. D. plus charges. Trimount Laboratory, Milford, Mass.

Agents Wanted.—One live amateur in every town to sell radio apparatus. Attractive discounts given. Write immediately for full particulars. Wilmington Electrical Specialty Company, Dept. C, 705 Adams Street, Wilmington, Delaware.

Advertise.—Country town newspapers. Lists ree. Pennill Company. Covington, Kentucky.

Amateur Agents Wanted in every town to sell radio apparatus. A few stocking agencies still open. Delfelco, 12 Meeting Street, Pawtucket, R. I.

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.

Patents—Send for free book. Contains valuable information for inventors. Send sketch of your invention for free opinion of its patentable nature. Prompt service, twenty years' experience. Talbert & Talbert, 440 Talbert Bldg., Washington, D. C.

TELEGRAPHY—(Morse and Wireless) and Railway Accounting taught thoroughly; big salaries; great opportunities. Oldest, largest school. All expenses low—can earn large part. Catalogue rfee. DODGE'S INSTITUTE, Hass St., Valparaiso, Indiana.

250 Wireless Exam. Questions Answered! Just out! New License Quiz Book for Government License Examinations. The first edition printed with new rules, regulations and gradings laid down by the Government on July 1, 1921. Invaluable information for amateurs taking Radio License Examinations. Answers to 250 Questions Many of Which Will be Useful in Examinations. Full descriptions of hook-ups. New devices, practical equations, international laws, official gradings, diagrams, definitions and other important information. Just off the press! 80 illustrations. Clip out this ad. Pin a dollar bill to it! Mail it today. This wonderful book comes by return mail. Don't miss it! Dept. 21-M National Radio Institute, 1345 Pennsylvania Ave., N. W., Washington, D. C.

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.

This is Real Success.—Panels cut to order, smooth sawed edges. We cut them exactly to size and ship the same day your order is received. ¼" thick, $.01½c per square inch; 5/16" thick, .02c; ⅜" thick, .03c; 7/16" thick, .03½c; ½" thick, .04c, why pay more? These radio panels are made o fthe highest grade black fibre. This material possesses high dielectric strength, is inexpensive, unbreakable and easy to work. Our special offer, radio panels 6 x 6 x ¼", 50c; 6 x 12 x ¼", $1. We also carry a complete stock of fibre rod and tubes, the real thing for electrical insulation, special prices quoted upon application. We pay postage. Radio Instrument & Panel Co., Box 75, Cicero, IIIlinois.

Radio Bargains—50c each postpaid. Phone plugs; 3 contact jacks, work either open or closed circuit; receiving station lighting arresters, carbon gap with high voltage use, on porcelein base, $1 value; Bakelite 3" diameter tubing, pe r foot; Ward Leonard resistance tubes, up to 2,000 ohms; non-inductive alloy wire resistance units on wooden spools, any resistance up to 2,000 ohms; six feet No. 5 ground wire flexible 61 strand R. C.; postage not paid on wire. D. C. C. Enam. No. 14 copper wire, 40c pound. Miscellaneous, bargains—change-over switches, for panel mounting with knob, six pole, D. T., $2 each; same, 2 P. D. T., $1; same, single pole D. T., 80c; Wheatstone Bridge resistance boxes, with plugs, 6 circuits, $4.50. F. O. B., Chicago. Twelve hour service on all above. American Radio Supply, 2140c So. Harding Ave., Chicago, Ill.

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 Manufactuerrs, 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.

Multigraphs, Typewriters, Addressing Machines, Duplicators, Folders, Sealers, Check Writers, Dictaphones. Office Equipment. Bought, sold, exchanged, rebuilt. Pruit Company, 110 North LaSalle, Chicago.

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

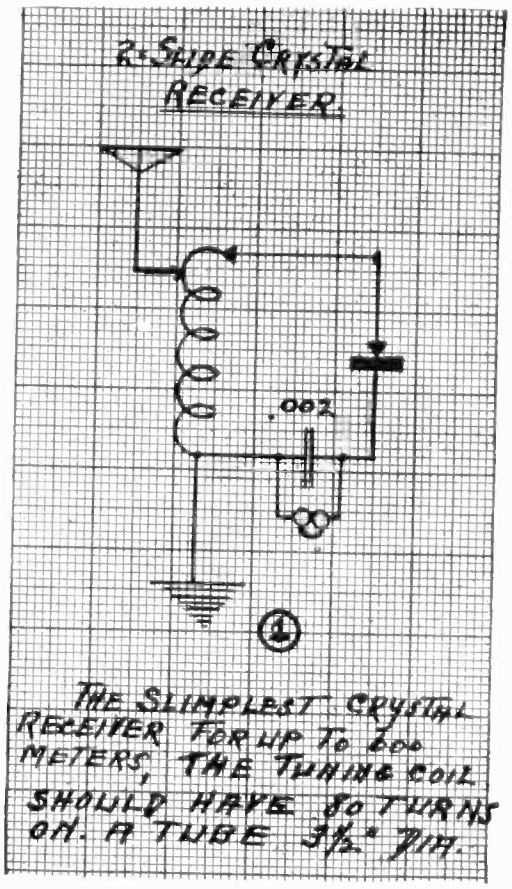
Stop! Look! Act! V. T.'s and accessories!—With each of the listed tubes Radiotron U. V. 200, $5 and A. P. detectors, $5; radiotron U. V. 201, $6.50 and A. P. amplifiers, $6.50. We will supply free of charge your choice of either of these five premiums—latest Fada rheostat, $1, No. 810 Remler smooth running 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 oregoing apparatus. Only new and high grade equipment carried in stock. Unsatisfactory goods subject to return within five days. Twelve hou rservice. Postage and insurance prepaid by us, thereby saving time and money. Remember us. The Kehler Radio Laboratories, Dept. R, Abilene, Kansas.

Wire.—B. & S. Ga., S. C. C. wire ¼ lb. lots No. 34 to 36, $.50, No. 30 to 33, 40c; No. 23, 23c; No. 25, 28, 32, 34 enameled, very reasonable. For ½ and 1 lb. lots proportionate prices. Write for price and information. F. Benedict, 3916 N. Irving Ave., Chicago.

Perasco Tested 150-2,600 meter regenerative receiver, $40. Perasco detector control, $15. Both $52. Unwired Perasco 150-475 meter regenerator with detector control in same cabinet, $40. Grid and phone condensers, 25c each. All standard parts at standard prices. Perry Radio Supply Co., 504 N. Grove Avenue, Oak Park, Illinois.

Easy Circuit for a Receiver

The accompanying represents a two-slide crystal receiver. T he equipment needed, would be a tube, three and one half inches in diameter, upon which is wound about 80 turns of No.



24 d.c.c., copper wire, two sliders (sliding contacts), about two feet of one-quarter inch brass rod, a good crystal detector, a .002 fixed condenser, and a pair of telephone receivers.

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