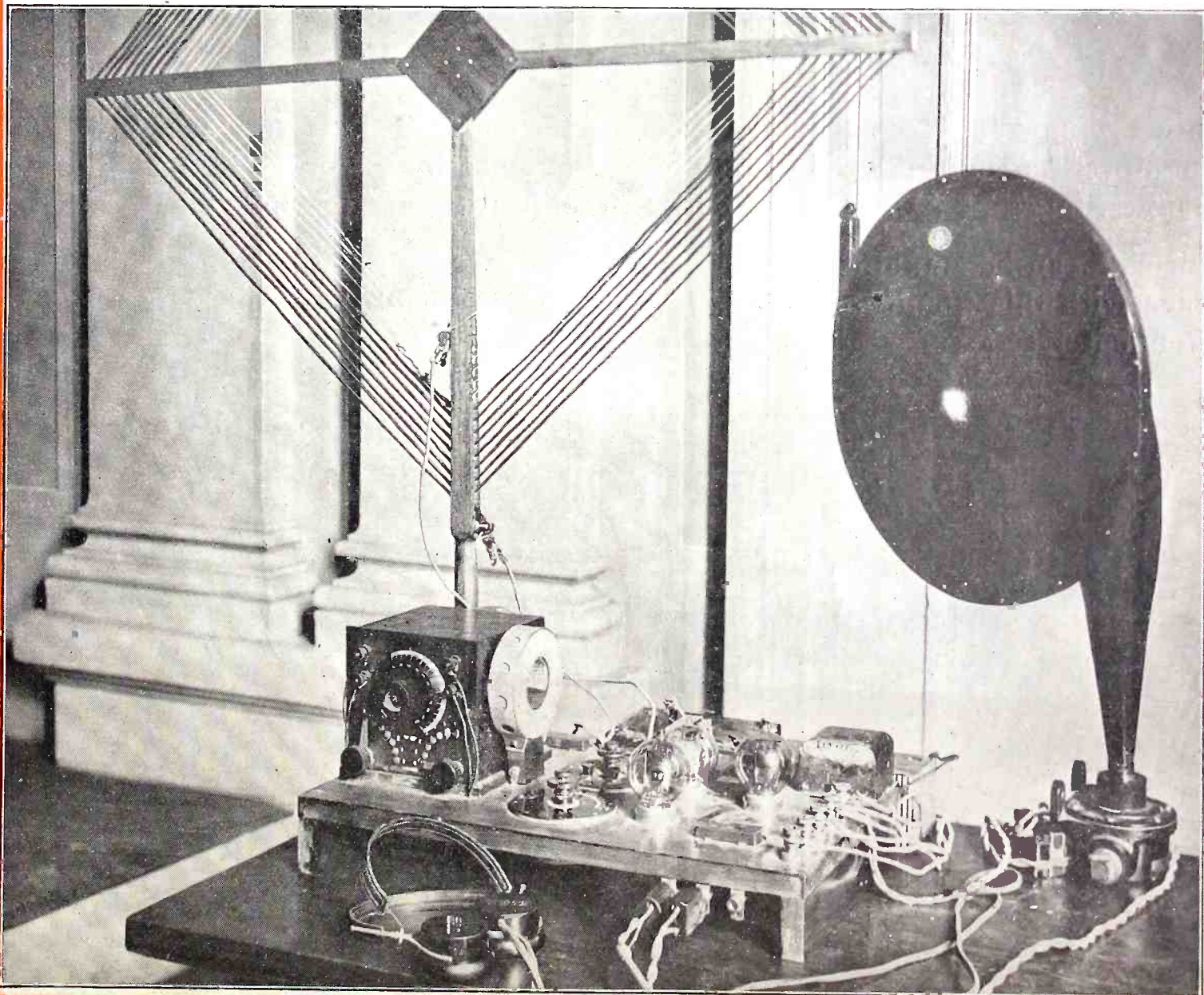


RADIO WORLD

Entered as second-class matter, March 28, 1922, at the post office at New York, New York, under the act of March 3, 1879

I L L U S T R A T E D

Latest Radio Revolutionizing Invention. See Page 8.



Major
Edwin
Armstrong's
Creation
which
Increases
the
Impulses
of a
Radio
Receiver
100,000
Times.
It is
One of
the Most
Important
Inventions
in Radio
Science.
(C. Ewing
Galloway,
N. Y.)

How to Make Your Own Radio Cabinets

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RADIO WORLD

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Chicago Radio Makers Demonstrate Public-School Equipment



(C. Underwood & Underwood.)

Radio "fans" from twenty-four Chicago high-school clubs met this week in the office of Albert C. Blumenthal, supervisor of technical education, and heard prominent electricians discuss some of the radio handicraft used in the schools. Chicago is taking a decisive position in radio instruction and enthusiasm in its institutions of learning. A special school radio exhibition is now in progress. The men in the photograph (from left to right) are: William Helm, Clarence De Butts, Milo E. Westbrooke and W. J. Bogan, four prominent radio promoters, Peter A. Morterson, superintendent of schools, and Corwin Eckel, radio expert.

National Radio Chamber of Commerce at Work

THE National Radio Chamber of Commerce is negotiating with various government departments, the Bureau of Standards, Department of Commerce, United States Signal Corps and United States Navy, cooperating in the standardization of radio apparatus, methods of manufacture, methods of testing, etc. The National Radio Chamber of Commerce intends to work with these departments and assist them in their radio problems.

It is planned to have a central testing-laboratory for radio apparatus, so that the various members of the National Radio Chamber of Commerce and any other manufacturers interested, may

avail themselves of the services of such a laboratory for the purpose of testing, calibrating and making such researches as may be desired.

The following board of directors of the National Radio Chamber of Commerce was appointed: William Taylor, Pennie, Davis, Marvin & Edmonds, chairman; William Dubilier, Dubilier Condenser & Radio Corporation; F. A. Andrea, F. A. Andrea Company; E. Steinberger, jr., Electrose Manufacturing Company; C. B. Cooper, Ship Owners' Radio Service; Leonard Fuller, The Colin B. Kennedy Company; Jack Binns, "New York Tribune"; George Lewis.

Alexander Eisemann, Freed-Eisemann

Radio Corporation, President of the National Radio Chamber of Commerce, and Joseph D. R. Freed, Freed-Eisemann Radio Corporation, Secretary of the National Radio Chamber of Commerce, are also members of the Board of directors, *ex-officio*.

The great widespread interest which the National Radio Chamber of Commerce has aroused is manifested by the daily increasing number of applications received by Joseph Freed at his office, 225 Fourth Avenue, New York City, N. Y.

It is the general consensus of opinion that the movement is a great advance in the development of radio business.

How to Make Your Radio Cabinets

By *W. S. Standiford*

MANY amateurs are constructing radiophone sets, and many of their instruments work well until the spaces between the leaves of the variable condenser and jacks clog up with accumulated dust. Then trouble occurs. In order to make their apparatus give the least amount of trouble, manufacturers of radio sets enclose them in a wooden cabinet which not only adds to their appearance, but also to their efficiency.

In sharp contrast to this, most amateurs do not enclose their outfits in a case, but try to keep dust away from the delicate parts by frequent cleaning—a process that not only wastes time, but is liable to press some wire connections too close together and out of shape; thus making other difficulties during operation. As a general rule, most electrical experimenters can make neat looking cabinets, but fall down in their finishing work, which is very crudely done and mars the appearance of their completed set. This is due, in most cases, to lack of knowledge of the processes and materials needed to do a good smooth varnishing and polishing job, rather than to carelessness.

Varnish is used as a base for many finishes, whether it is used for automobiles, furniture, or radio outfits. This work is very easy to perform, but certain precautions must be taken if a satisfactory result is desired. It is of the utmost importance to have a clean smooth surface in order to get a first-class finish. At the outset, it cannot be emphasized too strongly, that a smooth exterior is necessary whether the wood is to be painted, enameled, oil-finished in natural colored woods or stained and varnished. The first thing to do is to decide on what kind of wood the box is to be made of, whether it is open or close grained, and, also, if it contains any sap, as such things will cause different methods of working to be adopted. This is a matter of the utmost importance and should be looked into before proceeding with the work. In order that the amateur may not go astray, a list of open and close grained woods are appended, the handling of each kind will be described later in this article.

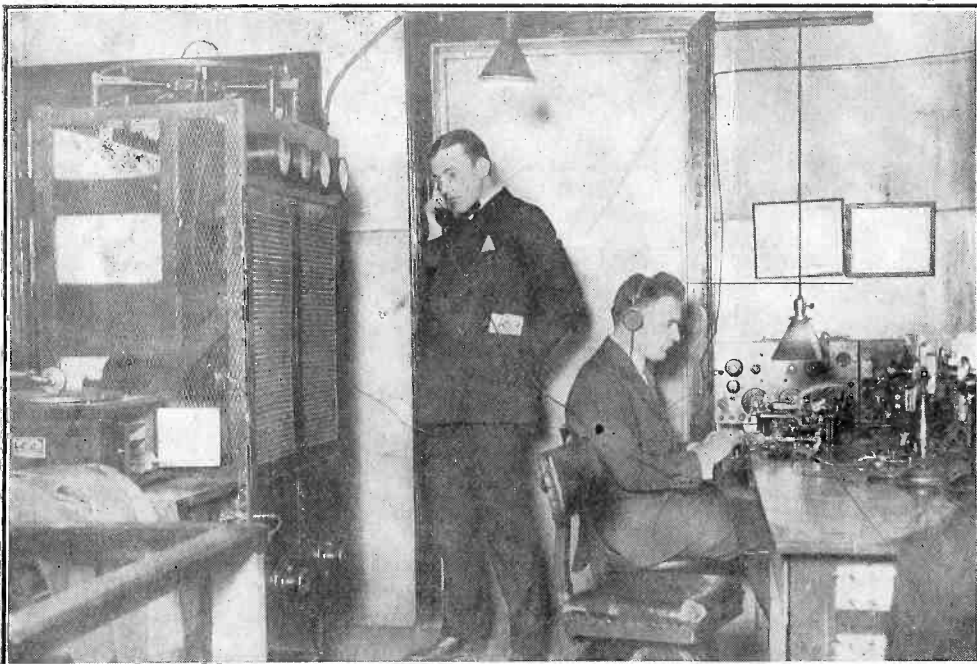
Open-grained woods: oak, ash, chestnut, walnut, mahogany, butternut. These require fillers.

Close-grained woods: pine, cherry, maple, birch, cypress, whitewood, poplar, sycamore, beech, redwood. These and others like them do not need fillers, but can be finished in natural colors or stained as the builder prefers.

Five operations in wood finishing are necessary, although, in the case of close-grained woods, the filling process can be dispensed with. For varnished cabinets, sandpapering, staining, filling, varnishing, and the final polishing comprise the list. Directions for each process will be given in rotation as the work progresses. Plane the wood as smooth as possible then tack a piece of 00-sandpaper on a level block and rub with the grain, using moderate pressure and taking care, when working near the edges, not to round them. Wipe all dust from surface with a cloth. Staining comes next if pine or poplar are used to imitate the appearance of the more costly woods. By using the former, radio-set containers can be made which will look as if an expensive natural-colored wood was used. In wood finishing, much trouble in working will be avoided by the purchase of the best stains obtainable. There are two kinds of stains on the market; water and oil stains, each having its good points. Oil stains are those in which the coloring pigment is dissolved in linseed oil, or turpentine; water is the solvent for the other. As pine wood, in some cases, has more or less sap, this wood after coloring with an oil or water stain when they are dry; should have two coats of white shellac-varnish put on; each coat after drying is to be lightly sandpapered.

This shellac coating effectually keeps any sap from discoloring the finish after the work is done. Varnishing, rubbing down and polishing can then be proceeded with. The best way to use water oil stains is to apply it with a brush and then rub it into the wood with a piece of cheesecloth. This distributes the color evenly and absorbs surplus moisture (which in the case of water stains is apt to raise the grain of the wood, thus making more sandpapering necessary, and also makes a uniform color tone). If the first application does not give as deep a color as desired, give it another. If the amateur desires to use an open-grain wood, such as mahogany or walnut, and use stains to

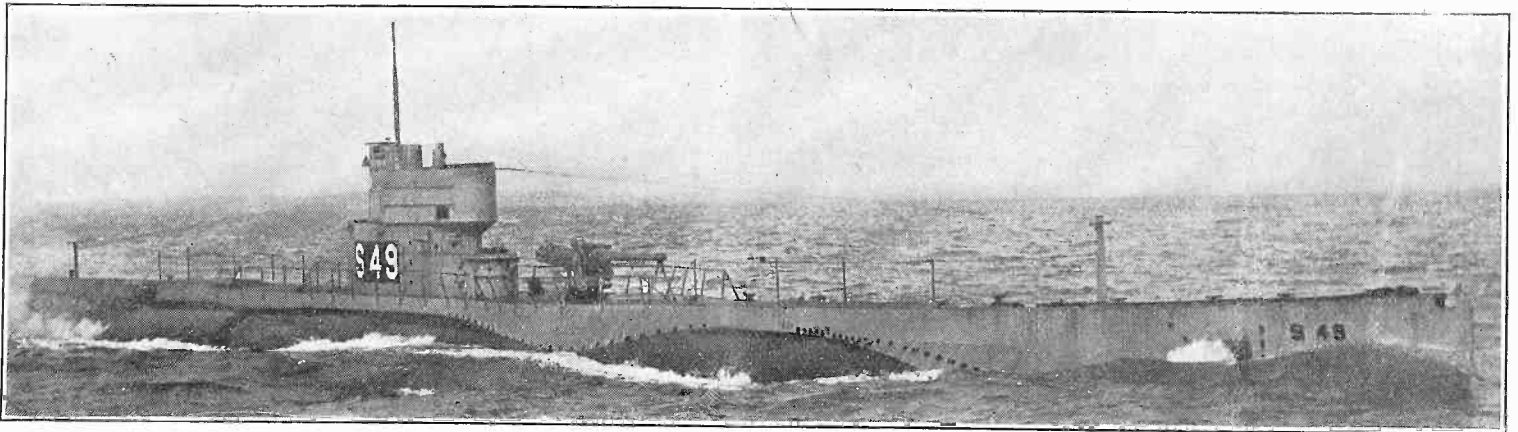
Chicago Radios Market Reports



(C. Underwood & Underwood, N. Y.)

The Chicago Board of Trade has put in operation a system of sending the opening and closing quotations of the wheat, corn, and oats market broadcast throughout the United States by radio. The quotations are sent from KQW, the Westinghouse Electric and Manufacturing Company, Edison Building. The man at the desk is receiving a message from Cuba. The man standing is verifying outgoing quotations.

Latest U. S. U-Boat Carries Radio



(C. International)

S-49, the latest type of submarine built by the United States Navy. She is one of the most heavily armed craft for under-seas purposes, and is equipped with radio, which can be operated while she is submerged.

(Continued from preceding page)

make them deeper in color, the pores will have to be filled after staining, otherwise staining can be omitted—but not filling, which is necessary. Suppose that such wood has been stained. Get a paste filler of a color to match the stain as nearly as possible. Put some of the filler on a piece of cotton cloth and rub it on the wood. As soon as this filler has dried a little (don't let it get hard), continue to rub the surface until all pores have been filled up, rubbing off the surplus, the idea being to have nothing but the pores contain filler.

After it is dry and smooth, give it a coat of white-shellac varnish. It ought to be rather thin; dilute with alcohol if too thick. All surplus varnish must be wiped off the brush before application to the surface, for if too thick a coating is applied, it will not be clear and allow the stain to show. The first coat of shellac should dry in about three hours, after which, put on another coat. Rub the dried surface with the finest-grained sandpaper until the wood is smooth. Don't rub it too hard, or the shellac will be cut through.

Varnishing comes next. Good brushes should be used as cheap ones will not give good results, as the bristles come out. Varnish must not be too cold as this prevents it from flowing freely. Have enough varnish on the brush to just give a level coating when it is brushed across the grain. Finish off by lightly rubbing with the grain, letting it dry thirty hours, or until thoroughly hard. If varnish is too thick, put a little turpentine in it.

Purchase some FF grade of pumice stone and a rubbing felt. Dip the felt into linseed oil, then rub on pumice stone which will now adhere to the felt. Now rub the varnished surface

lightly along the grain of wood. Continue this process until all small depressions have disappeared. This may be observed by looking diagonally over the wood's surface when it is held to the light. All hollow places will now show as dark spots. Surplus pumice stone must now be removed with a soft cloth.

Give it another coating of varnish and repeat the operation with pumice stone. The cabinet will now have a "dead non-glossy" finish. Those who prefer a shining polish can easily obtain it by dipping a piece of felt into linseed oil and powdered rotten stone; and by going over the surface in the same manner as with the pumice stone. A higher polish may be obtained on the last coat by giving it the rotten-stone treatment and then rubbing the hard varnish with a soft cloth dipped into linseed oil and using plenty of "elbow grease" until a very high polish is the result. The surplus oil should be wiped off with a soft chamois skin. The above gives a durable finish; one that will not scar easily. If all of the work has been done carefully, the radio fan will have a neat-looking cabinet that will be envied by his friends who do not understand polishing work. Varnished and polished woodwork of all de-

scriptions should not have any strong soap-powders applied for cleaning purposes to remove finger marks, etc.; as it will turn white in spots. Use nothing but a good furniture polish which will be found to clean it nicely.

Difficulty.—The finished work has a mottled appearance, some parts being deeper in color than others.

Remedy.—This is due to the staining being unevenly done; some places are left lighter than others due to too much stain being used. Sandpaper the darker spots carefully and spread a little more of the stain on the lighter ones so as to make an even tint; then finish surface as directed in article. Another rapid way to produce a fine finish on cabinets made out of close-grained woods is: first coat the wood's surface with shellac varnish, well rubbed in and sandpapered to kill any pitch in wood, and next put on two coats of a combined varnish-stain, one at a time, the first coat to be rubbed down with pumice stone and the last coat put on and when dry polished with rotten stone and oil or left the way it is. A first-class spar varnish-stain makes an excellent wearing surface, as it doesn't crack with use and will not turn white in spots after long use.

Owing to their composition, they ought to be put on like a varnish and not be brushed on like the ordinary variety, it not being made to spread that way.

Difficulty.—The work has a lumpy and uneven appearance.

Remedy.—Sandpaper smooth and dilute material in can with a small quantity of turpentine, stirring well from the bottom of can to dissolve any lumps. Use a small amount on brush and flow across grain of wood. After drying thoroughly apply another coat spreading with grain of wood.

To Find a Sensitive Spot

Editor, RADIO WORLD: Radio fans who cannot find a sensitive spot on galena should try this idea:

Get a file and file the surface of the crystal. Put the crystal back into the cup and press the catwhisker against the filed surface. I have tried this many times, and have always had excellent results.—John Camarda, 3316 Church Ave., Brooklyn, N. Y.

The most remarkable thing about the rapid spread of radiophones is that it has occurred without a law forbidding it.—"The Sun," Baltimore.

How the Crystal Detector Is Used to the Best Advantage

By C. J. Williams

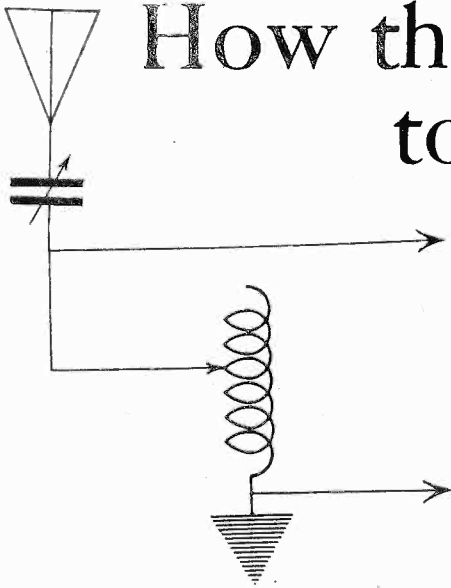


FIG. 1

A single-circuit conductive-type receiver. Suggested by C. J. Williams. Drawn by S. Newman.

THE method of receiving radio-frequency currents, after they have passed through the necessary tuning-apparatus, is to convert or change them from radio frequency to audio frequency, and also to change them to direct current, in order that they may operate a telephone receiver.

This changing is done by a means or device known as a detector. There are several kinds of detectors, but only two are in common use: One is the so-called crystal; the other, the vacuum tube. It was explained in the description of tuning that an inductor, wire wound into some form of coil, was used in the antenna circuit. Besides its use for tuning, the inductor is used to connect the detector. There are two ways of doing this. These are shown in Figures 1 and 2. Figure 1 shows a "single circuit" connection. In this, the detector apparatus is connected directly to the terminals of the inductor. Sometimes better results are obtained by connecting the detector across part of the coil, instead of across all of it. The best fraction of the whole coil to use is from one-third to one-half of the coil. The other way of connecting the detector to the antenna is not a direct one, and is shown in Figure 2. In this method, the antenna circuit-inductor is one winding of a transformer, the other winding of which, called the secondary, is connected to a condenser.

This transformer is often called a coupler, loose coupler, or vario-coupler. It is a coupler in the sense that it couples together, electrically, the antenna circuit and the secondary circuit. The secondary coil has currents induced in it by currents flowing in the primary coil when the two are placed near each other. In the usual radio coupler, the secondary coil is made movable in regard to the primary, so

that the effect of the primary on it may be regulated. In the two-circuit receiver, all the principles and rules of tuning and resonance which have been described for the antenna circuit apply equally to the secondary circuit. So that, in this type of connection, which is called a two-circuit receiver, there are two circuits instead of one to be tuned to the wave length to be received; also, the coupling between the two circuits must be adjusted for best results. It is obvious that the one-circuit receiver is very much more easily adjusted than the two-circuit. The two-

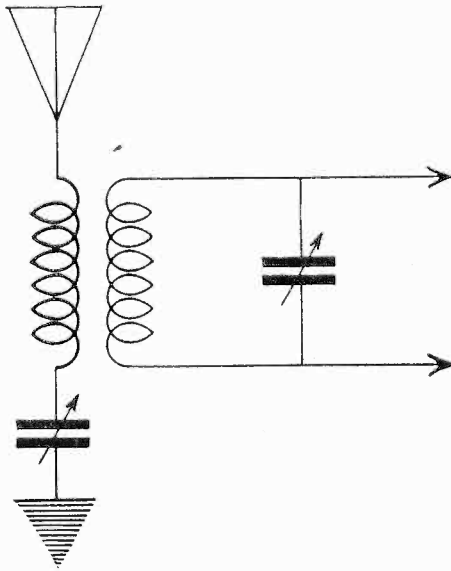


FIG. 2

The inductive method of coupling a receiver. Suggested by C. J. Williams. Drawn by S. Newman.

circuit receiver, on the other hand, is more selective; that is, when it is tuned to one certain wave length, currents of other wave lengths get through it to the detector less than they do on a single circuit receiver. The two-circuit receiver is, therefore, more useful in eliminating interference from undesired signals, and the single-circuit receiver is advantageous in its simplicity of tuning operation.

In either the one- or two-circuit receiver, the detector is connected to an inductor; the difference is merely that in one it is to the inductor in the antenna, and in the other to the one in the secondary, so that whenever currents flow in the inductor the voltage which is present across it is applied to the detector.

In explaining, the action of a crystal detector is merely that of a rectifier—that is, current can flow through the

detector in one direction only, so that when alternating current, which flows in two directions alternately, is applied to it, the current flow in one direction gets through the detector and the flow in the other direction does not. This, in effect, changes the alternating to direct current.

Of course, this direct current is a pulsating one, because no current is flowing during the time that the alternating current is applied in the wrong direction to get through, but the effect is the same. The pulsating direct-current flows through the telephones as well as the detector, as they are connected in series, and this operates the telephones. In radiotelephony, the alternating current which is received in the tuning elements is varying rapidly up and down in strength just as the transmitter currents vary in accordance with the speech or music sound vibrations. And the pulsating direct current which results through the detector and telephone varies the same way. Therefore, the telephone-receiver diaphragms are pulled back and forth by the magnetic effects of the currents in their windings, and so give off sound waves.

A vacuum tube may be used as a rectifier, or detector, of high-frequency oscillations. When connected up to the proper circuit, it performs this function with as much efficiency as the crystal detector. The vacuum tube, when connected up to a tuning device and used as a rectifier of electrical oscillations from distant transmitting apparatus, will work with a satisfactory degree of efficiency and, also, uniform sensitivity.

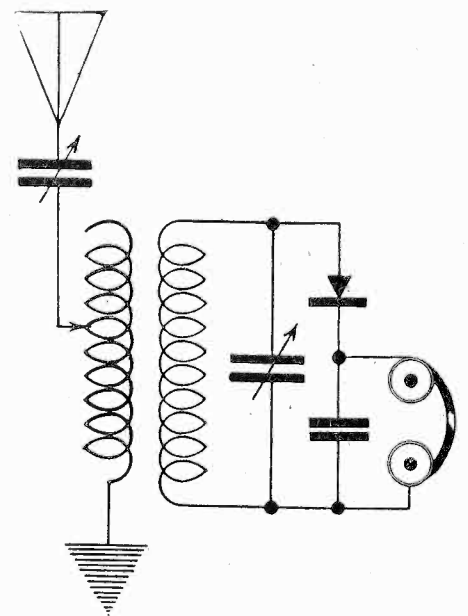


FIG. 3

Schematic diagram of a crystal inductive-type receiver. Suggested by C. J. Williams. Drawn by S. Newman.

How to Construct a Long-Wave Regenerative Receiver

By George W. May, R. E.

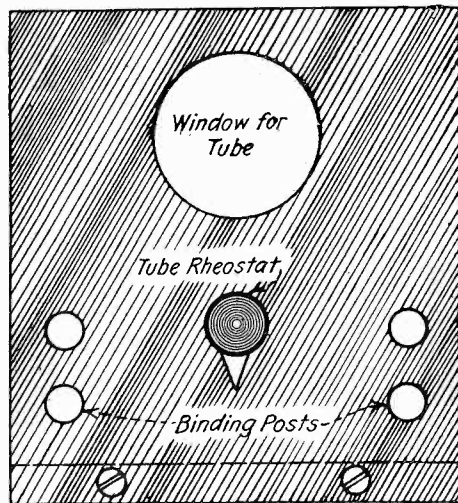


FIG. 1

How the front panel should appear. Suggested by G. W. May. Drawn by S. Newman.

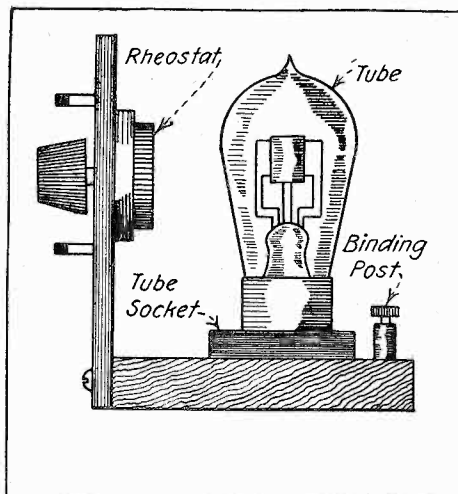


FIG. 2

A side view, showing the position of the tube-socket holder and rheostat. Suggested by G. W. May. Drawn by S. Newman.

RADIO amateurs who intend to advance into the tube class, and are serious of thinking of building a tube set, will find that the regenerative, or feed-back circuit, if placed in a receiver, presents many points of superiority over the crystal type of receiver. This feed-back, or regenerative circuit, is more selective, more sensitive, and provides for considerable amplification of signals, through the phenomenon of regeneration. There is no question that a little skill is required in constructing the set, which in turn would bring better results. Although more complex in operation than the crystal set, the results obtained warrant the extra trouble and expenditure of money.

Because of the fact that there are broadcasting stations on long waves well as short ones, a receiver which will respond to a range of wave lengths between 200 and 1700 meters proves interesting as well as useful. There is certain pleasure in being able to shift from one wave length to another and intercept signals from various stations at will. Instead of standing idly by during the intermissions of the 360-meter broadcast, the operator may tune in another broadcasting station. A greater variety of concerts is available at the touch of the tuning knobs. One is no longer compelled to stay on the 360-meter wave.

This receiver is easy to build and operate. Besides the necessary tube controls, there are but three others: the antenna series-condenser, the tickler coupling and the inductance switch. The circuit is the familiar plate feed-back circuit used extensively in the United States Navy. It is as efficient as

—and certainly more flexible than—the variometer type of regenerative circuit. It is simpler in operation and construction. The antenna tuning inductance is wound on a cardboard tube 4 inches in diameter and 9 inches long. Only 7 inches of the tube is wound with one even layer of No. 24 single cotton-covered wire. The winding is tapped at the 20th tap, and every 10th tap thereafter until the 80th. Then use taps every 40th turn until used. The first seventy turns will provide ample tuning for waves up to 600 meters. The winding is then given a coat of white or brown shellac and left to dry. This will tend to hold the wires firmly from becoming undone, as, in some cases, this will happen. The next 2 inches of the tube, which is left unwound, will be used for the tickler-coupling winding. This winding is a continuation of the main inductance and consists of 50 turns of No. 22 single cotton-covered wire wound in two sections of 25 turns

It Is "Broadcast"

IT is incorrect to say that a message was "broadcast." Hereafter the word will not appear in the columns of RADIO WORLD. We have ascertained, to our final satisfaction, that the past participle of "broadcast," like "forecast," is the same as the infinitive form. Therefore, the program "was broadcast from XZZZ" will be our—and the only correct—way of expressing it.

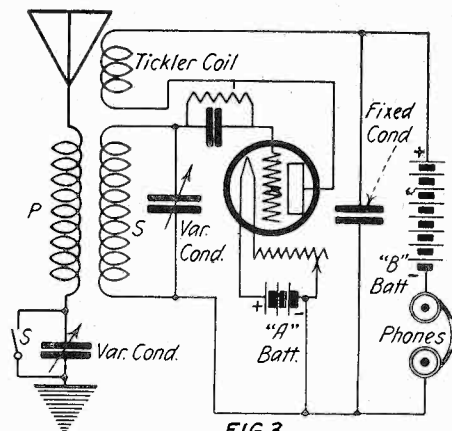


FIG. 3

Schematic diagram to indicate how the set should be wired in order to obtain regeneration. Suggested by G. W. May. Drawn by S. Newman.

each with a separation of $\frac{3}{4}$ of an inch between sections. This space will serve for the tickler-shaft bearing.

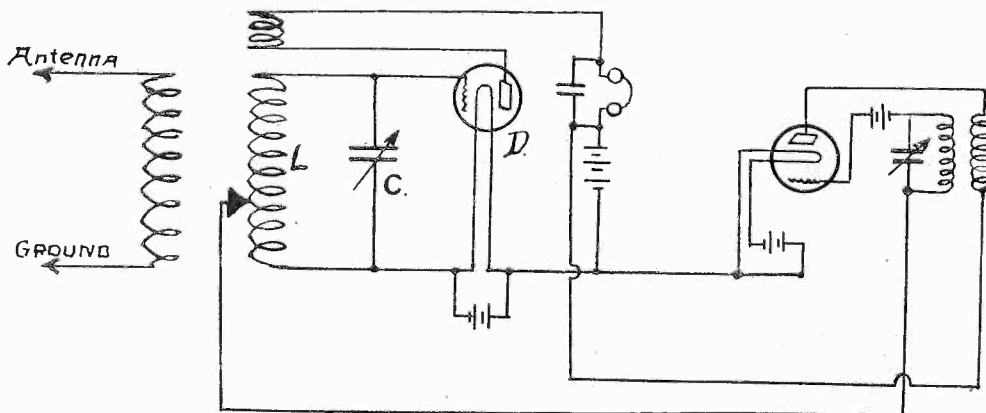
The tickler comes next. It consists of a tube 3 inches in diameter and $1\frac{1}{2}$ inches long. It is fitted with a brass rod, which serves as a shaft for its rotation when placed inside the main inductance-coil. The winding consists of 2 sections with a separation of the sections $\frac{3}{4}$ of an inch wide. This tickler winding is coupled to the winding just described and serves to feed back the energy from the plate circuit.

The next piece of apparatus required is a variable condenser, .001 mfd. It is used in the antenna circuit and is valuable for fine tuning impossible with the inductance taps alone. The only equipment needed now is the usual tube apparatus.

Generally when using the regenerative or tickler coil method, the radiophone station denotes its presence by a whistling sound as the tuner is varied. By moving the tuner back and forth over the entire range of wave lengths, whistling sounds may be detected at certain points. Then the tuner is finally adjusted so as to get in between these whistling points or sounds, where there is a silent zone. It is in this zone that the radiophone music or talk is heard. At other times, these whistling sounds are due to continuous waves or undamped wave-transmitters which, like the radiophone, make use of the same kind of waves and, therefore, have the same characteristics. All regenerative sets are delicate to operate for the regenerative effect and give rise to all kinds of noises. Furthermore it is necessary to use metallic shields between the operator and component parts of the regenerative set, since the capacity of the body of the operator affects the delicate adjustments.

Tested Invention of Major Armstrong Amplifies Set 100,000 Times

By John Kent



As will be seen from the schematic diagram Major Armstrong's unusual result is obtained by the addition of a second tube to the detector tube and connecting this second tube so that it acts as an automatic switch automatically cutting in and out a few turns of wire on the secondary inductance. The ordinary Armstrong regenerative circuit is used as the basis for the new circuit, the plate circuit of the "switch tube" being connected to the plate circuit of the detector tube through suitable inductance and capacity. The grid of the second tube is inductively coupled to its plate circuit. In this way the variation is introduced into the positive resistance of the tuned circuit. This is done by means of an oscillating tube (the tube at the extreme right), the grid circuit of which is connected through the tuned circuit L-C of the amplifying tube D. L is inductance and C the capacity. Drawn by John Kent.

BEFORE a crowd of radio engineers, radio amateurs, and plain radio fans that filled to overflowing the auditorium set aside for the regular meeting of the Institute of Radio Engineers in the Engineering Societies Building, Wednesday evening, June 7, Major Edwin H. Armstrong divulged for the first time his second revolutionizing contribution to radio science—the Armstrong super-regenerative circuit.

With a directness and simplicity that appealed to those in the audience who were not learned engineers, Major Armstrong commenced at the lowest rung of his ladder of research and carried the work, step by step, to the final result after which he demonstrated the circuit by comparison with the standard regenerative feed-back hook-up. Using a 3-foot, 12-strand loop aerial pointed for WJZ, Newark, N. J., the young inventor demonstrated his invention which, under test, has proved that it can amplify radio impulses 100,000 or more times. Signals which could barely be heard with a two-stage regenerative set, filled the room and reverberated back and forth when his new two-tube circuit was substituted. At the close, the audience showed its appreciation of the marvelous work by prolonged applause that left no doubt of their admiration for its inventor.

During the course of his explanation, Major Armstrong described in great detail the three principal methods

which he has devised to accomplish superregeneration. After describing the struggles of amateur experimenters with regenerative circuits, during which they had attempted to find a way to prevent the vacuum tube from sliding over into the oscillating state as the regenerative coupling was increased Major Armstrong stated that unlimited regeneration could be accomplished if these oscillations could be prevented. While working on the problem himself he had resolved the problem to one of varying the positive resistance of the circuit while holding the negative resistance constant. Other methods of accomplishing the same result could be secured by varying the negative resistance as the positive resistance was held constant or by varying both negative and positive resistance in regular cycles but with the average negative resistance always greater than the average positive resistance. The accompanying schematic diagram embodies the condition of varying the positive resistance while holding the negative constant.

Heretofore, the most powerful amplifier had an increasing power of 5,000. With Major Armstrong's invention in use, an amateur with an or-

dinary receiving-set will be able to pick up the faintest broadcasting of Europe or the Orient. Major Armstrong calls his invention a "super-regenerative circuit"—perhaps the most important addition yet made in radio equipment. He outlines its possibilities in his own words:

"A brief way to describe the super-regenerative circuit," says Major Armstrong, "is that one vacuum tube is made to do the work formerly done by three. It has been shown, for several years, that the limit of amplification is reached when the negative charge in the tube approaches the positive. In experimenting, I found that it is possible to increase the negative charge temporarily, for about one-twenty thousandths of a second, far above the positive, and still keep the average down. It is the possibility of increase which permits the enormous amplification which I have demonstrated and enables me to eliminate two tubes from the circuit.

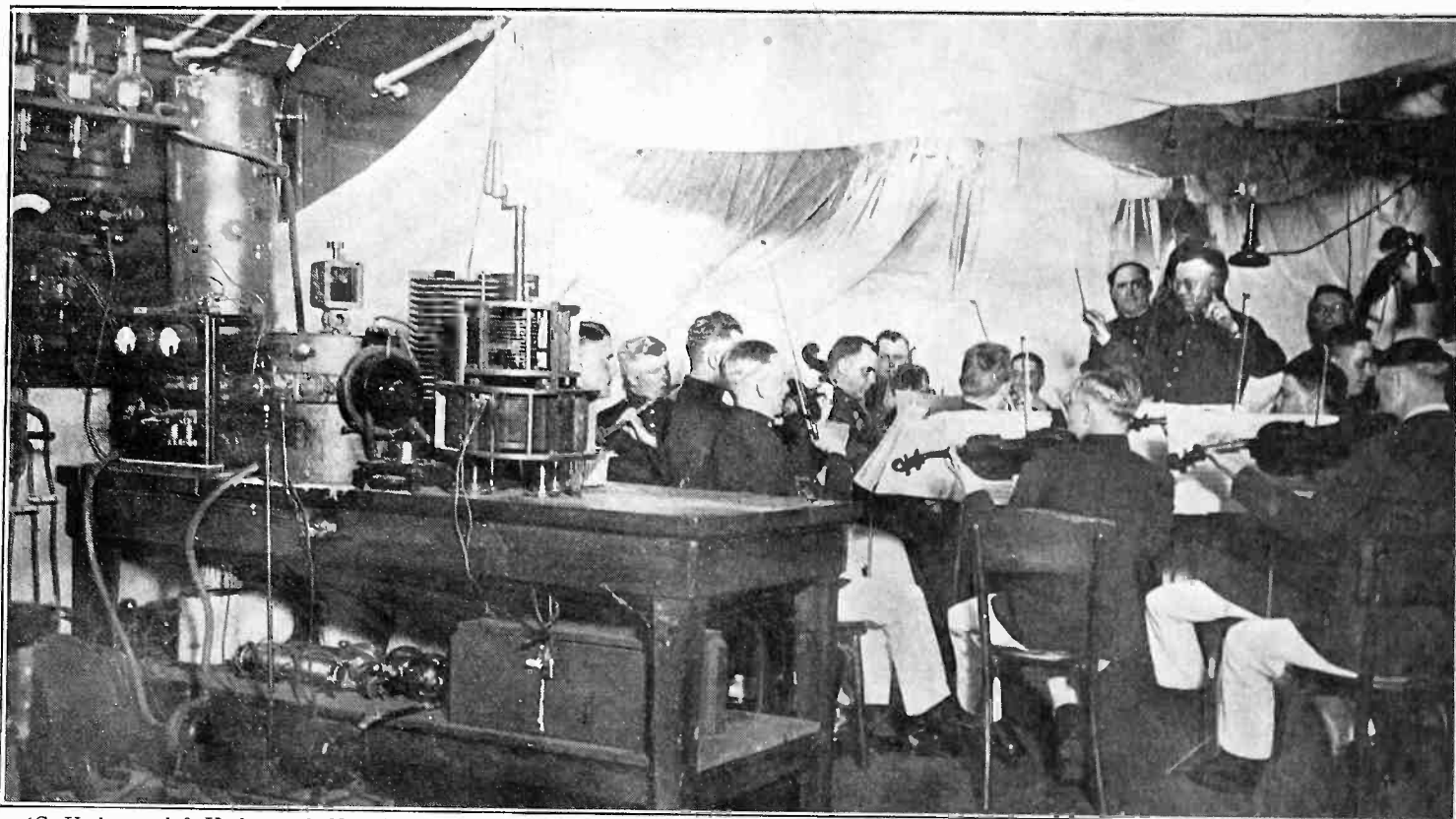
"Another practical result of this circuit will be the ability to detect wavelengths under two hundred meters with ordinary amateur-sets. In the past, short wave-lengths were undistinguishable for small sets. Now that the range under two hundred meters is available for the broadcasting stations, the cost of operating will be lessened. To illustrate the difference between a receiving set equipped with the super-regenerative circuit and the ordinary set, I have found that the signal which can just be heard with a simple regenerative-circuit, at the most critical zero point, can be heard all over the room with the super-regenerative circuit."

The new instrument also enables the amateur to get along well without an outside aerial without spending any more for his equipment than he spends now for an outfit with the aerial. The outfit with the super-regenerative circuit may be manufactured for the same price as equipment requiring the cumbersome outside aerial. Receiving outfits with outside aerials have been in use for some time, but they have been too costly for many amateurs.

Major Armstrong's invention is a very important step in the development of radio. He has a number of inventions to his credit, particularly the radio-audion and the superheterodyne. Major Armstrong experiments in the Hartley Research Laboratories, Columbia University, New York.

Invention is the most constructive force in our economic life.—Miller Reese Hutchison.

Two Millions Heard this Band Play



(C. Underwood & Underwood, N. Y.)

Have you heard the United States Marine Band play for radio fans? It not, listen in any Wednesday night. This famous musical organization plays by permission of Edwin Denby, Secretary of the United States Navy. Anacostia Naval Station does the modulating on 412 meters, between the hours of 8:30 and 9:30 p. m. The concerts are directed by Captain William M. Santelman, and continue for over an hour. The illustration shows the band section of the interior of the United States Broadcasting Station at Anacostia, D. C.

Repairing Cranks in Hard Rubber Storage Battery Jars

By W. S. Standiford

STORAGE batteries are in extensive use for both automobile and radio work, the best ones being enclosed in hard-rubber containers. It frequently happens that such a jar gets cracked, is rendered useless, and must be thrown away. The writer has found out that such a course is not necessary, as a repair job may be done which will prove satisfactory.

Proceed as follows: Take a three-cornered triangular-shaped file, and file the crack to a V-shape, making the widest opening face towards the outside surface. Next, get an old-style wax Edison cylinder phonograph-record and cut a stick, lengthwise, out of it. Take your hot soldering iron, place the box on its side, and, holding the material over the crack, run it into the fracture. The hot iron will operate nicely and permit neat work. When cool, the break is repaired.

Should one of these old-style records be unobtainable, a filling mixture

can be made by melting together a compound composed of 50 per cent paraffine wax, 25 per cent bees-wax, 100 per cent rosin, and 5 per cent sulphur. The above will give good insulating and sealing results and stand acids. If a person does not care to mix the formula and desires to use something simpler, some of the automobile tire cements for patches as well as a ready-prepared dough, sold in cans, will do very nicely. It is best, in all cases, to widen the crack at its top so as to get a lot of cement in; as it holds better while the battery is in use.

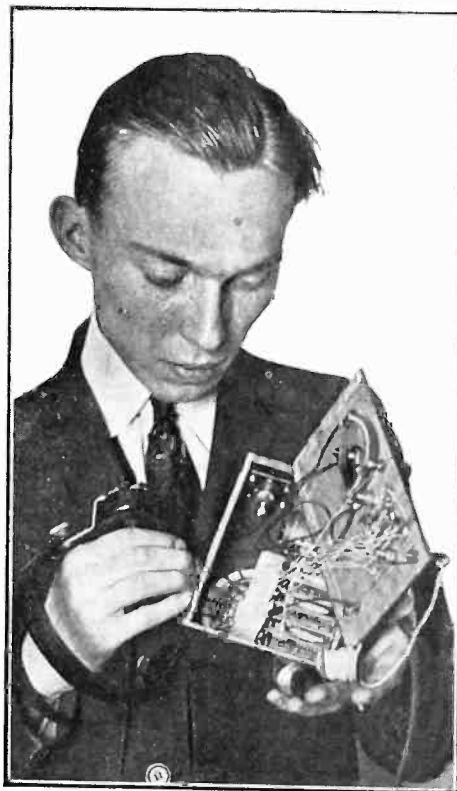
Radiolets

With the radiophone in receptive mood, all the family quarrels may be enjoyed by the neighbors without putting ears to the walls or opening the windows.—“Topics of the Day.”

* * *

What we may expect to hear next: “I am returning your coin. The air is busy,” or perhaps, “Say, operator, you gave me the wrong wave length.”

Vacuum-Tube Pocket Set Wins First Prize



(C. Kadel & Herbert)

Sterling S. Sears has won first prize at the New York Radio Show for the smallest vacuum tube set. It has a range of 75 miles. The set is about as large as a book and weighs less than half a pound.

Photograph Sent by Radio from Italy to United States in 40 Minutes!

"The World," of New York, in its issue dated Sunday, June 11, offers evidence of an extraordinary feat of modern science—the transmission by wireless telegraphy of a photograph from Rome, Italy, to Bar Harbor, Me., and its reproduction in New York. RADIO WORLD is permitted to republish in part this article through the courtesy of "The World" and Mr. Arthur Benington, its author.

THE process by which this "miracle" was performed is the invention of Dr. Arthur Korn, professor of electrophysics at the Berlin High School of Technology. Tests of it that have been under way between his laboratory at Centecello, a suburb of Rome, and the United States Navy Radio Station at Otter Cliffs, Bar Harbor, were announced in *The World* of May 6, and now *The World* reproduces a photograph actually sent in the same way and over the same route.

When this photograph was "filed," at Rome no one in America had ever seen it. Forty minutes later it had been picked out of the ether on the Maine coast by Chief Radioman Edmund H. Hansen, U. S. N. From Bar Harbor to New York it had to be transmitted by mail, but from Rome to New York less than twenty-four hours elapsed.

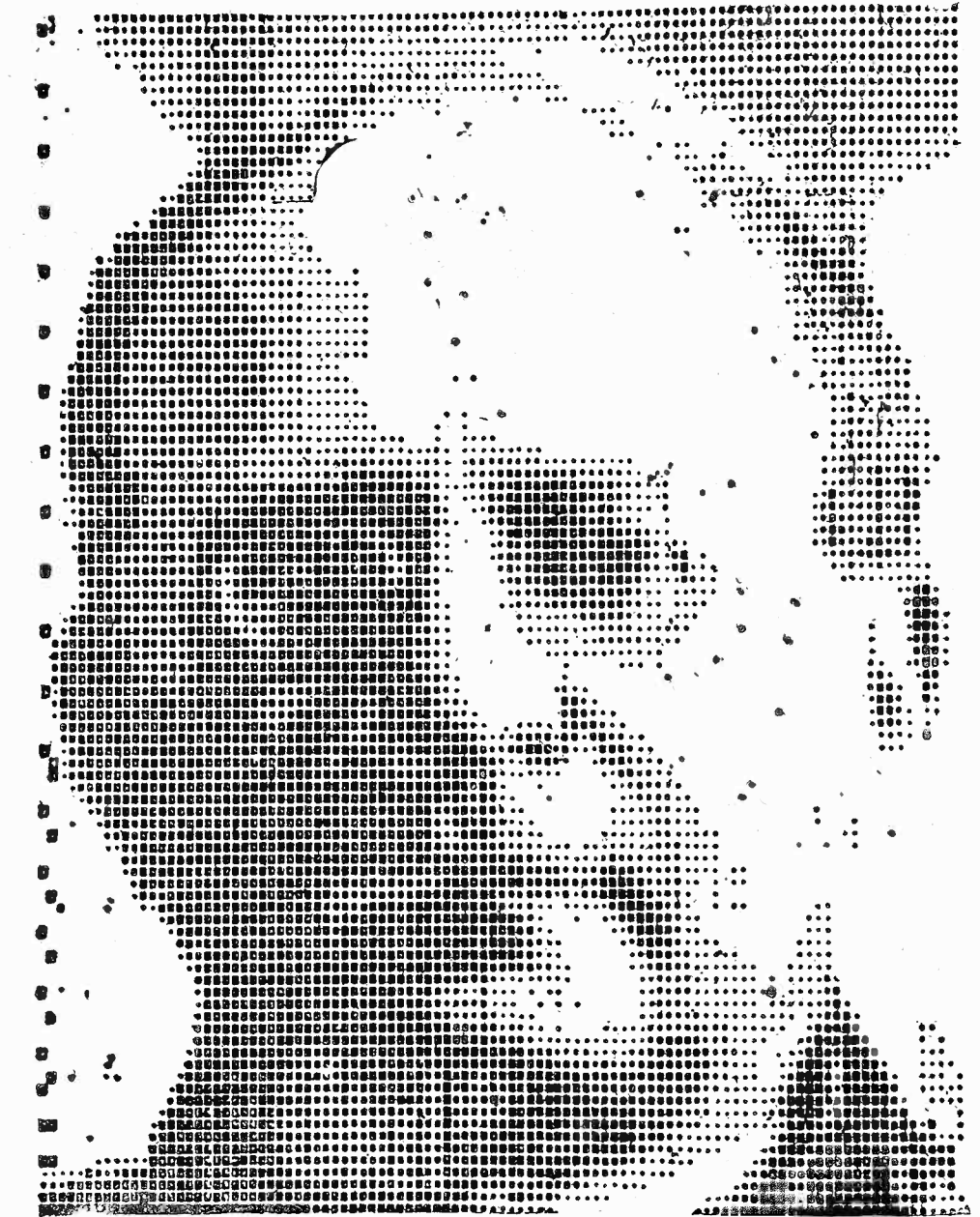
The result of the experiment is far from perfect, but it points the way to an achievement that seems now to be in the near future. Over shorter distances and under more favorable conditions pictures have been transmitted and reproduced with surprising clarity of detail. The picture produced herewith is evidence that the basic method is sound and that with refinements of the mechanical processes and certain elaborations of their use the time soon may come when pictorial records of events will be available as speedily and as accurately as descriptions of them already are.

The larger of the pictures appearing on this page was photographed directly from the "translation" made at Bar Harbor by Chief Radioman Hansen of the message sent from Rome. The original measured 7 by 9½ inches, so that the reproduction here was reduced not quite one-third. It portrays vividly the method used. The smaller picture is this same photograph of the "translation" reduced to standard one column size.

Two years ago, *The World* amazed its readers, and especially the great scientists, by transmitting photographs by telegraph between New York and St. Louis. This was made possible by its use of the apparatus invented by Edouard Belin, the French electrical engineer, whom it brought from Paris just to make this demonstration. Last fall it again astonished its readers by printing autographic reproductions of messages signed by Premier Briand of France and Gen. Pershing sent by wireless from Paris, also by the Belin method.

This latest feat, however, is by an entirely new and distinct process. Dr. Korn had invented and carried to some degree of perfection a method of transmitting photographs by telegraph before the war. Terms had been arranged with several countries when the outbreak of hostilities brought these to an end.

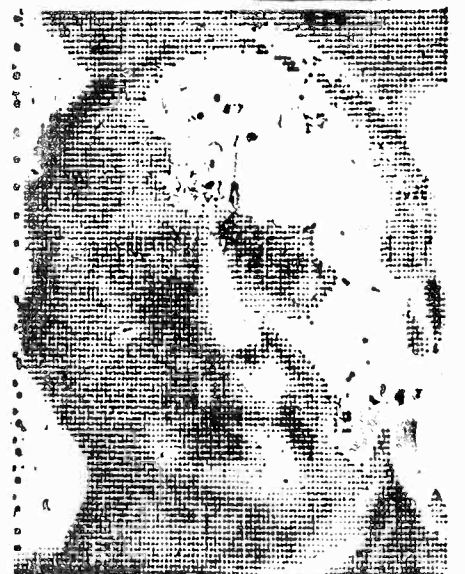
When the war was over, Dr. Korn found it impossible to get the financial backing he needed for his final experiments. He went to Italy and interested some wealthy men in his invention, with the result that it was



Photograph sent by radio from Rome, Italy, to Bar Harbor, Maine, reduced from the print in the New York "World." The large reduction is less than one-third of the original radioed copy. At the lower right is a reduction made to the standard newspaper one-column size. This is one of the most remarkable radio achievements of the day. It is only the crude beginning of what may be expected in this still undeveloped science. There are only two sets of Dr. Korn's apparatus in existence. One in Germany, the sender; the other in his laboratory in Centocelle, near Rome. The receiving, or decoding, instrument is in America.

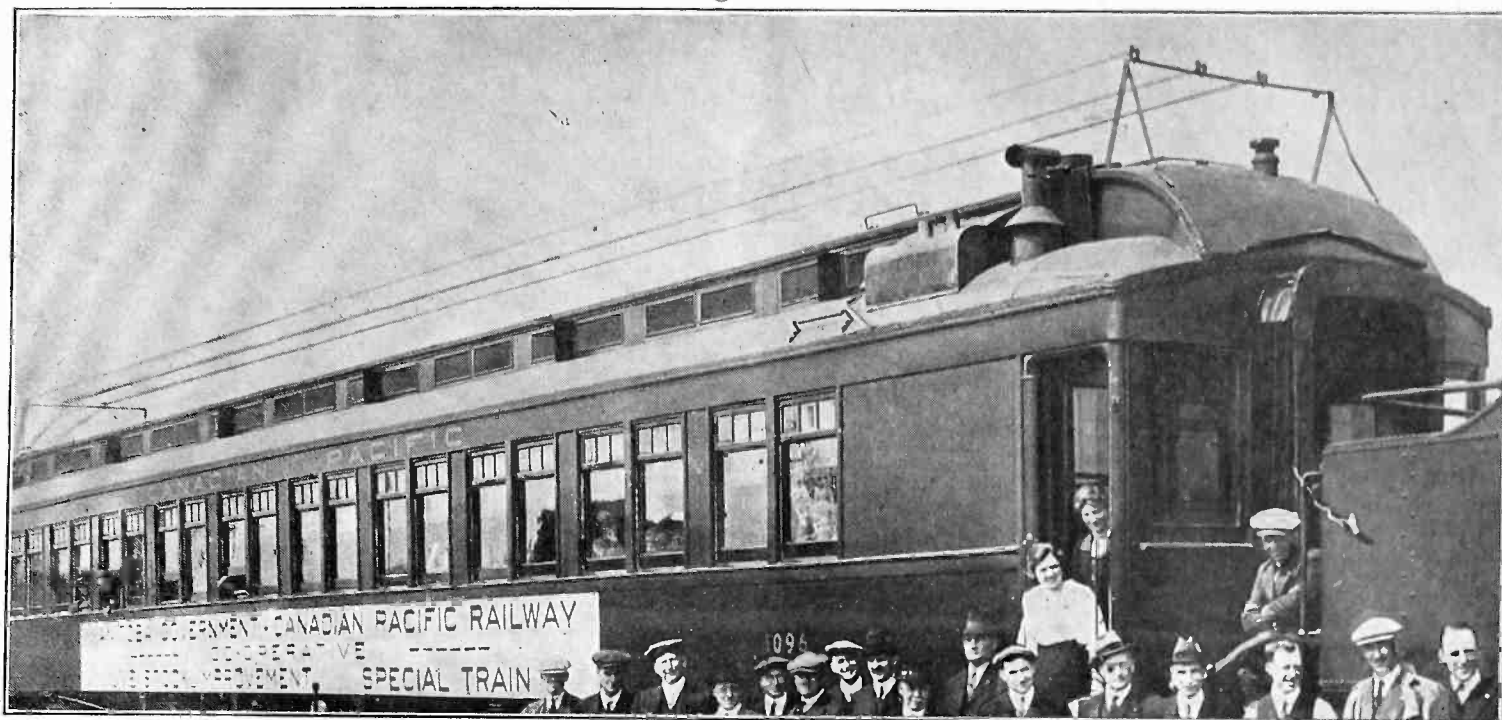
completed in Rome and a company organized. This is called the *Sindacato Italiano Invenzioni e Scoperte* (Italian Association for Inventions and Discoveries) and has acquired the patents taken out by Dr. Korn. Commendatore Francesco Pascale, an Italian Senator, is President and General Manager.

It was through Commendatore Pascale that *The World* was enabled to secure the picture reproduced herewith. Much more than this alone was required, however, for



the receiving machine now at Otter Cliffs was there by reason of tests being made by the Italian Admiralty with the co-operation of the United States Navy Department. Official permission was necessary from these two and last week it was granted.

Canada's First Radio-Equipped Train



The Canadian Pacific is the first railway in Canada to install radio on its trains. Travelers on the livestock train of seventeen cars now touring the Province of Manitoba will receive from Winnipeg headquarters concerts and all important news of the world as they proceed on their itinerary, even to the remotest rural places. Two Marconi representatives and a radio machine accompany the train to insure successful working of the apparatus. The livestock-improvement train is equipped and maintained by the Canadian Pacific Railway. The project is backed by the Dominion Department of Agriculture, the Agricultural College, the Livestock Exchange, the packing companies and the Cattle Breeders' Association of Manitoba. It will tour the Western Provinces in the interests of better farming and particularly to encourage the breeding of higher-grade and more profitable livestock. The illustration shows part of train with the radio apparatus at both ends of a coach.

Hook-ups *By Albert P. Taylor*

WERE you tuned in when John C. Freund, editor of "Musical America," gave that great talk of his from WJZ? Said a lot of homely things, didn't he? But it hit the nail squarely on the head. Maybe there is some music "made in America" that we don't care to blow about; if there is, it hasn't been riding on a 360-meter wave. We noticed what he said about his age—eighty, and about "music in the home." Recommended radio as a means of bringing it there (the music, not the age.) A man of his years has sure seen some new things spring up. Well, we think there will be a lot to see yet in the radio field. Wish somebody would show a picture of the youngest and oldest tuning in. Age don't count in this business.

Uncle Sam is a few meters ahead of the fans across the big pond. It isn't all their fault, though. Most of the governments over there haven't given them the leeway, so people there didn't have such programs handed out to them every day, and most all day, like we do. Reckon it will be different soon because we sent some fellows over there to hold a confab with them. That gave us a fine chance to tell them some things about the doings in wireless on this side. Most of us don't realize where we have jumped to, so suddenly, in radio. Let's keep there, too.

We've got to decide on a language to use when those big wireless-telephony stations swing into the ether, for they will be located in several different countries. If they each talk their home dialect, there'll be some folks won't understand a thing, no matter who's talking—Spaniard, Italian, French, or Englishman. We hear some fans are trying to learn Esperanto. If they use that the whole crowd will have to pitch in and study. There's a few of us understand English (fairly well), probably more than would understand any of the other languages. Now somebody's got to learn a new brogue, so why not let the other fellows do it?

A fan in our New York State wrote from his farm to a farm journal about his experience listening in to WJZ and KDKA. He says he makes use of the crop reports and the weather jokes. Always gets his time correct, too, even if he does have to sit up late for a daylight-saving farmer to get it. He tuned in to hear the Shady Avenue Church services, though he isn't much on church, he writes. Thought that was fine! Enjoyed the sermon as well as the music.

We got a phonograph with a lot of spunk. Rigged up a contraction so as we could use the thing as a loud speaker. At first it worked fine. That was "Bedtime Stories." Then they put on some records and the blame thing struck! Won't receive second-hand phonograph stuff. 'Spose that's temperament.

Some trains have added receiving sets to make the passengers forget their troubles. Where the road-bed is rough, or the fat man in the upper ten snores so loud you can't sleep, just tune in the set in your car and turn madness into joy. Again it may be that lady behind you "loud speaking" her mind to the small boy. When you get tired of it, amble up to the set and tune in!

Station WWI will give the autobiography of the "flivver." Yes sir, Henry Ford is going to reveal the secrets in the darkest closets of the popular heroins. Really the Ford is the "crystal set" of the automobile world. Now it would be a nice thing for every owner of a "Lizzie" to drive her up to the window, so she can listen to her master's voice.

Crystal D. Tector, in her interesting department in RADIO WORLD, made an observation that startled us. Is it possible that pipes and cigarettes are to fade out when any polite receiving sets are around?

Radio Will Carry Wisdom to the World's Remotest Ends. —Tesla

The Radio Primer

For the Beginner Who Must Have Radio Rudiments Put Plainly and Tersely, and All Terms Explicitly Explained

The Beginner's Catechism

By Edward Linwood

WHAT are the essential features of construction of the audio-frequency amplifying transformer?

The audio-frequency amplifying transformer consists of an iron core around which are wound several thousand turns of fine insulated wire. The windings are in two parts, the primary and secondary.

* * *

What is meant by the terms, Primary and Secondary?

These words are used to designate the two windings of the transformers. The primary winding is the winding into which the current is fed. The secondary winding is the winding from which the transformed current is taken.

* * *

How is the iron core made?

The core is made up of a large number of thin sheets of a special iron arranged in a square or rectangle, thus forming a complete path for the magnetic force which is produced in the iron when the primary of the transformer is connected to a source of electricity.

* * *

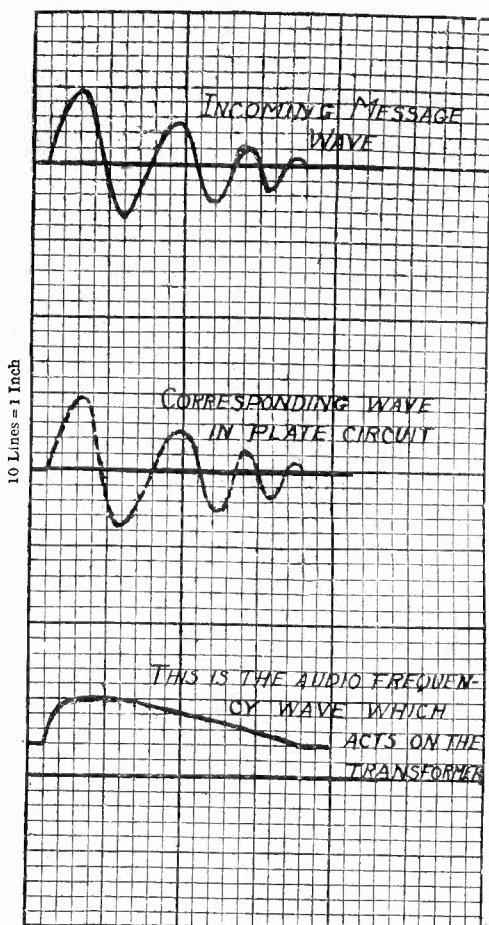
What makes necessary the use of thin sheets? Why cannot iron rods of the correct size be used?

Very small currents which pass around and around in the iron, heating the iron and causing a loss in efficiency, are present when a solid core is used. Particularly if the iron contains impurities, these eddy currents, so called, must be reckoned with. By making the core of thin laminations the effect of the eddy currents is greatly reduced. When it is considered that the loss in energy from eddy currents increases with the square of the frequency, and that, in radio work, the frequency often rises to 3000 a second or more, the desirability of keeping the eddy currents within limits is easily appreciated.

* * *

How are the windings proportioned between primary and secondary?

The "ratio of transformation," as the relative proportion of turns is called, varies in audio-frequency transformers from 2 to 1 up to as high as 10 to 1, meaning that there are up to



Graph showing the three curves, which indicate how the incoming wave acts on the transformer. The first is the incoming wave. The second is the wave on the plate circuit. The third is the wave acting on the transformer. Suggested and drawn by Edward Linwood

ten times as many turns of wire on the secondary as on the primary.

* * *

What determines the proper ratio to use?

The design and operating characteristics of the vacuum tubes in use. To be of the highest efficiency as an inductive coupling between amplifier tubes, the primary and secondary windings should take into consideration the

The Radio Primer has been published regularly in RADIO WORLD since issue No. 1, and will be a regular department in order to instruct and aid the many thousands of amateurs who are joining the ranks of radio enthusiasts every week.

impedance of the two tubes connected into the circuit.

* * *

What is the function of these transformers?

To change the audio-frequency variations in the plate circuit of the detector tube, for instance, into similar but greater variations in the grid circuit of the first amplifier tube. As a potential on the grid determines the strength of the signals heard by means of phones in the plate circuit, the transformers make it possible to strengthen greatly these signals by increasing or boosting the potential impressed from the plate circuit of one tube onto the grid circuit of the next.

* * *

In building a set at home is it advisable to attempt to construct one's own transformers?

No, because of the many uncertainties which must enter into such designs. You have no way of knowing the permeability of the iron sheets. You are not certain that the core is correctly proportioned and the best methods of interconnecting the coils of primary and secondary are always in doubt. The average amateur will have sufficient trouble in maintaining a cascade amplifier set in perfect operation with purchased transformers, without adding to his woes with poorly assembled, inefficiently designed apparatus.

* * *

What is the principal trouble encountered in the operation of amplifiers?

Howling between the stages. If the transformers are placed too close together the magnetic leakage, caused by lines of force escaping from the core into the air, passes from one transformer into the next and destroys the electrical balance. As a result the circuits are placed in a state of unbalance resulting in a series of screams and screeches in the phones.

* * *

Is there any way to prevent this trouble?

Howling from magnetic leakage can be prevented by spacing the transformers four or more inches apart and at right angles to each other. The same effect is gained by enclosing each transformer in a complete covering of metal. When this is done the vagrant lines of force pass into the metal which should be grounded, rather than into the iron core of the nearby transformer.

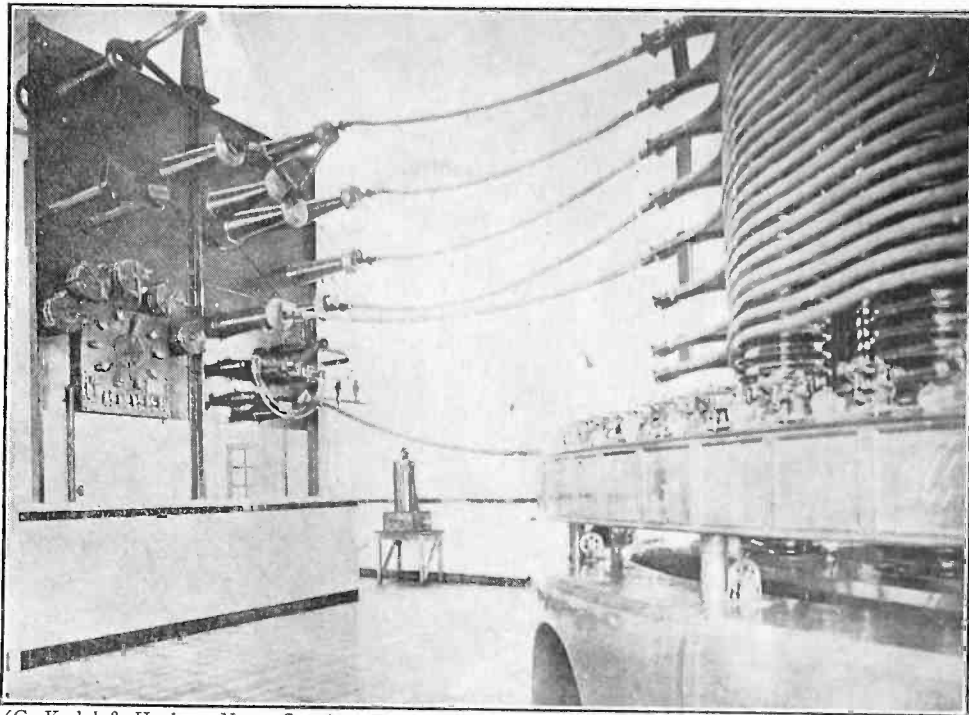
U.S. Radio and Look-out Station, 11,250 ft. above Sea Level

Interior of the World's Largest Radio Station



(E. C. Underwood & Underwood, N. Y.)

It is situated on Mt. Hood, Oregon, to locate forest fires.



(C. Kadel & Herbert News Service.)

The powerful, well-equipped station at Lafayette, near Bordeaux, France, built by the United States Navy to facilitate America's part in the World War and since sold to France for trans-Atlantic communication. In Radio World, May 13, No. 7, an illustration was shown of the towers and building where messages are transmitted 4,000 miles. The above illustration is an interior view of the large inductance coils and various high-tension insulators whereby messages must be sent through in order that they may be conveyed to the huge antennas strung from the mighty towers. This station is now challenged for first place by the commercial station at Port Jefferson, Long Island, New York, which, if it is not now more powerful, will be when additional units are added. Radio waves are transmitted from the Bordeaux station on a wave length of 23,000 meters, approximately fourteen miles. Radio communication is now established between this station and that of the Radio Corporation station at Port Jefferson, Long Island, New York.

Radio World's Revised Radio Dictionary

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

B. Battery—A high-potential (high-voltage) battery connected to the plate of a vacuum tube.

Battery (storage)—A battery which may be charged and discharged repeatedly. Such batteries are charged by connecting them to a source of direct current.

Battery Charger—Usually a device which changes alternating current to direct current, so that it may be used to charge a storage battery. Frequently referred to as a rectifier.

Bakelite—Trade name for an insulating material used in the form of panels, plates, tubes, and rods.

Ball Type Variometer—A variometer, the coils of which are wound upon a spherical form.

Bobbins—The little spools in the telephone receiver that hold the fine wire on which the diaphragm rests.

Bulb—Vacuum-tube detectors and amplifiers are often called "bulbs."

Brush Discharge—The brushlike appearance of luminous rays diverging from a pointed electrified body.

Broadcasting—The sending of intelligence either by radiotelegraphy or radiotelephony, from some central point for the benefit of a number of receiving stations located within the range of the broadcasting station. Also, a radiotelephone station used to send forth music and other entertainment for the public.

Capacity—Extent of power to contain or hold. Electrical condensers are able to hold a certain amount of electric current in the form of electric static-charges. The changing of the capacity of a wireless circuit always brings about a change in the wave length. The unit of electrical capacity is the farad; but the farad being too large for practical radio work, the microfarad is used. The abbreviation is generally used as MFD., meaning microfarad.

Cascade Amplification—When several vacuum tubes are employed, which refers to high amplification, sounds or waves are amplified as they pass on from one tube to another many hundreds of times. Thus we may speak of a two-step amplifier as a cascade.

Change-Over Switch—A switch used to disconnect and connect the transmitting set from the receiving set. In other words, a switch with two poles and a double throw. The central points of the switch are connected with the aerial and

the ground. When the switch is thrown in one direction, the receiving instruments are connected to the aerial and ground. When it is thrown in the opposite direction, the transmitting instruments are connected to the aerial and the ground.

Compass Radio—A radio receiver by which the direction of a sending station may be determined. The aerial, which is in the form of a large coil, or "loop," is turned on its axis until the maximum energy is received.

Condenser—Two or more conductors separated by an insulating substance. A condenser represents electrical capacity. An electric current may be stored in a condenser.

Continuous Wave—A wireless wave that does not "damp" or fade out. All waves are of the same size. Continuous waves are usually referred to as C.W.

Coulomb—The unit of electrical quantity. The amount of electrical energy that passes a given point in a circuit when a current of one ampere flows for one second.

Coil (Spider Web)—An inductance coil used in radio, wound flat like a spider web.

Coil (Tickler Special)—Coil used in radio receiving circuits of the regenerative sets.

Radiograms

THE DEPARTMENT OF AGRICULTURE WILL BROADCAST weather, crop and market reports daily from Arlington and Great Lakes wireless stations of the Navy Department. W. A. Wheeler, in charge of the work, says: "This makes possible the receipt of agricultural reports by radio through virtually the entire United States, and is the most important step of its kind in the radio world."

THE SAME INSURANCE IS NOW PLACED ON RADIO AS ON ELECTRIC LIGHTING. Contrary to prevalent opinion that the installation of radio increases the rate of insurance, the Suburban Fire Insurance Exchange, maintained by the leading fire insurance companies, announces that radio installation is considered in the same class as electric wiring which has no effect on insurance rates in most states.

IN CANADA, THE AMATEUR IS TAXED \$1 for all experimental radio sets. Over 400 licenses have been granted by the government.

A BROADCASTING STATION ERECTED AND MAINTAINED BY POPULAR SUBSCRIPTION is planned by the University of South Carolina, Columbia, S. C. It is expected to raise \$12,000 in \$1 donations.

SOVIET RUSSIA WILL SOON HAVE A RADIO STATION CAPABLE OF TRANS-ATLANTIC SERVICE. This news is sent out by the Posts and Telegraph Department. The station, to be erected at Bogorodsk, near Moscow, will be one of the most powerful in the world. Its towers will be 900 feet high, 300 feet higher than the famous towers at Nauen, Germany. The power will be 500 kilowatts. Russia now has thirty-eight sending stations and 290 receiving stations.

WITH A POPULATION OF ONLY 120, Tristan da Cunha, the British island in the middle of the South Atlantic, will have a radio station. Its population is mostly descendants of Napoleon's St. Helena guards.

THE HOLY BIBLE WILL BE BROADCAST by the Westinghouse Company from Newark, N. J., (WJZ) as a part of its daily broadcasting service. This will be done to increase the interest in scriptural literature.

SUCCESSFUL TESTS HAVE BEEN MADE WITH RADIO FOR GUIDING AIRPLANES IN FOGGY WEATHER at Croydon, the aerodrome terminal in London. An operator on the ground is able to tell the pilot of the airplane into which section of the aerodrome he can make a safe landing and the exact moment when he may descend.

OVER 600,000 RECEIVING STATIONS IN THE UNITED STATES! This is the estimate of experts. The output of manufacturers only marks the limit to which receiving stations will go.

THERE ARE TEN TRANSOCEANIC STATIONS OPERATING IN THIS COUNTRY. And American ships to the number of 2,783 are carrying radio and are listed as ship stations—nearly four times the number of ships listed as radio carriers before the World War.

TO MAKE BRITISH BROADCASTING SELF-SUPPORTING, the British Government believes that one special agency should be licensed to broadcast, and that, through the post office, all receiving stations should be licensed. This is declared necessary to insure a high-class program of entertainment.

IT IS AMAZING TO REALIZE THAT 305 BROADCASTING STATIONS licensed by the United States Department of Commerce are now in full operation. This should keep all radiophone owners up to the minute on all the latest news of the world.

"SPIRITISTS MAY BE HIGH FREQUENCY RADIO RECEIVERS AND NOT KNOW IT," asserts Professor William C. Ballard, professor of electrical engineering, in charge of the department of electrical communications of Cornell University. Radio, heat, light waves, and the waves of the X-ray he explains, are all of the same kind—electro-magnetic—but

Radio Set in Safety-Razor Box



(C. Kadel & Herbert News Service)

Many attempts have been made to build a miniature radio set that will actually work, but few have operated successfully. Sidney Kasindorf (in photograph) after a great deal of experimenting, has made a radio set in a safety-razor box that is unusually unique. From his home in the Bronx, N. Y., he can hear WJZ, Newark, distinctly. His set, which is very small, consists of a variable condenser, tuning coil and a crystal detector. A buzzer test adds to the efficiency of this boy's very interesting piece of workmanship. This would enable a person to carry this miniature receiving set most anywhere, and, with the proper equipment—such as aerial, ground and head phones—messages should be received.

in between the heat and radio waves is an unexplored range of frequency.

NEW JERSEY CLAIMS THAT HER PEOPLE HAVE TAKEN TO RADIO more completely than the people of any other State. Hundreds of New Jersey public-school children are actively engaged in experiments.

IN THE FUTURE PATRIOTIC EXERCISES IN PUBLIC SCHOOLS WILL BE ARRANGED BY RADIO. Amplifiers will be erected in assembly rooms and messages of the day broadcast to half a million pupils at one time. The day is not far off when the President of the United States, sitting in the White House, may send words of inspiration to the school children of America on special occasions.

FROM ALL QUARTERS INHABITED BY RADIO FANS come reports of much confusion caused by broadcasting stations that fail to sign their call letters more than once or twice during an evening's entertainment. The listeners-in are curious to know to whom they are indebted for their diversion. They have no means of finding out unless they should be on hand the exact moment the sender decides to sign.

IN SOME QUARTERS IT HAS BEEN FELT THAT RADIO WAS INVADING THE FIELD OF THE NEWSPAPERS. Statistics prove the opposite. The circulation of metropolitan newspapers has generally increased since radio news has been receivable.

A RADIO HONEYMOON IS BETTER THAN NONE. When Mr. and Mrs. Sherman Holt recently started for Europe, from New York, on their honeymoon trip, Mr. Holt, through a business meeting in Philadelphia, missed the "George Washington," which put to sea with his bride aboard. A radio message was sent to Mrs. Holt to relieve her mind. Meanwhile, Mr. Holt has taken a radio equipped room at the McAlpin Hotel, to keep in communication with his wife as long as possible.

Radio and the Woman *By Crystal D. Tector*

ONE New York radio merchant is taking time by the forelock and is building for the period when women will become potent factors as purchasers of radio equipment. He has placed an energetic and attractive young sales-woman in his radio department. He avers that the young woman in question is just as good a salesman as any of the males in his employ, and he believes that, eventually, when women will buy radio goods as they now buy butter or voile, he will be ready to take care of the new angle in trade. Which recalls an amusing incident told by the same business man. A woman came up to his radio counter and asked if she could buy a receiving set that would play all the leading jazz music. Her intentions were good enough and her interest in radio unmistakable, but somehow, she seemed to get terribly mixed in distinguishing between phonograph records and head sets.

* * *

Will it be easier, hereafter, hubby to occasionally cut out one of his week-end excursions to wifie and the kiddies in places far away from his center of business activities? That is to say, will the installation of radio sets in summer homes make solitary waiting and watching a little less irksome? I have just heard the story of a young married woman who has taken a bungalow at Rye Beach, N. Y., and whose first inquiry was not whether the plumbing was all right, or whether there were wasps in the eave. She wanted to know if there was an antenna connected with the establishment; and when she found there was, she signed the lease and now declares she isn't going to be lonesome no matter how late friend husband remains in town.

* * *

One enterprising Catskill Hotel proprietor is advertising the fact that he has equipped his ball-room with an expensive radio-outfit and that his guests may now enjoy the new pastime and science without any extra items on their bills.

* * *

You will remember that, some weeks ago, Ed Wynn, the man with the funny hat and face, radioized a part of his performance for the benefit of the general public. A young girl in the company, whose chief claim to fame is that she looks very well in an ensemble, asked Mr. Wynn if her name appeared in the cast of those who supported him in his broadcasting operations. When Mr. Wynn patiently explained to the young woman that he was the star of the aggregation she forthwith handed in her resignation. There is no particular moral to this story except that her resignation was accepted faster than it was tendered.

* * *

A high-school girl of Holyoke, Mass., is said to have received messages from a point farther off than have been covered by any other radio enthusiast in her town. She is now trying to reach across to the Pacific without the aid of relays. Can she do it? Those who know the resourcefulness and skill of this young girl declare that she will do it, if it can be done by anybody.

* * *

The daily papers occasionally print jokes aimed at the inaccuracy or utter ignorance of women on radio subjects. These jokes will, of course, have their run along with the mother-in-law, the flivver, and Conan Doyle's spiritistic near witticisms. But it looks just now as if Madame would soon show that her mental equipment is quite sufficient to encompass the difficulties of this wonderful radio game. Cartoonists, too, will also have their little fling at woman's presumption in believing that she can become mistress of a different science; but then cartoonists must have their fling and they might



(C. Fotograms, N. Y.)

Mrs. Oliver Harriman, president of the Camp Fire Girls, broadcasting a message to fathers and mothers telling how girls are developed by joining the organization of which she is the leader. Mrs. Harriman is speaking into an ordinary telephone with a horn, shaped of paper, attached to the mouthpiece. This helps to carry the minutest shades of her voice into the microphone of the transmitter, enabling perfect modulation of speech to be received.

just as well direct the slings and arrows of outrageous fortune at our weak flesh as at anything else that may catch their gaze.

Did you see in the columns of a Sunday supplement, recently, the picture of a baby carriage, a baby, a receiving set, and nothing else in the world that had anything to do with radio? It was a perfectly cute picture, but the mere fact that the baby couldn't possibly hear anything through the receiver as arranged on its little head evidently didn't bother the photographer at all.

Broadcasting, Old Verb

A London literary weekly says "broadcasting" is "a new word added to the language by wireless telephony," says a correspondent of the New York "World." Such a periodical should rather have referred with pleasure to the fact that the good English verb "to broadcast" has found apt employment for many years.

There is a popular hymn which thousands of Lancashire people sing at Whitsuntide, whose first verse begins, "Sow in the morn thy seed," and ends with "Broadcast it o'er the land." Reference to the Thesaurus confirms the fact that broadcast was already in the language, and suggests that in its place we might easily have been afflicted with one of its synonyms. "Widespreading" would have been as good.

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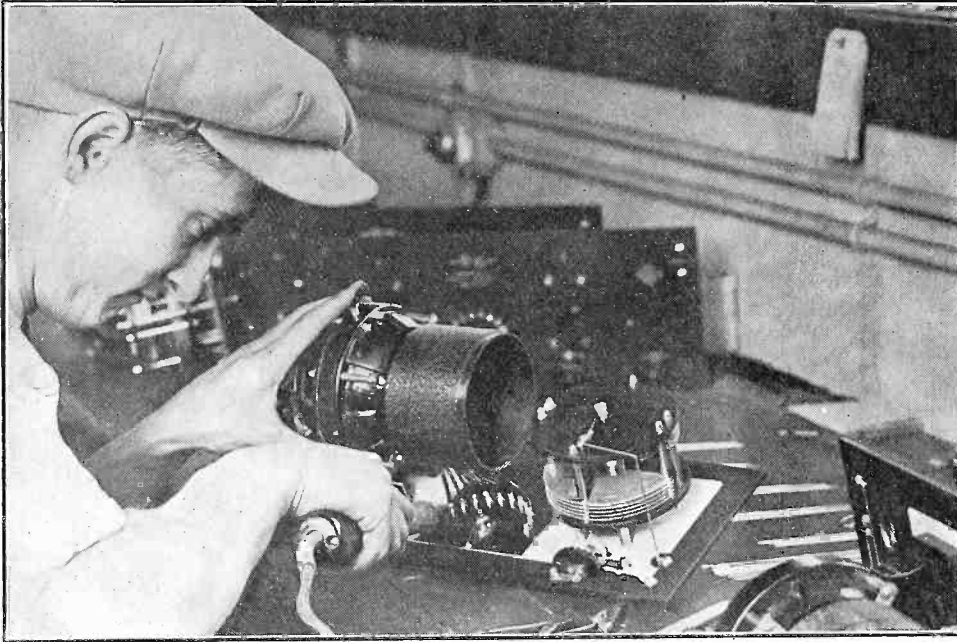
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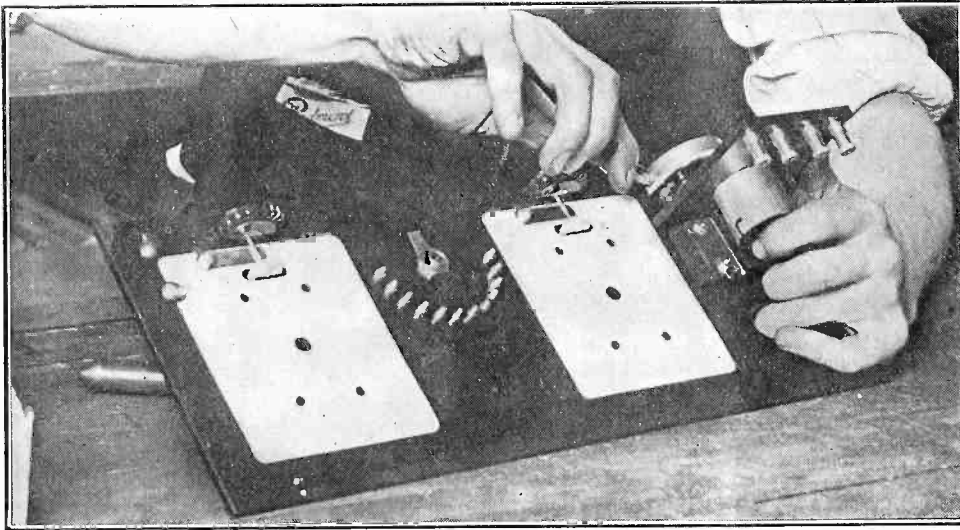
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Skill Required to Make Radio Sets



No. 1—Wiring a regenerative receiver.

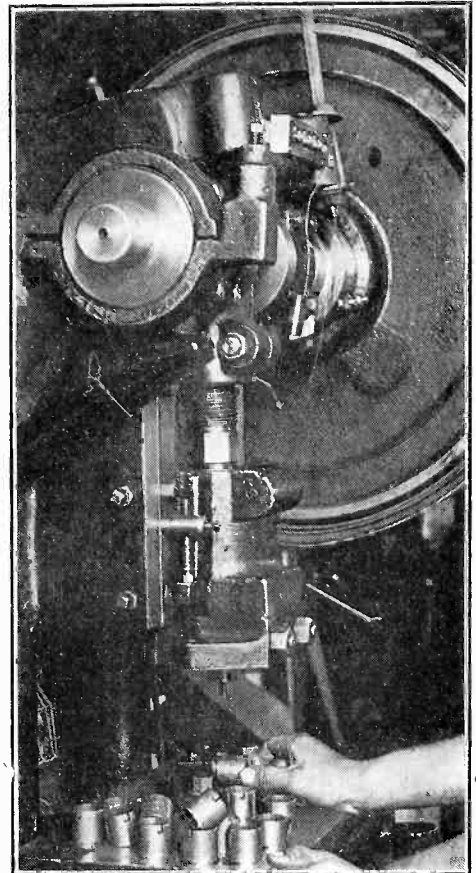


No. 2—One of the important assembling tasks.



No. 3—Testing the completed receiver.

(The four photographs on this page copyrighted by Ewing Galloway, N. Y.)



No. 4—A vacuum-tube slotter.

The Photographs Described

No. 1—Wiring a regenerative receiver. This is one of the final operations before the receiving set is ready for the test. The wireman must complete the circuits from one unit on the panel to the other. Note the short lengths of wire lying on the table. These wires are cut to size and fit into place in the receiving set.

No. 2—One of the assembling tasks. This man is assembling minor parts on the main panel. When the apparatus has reached this stage it is recognized as a radio receiver. It is at this point that all the smaller parts are mounted onto the main panel and made ready for the wireman.

No. 3—Testing the completed regenerative receiver. Each instrument must be tested for mechanical as well as electrical defects. Whether the instrument shall be sent back to the wireman or the assemblyman depends on this man's verdict.

No. 4—Slotting the vacuum-tube sockets which provide a locking device for the tube. This automatic machine is a new type that came into use with the quick growth of radio manufacturing.

THE men and women employees in the various factories now turning out radio equipment are skilled and thorough workers. They must be; for the complete radio set is a complex affair—a machine of many intricate and perfect-working elements, all of which are turned out by the most up-to-date machinery and handled by craftsmen who see a great future in this new and prosperous in-

Radio World's Hall of Fame



(c. Underwood & Underwood)

DR. MILLER REESE HUTCHISON

One of the leading radio engineers of the country. Formerly chief engineer of the Thomas A. Edison interests, now president of Miller Reese Hutchison, Inc., vice-president of the Hutchison Office Specialties Company, and member of the Naval Consulting Board. He has a career along electrical lines, beginning with his eleventh year. Dr. Hutchison was born at Montrose, Baldwin County, Alabama, August 6, 1876.

(Continued from preceding page)
 industry. Many amateurs still prefer to construct their own sets; but, even so, there remain some parts that must be purchased—parts that can be bought cheaper than the amateur can make them.

Massive machinery is used in the great radio factories of the country.

A visit to one of these concerns will impress one that radio-manufacturing machinery is about as up-to-date and thorough as the machinery used in any other industry. This article is illustrated with photographs that prove this statement. The photographs were made in the plant of A. H. Grebe & Co., Richmond Hill, N. Y. They tell

more plainly than words what a high plane the industry has reached in its manufacturing field.

Machinery of the highest order is now being used in manufacturing radio sets. The interior of a big radio factory is a busy, hustling place, and the men and women employed are skilled to the highest degree of workmanship.

Radio Merchandising

National Radio Dealers Association Formed

Special to Radio World

CHICAGO, June 17.—One of the latest steps in radio activities was the formation, here, of the National Radio Dealers Association, with headquarters at 10 North Clark Street, and district offices in New York and San Francisco.

The original group comprised the commercial membership of the American Radio Association, about two hundred dealers. About four thousand radio dealers in all parts of the country have been requested to join by invitation.

The new association has been chartered under the laws of Illinois as a corporation, not for pecuniary profit, is registered in the corporation department of each State and has applied for a national charter. The purpose of the association is to protect and develop the commercial interests of its members, to co-operate with all radio bodies, and establish a definite policy to the buying public.

Plans were discussed for a national convention to be held in Chicago which will be composed of a representative from each dealer in the country. This convention will institute policies and recommendations to be used as a basis of information for national dealers, manufacturers, and policy of jobbers toward the public.

Edward C. Talbott, jr., executive officer of the new organization in an announcement states:

The Bureau of Standards, Department of

Commerce, in a letter endorsing the American Radio Association stated: "The Government believes very thoroughly in co-ordinating the various phases of radio work in this country, and is glad to note that a number of the stated purposes and aims of the American Radio Association, are along these lines." The new association will be a long stride toward the accomplishment of this aim and the elimination of the present commercial radio confusion. The radio public can purchase apparatus from the members of the new association with the utmost confidence, as manufacturers and dealers who produce and sell inferior and inadequate apparatus with no guarantee or scientific construction, and those interested in only a temporary "get-rich-quick" policy in order to take advantage of the uninformed radio public will be excluded.

The new organization will be extensively advertised in a national publicity campaign. National expositions will be held at the time of the annual meeting to bring the various commercial interests together.

An information bureau posting the membership on all radio developments will be established.

A credit bureau will also be organized for the exchange of credit information.

All reputable dealers interested in the scientific, commercial and public permanency of radio are eligible to membership.

Radio Captains of Industry

No. 2—MEYER ROSENTHAL

President, Air-o-Phone Corporation,
New York



Need of Radio in the Home

By Meyer Rosenthal

President of the Air-o-Phone Corporation

THE radio industry has now reached the point where it may be considered a permanent form of entertainment in the American home. Radio concert receiving has a fascination of its own. Listening into the unknown bring-in voices out of the air, is making hundreds of new radio fans every day.

A typical evening's entertainment before a radio receiving set: First, bed-time stories for the children, broadcast from one of the leading radio manufacturing concerns. A minute turn of the dial brings in a piano selection broadcast by a prominent newspaper, turning back the dial brings the end of the bed-time stories, and the children are packed off to bed.

Then the baseball returns which please the male audience. Two new stations are suddenly heard testing their broadcasting equipment by talking to each other. A call for a steamer is heard, and the listeners wait breathlessly for the answer. It comes in, faint but audible, and everyone exclaims, "How marvelous." Then all admit that it does seem uncanny to sit in a room, with all windows closed, and listen to voices hundreds of miles away.

The machine starts to buzz, but a few adjustments bring in two stations—one near New York, the other several hundred miles away. These stations, or selections broadcast by them, come in clear and distinct, but not so loud.

A prominent lecturer speaks for a few minutes. Next, a young lady in the audience tries to tune in some jazz music. She is successful in catching a dance record being broadcast, and an impromptu dance is held.

The feature entertainment of this evening happened to be a complete opera broadcast by a newspaper. It was broadcast, announced, and sung so well that those who were interested in radio understood why radio is bound to develop into a permanent form of entertainment.

Radio, at first thought, appears to be a competitor of the phonograph and the theater; but a careful analysis will show that the radio only competes with the phonograph in the way of the moving-picture theater competes with the speaking stage, or the player piano competes with the phonograph. In other words, radio is a distinct form of entertainment.

Trade Notes

SIDNEY HAMBURGER, GENERAL MANAGER OF THE CANADIAN PACIFIC RADIO CORPORATION, extends an invitation to the trade to visit the offices of the corporation in the Canadian Pacific buildings, suite 708, 342 Madison Avenue, New York City, for demonstrations of radio-receiving sets and inspection of their complete line of parts. The Canadian Pacific Radio Corporation is a thoroughly organized sales and distributing organization, with a large and efficient selling staff, and is in position to give manufacturers of standard radio apparatus most efficient and satisfactory representation.

NEW DE FOREST SETS of greater range and beauty, are now being designed for early production, according to R. M. Keator, general sales-manager of the De Forest Radio Telephone & Telegraph Company. The new sets will include a tuner, a radio-frequency amplifier, a detector, and also an audio-frequency amplifier.

"The new line of apparatus," says Mr. Keator "is being designed to satisfy the eye as well as the ear. It will come in period cabinet furniture, suitable for any household or apartment, and will range in price probably from fifty dollars to a thousand dollars."

Latest broadcasting map, 15c. That is, a complete broadcasting map appeared in RADIO WORLD, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, New York City.

"Never Saw So Much Hell Over a Small Advertisement"

Gus C. Unkrich
Fairfield, Iowa.
Jeweler

Fairfield, Iowa,
June 5, 1922.

Radio World,
1493 Broadway, New York.

Gentlemen:—

Perhaps it will be interesting to let you know what results I got from the small ad in your paper advertising a Harko Senior Receiving Cabinet for \$15.00. The Radio World must reach over lots of territory as I have been swamped with telegrams and letters. I returned four checks today as I sold the machine to a Chicago man the first day. I am just returning a check by this same mail to a man in Maryland. I also have a bunch of Radio World letters from parties setting forth what they would trade for the cabinet; in fact, I never saw so much Hell over a small ad. Thanks to you.

(Signed) GUS C. UNKRICH.

Write us for full information concerning

Radiobat B

The Revolutionary Battery For
Wireless Telephony.

Multiple Storage Battery Corp.

350 Madison Avenue New York

READ RADIO BOOKS

By JAMES R. CAMERON

HOW TO BUILD YOUR OWN RADIO SET \$.25
RADIO DIRECTORY..... .50
RADIO FOR BEGINNERS 1.00

Buy them to-day from your dealer or direct from

TECHNICAL BOOK COMPANY
130 WEST 42nd STREET NEW YORK

New Firms and Corporations

Notices in this department are considered as purely interesting trade news and published without compensation to us. We welcome trade news of this nature. All notices having an advertising angle are referred to our Advertising Department, and are placed under Classified Advertising at 5 cents a word, or as Display Advertising at \$5 an inch.

(The firms and corporations mentioned in these columns can be reached by communicating with the attorneys, whose addresses are given whenever possible.)

Blatt Radio Specialty Co., Manhattan, \$5,000; M. Blatt, B. Neuwurth, G. Horowitz. (Attorney, E. J. Garvar, 74 Graham Ave., Brooklyn, N. Y.)

Mercury Radio Corp., Manhattan, electrical works, \$20,000; M. Levy, C. W. Bennett, E. Olson. (Attorneys, Bennett, Weiner, Tronfelt & Grenthal, 2 Rector St., N. Y.)

Inland Radio Telegraph Co., Wilmington, apparatus, \$250,000. (Corporation Trust Company of America.)

Capitol Radio Sales Agency, 911 Mather Building, Washington, D. C.

Radio Equipmet Laboratories and Roth's Music Store, Leechburg, Pa.

The Victor R. Vail Co., 95 Metropolitan Ave. Brooklyn, N. Y.

Monmouth Radio Service Co., Robert Johnson, Harold Allen, treasurer; Harold Davison, secretary. White St., Red Bank, N. J.

Radio Vacuum Electric Co., Station C. Box 103, Toledo, Ohio. Manufacturing Vacuum bulbs used in wireless outfits.

The Simplicity Radio Corporation, Cincinnati, subsidiary of the Aerophone Radio Corporation, Wilmington, Del.

Charles E. Hayes Company, jobber of radio supplies, Springfield, Mass.

Kramer Radio Company, radio distributors and jobbers, 4713 Sheridan Road, Chicago. This firm would like to get in touch with reliable manufacturers looking for proper distribution in the Middle West.

F. A. Rose, Two Harbors, Minnesota. "Started recently and going good," writes Mr. Rose.

Gordon Radio Company, Gordon, Nebraska.

R. R. Garrick, 126 North Redfield street, Philadelphia. Mr. Garrick says: "Have started in business not so much to make money, but to help the real amateur get the best material."

Alladin Radio Mfg. Co. Manufacture radio and wireless apparatus. \$15,000. William A. Leyda, Julian A. Ramsey, Rea J. Thompson, Washington, Pa. (Capital Trust Co.)

Rhineland Radio Mfg. Corp., Manhattan, \$500,000; J. W. Sawson, E. Rhine, D. W. Friedlander. (Attorneys, Berger & Hartman, 217 Broadway, N. Y.)

Radio X. Corp., Manhattan, \$10,000; E. A. Abrahams, E. M. Lovell, H. A. Hayward. (Attorneys, Flaherty, Turner & Strouse, 2 Rector St., N. Y.)

Renulite Corp. of America, electrical contracting, \$500,000; Theodore L. Ernst, S. E. Freeland, Samuel Baras, New York. (American Guaranty & Trust Co.)

Twentieth Century Wireless Telephone Corp., White Plains, N. Y.

Sleeper Radio Corp., New York City, has increased its capital from \$25,000 to \$250,000.

Alladin Radio Manufacturing Co., apparatus, \$15,000; William A. Leyda, Julian A. Ramsey, Rea J. Thompson, Wilmington, Pa. (Capital Trust Company.)

General Radio and Electric Corp. of America, Wilmington, radio sets, \$5,000,000. Corporation Trust Company of America.)

S. G. K. Radio Corp., Wilmington, Del., apparatus, \$100,000. (Corporation Trust Co. of America.)

A Receiver with An Appropriate Name

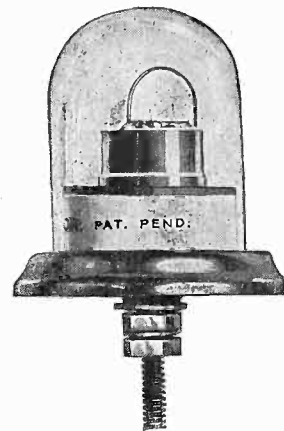


The "Vox Humana"

A radiophone receiver in a beautiful period-design cabinet, which made its first appearance at the recent New York Radio Show. It is known as the "Vox Humana." While embodying many original features in the set, the designers have particularly attempted to obtain the most natural reproduction of the human voice transmitted by radio telephone possible to obtain. They have apparently succeeded beyond their expectations. The demonstrator merely pushed a switch and the voice of the announcer at WJZ emanated from the horn in the cabinet in such natural tones that it was hard to believe that it was not someone in the room who was speaking. The voice was loud, but not too loud, and there was a total absence of extraneous noises. When the voice ceased there was absolute silence. The machine does not seem to know what static or interference means.

Does Summer Static Bother You?

IT WON'T WITH THIS
RADIO DETECTOR



(Actual Size)

PRICE \$2.00

In using the GREWOL you don't have to find the spot.

THIS DETECTOR IS
ALWAYS SET AND READY

GUARANTEED ONE YEAR
IF YOUR DEALER DOES NOT
HANDLE THE GREWOL SEND
US \$2.00 AND WE WILL MAIL
ONE TO YOU.

DEALERS WRITE FOR
PROPOSITION

RANDEL WIRELESS CO.

9 Central Ave. Newark, N. J.

COMPLETE YOUR FILE OF RADIO WORLD

Copies of Radio World No. 1

If you did not get a copy of Radio World No. 1 send us \$6.00 and we will send you the paper for one year, and start it with our first issue, which will be mailed you as soon as possible after receipt of order. (Adv.)

Radio Patents

RECENTLY ISSUED

Father Urges Son to Prefer Radio to Amusement



(C Underwood & Underwood, N. Y.)

One of the most ardent young radio enthusiasts in Washington is Dederick Ten Eyck, the fourteen-year-old son of Congressman Peter G. Ten Eyck, of New York. The congressman says he prefers to have his son entertained by a radiophone than any other form of amusement he might wish, so he has procured one of the best radiophones in the market.

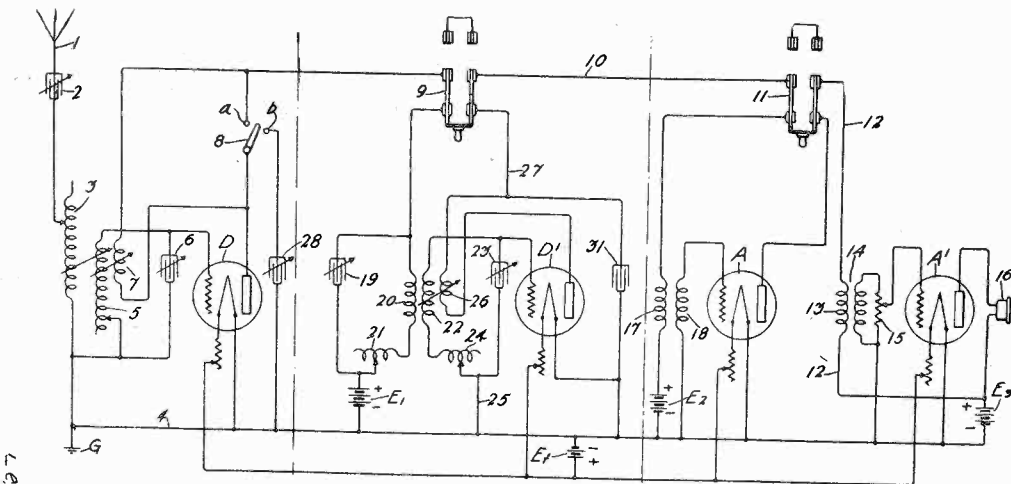
"Music in de Air, Suah!"

Soap Monroe, a colored chimney cleaner of Greenville, Ala., while engaged in cleaning a smoke-stack for the W. T. Smith Lumber Company there heard the strains of "Dixie" coming from the deep pit of the stack. Soap and his two companions climbed from the stack to see the parade. There was no parade and investigation proved that there was no band within miles. Soap Monroe started to run and is supposed to be still at it. His two companions, Bert Harrison and Ed. Cooper, verified the report and said that the music was very clear and loud. The stack of the plant is supported by a number of guy wires which it is believed picked up a radio message and in some freak manner the chimney acted as a receiver.—"The Journal," Providence, R. I.

signaling currents or other low-frequency electrical variations.

The principal object of this invention is to provide a modulating circuit in which a two-element electron discharge-device may be used as a modulator.

According to this invention, high frequency oscillations are impressed across the terminals of a two-element electron discharge-device simultaneously with low frequency electric variations, which may be signaling currents such as are used in telephony and telegraphy, control currents, or impulses such as are used in selecting systems. A source of unidirectional current maintains an electron discharge between the electrodes of the discharge-device, and the effect of the high frequency and low frequency oscillations is to cause a variation in the electron discharge. This variation component gives rise to an alternating current of the high frequency and of an amplitude varying in accordance with the low frequency current.



Schematic diagram showing the Clement circuit. Four tubes are used which may be utilized by the operator, either cutting in one or more tubes.

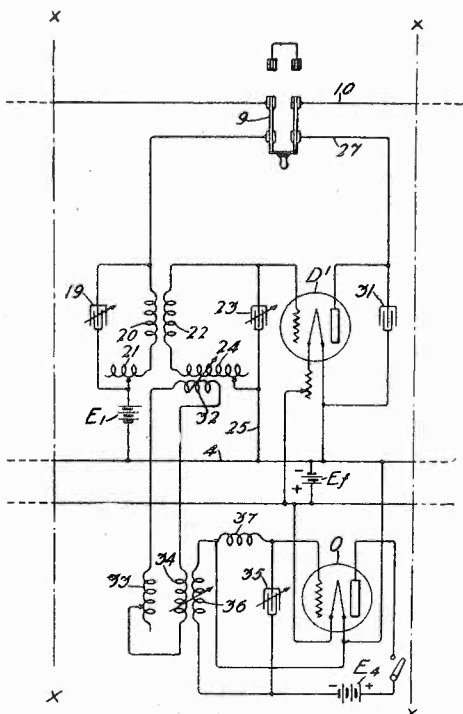
Lewis M. Clement, of Newark, N. J., has invented a device to regulate waves in an electromagnetic receiving station. By his invention he hopes to produce a receiving station capable of receiving many kinds of signals efficiently, and particularly one in which a detector circuit may act to detect waves of one or more kinds and, also, in combination with another or other detecting-circuit arrangements may detect waves having one or more different characteristics.

A more specific object is to produce a station in which a single detector circuit may receive simple damped wave trains of

of circuits which may be rapidly and conveniently tuned to receive plurally or successively modulated or modified waves.

A still further object is to produce a system capable of receiving signaling waves in a plurality of different ways and which may be rapidly and readily changed from a condition adapted to one method of reception to a condition adapted to another method of reception.

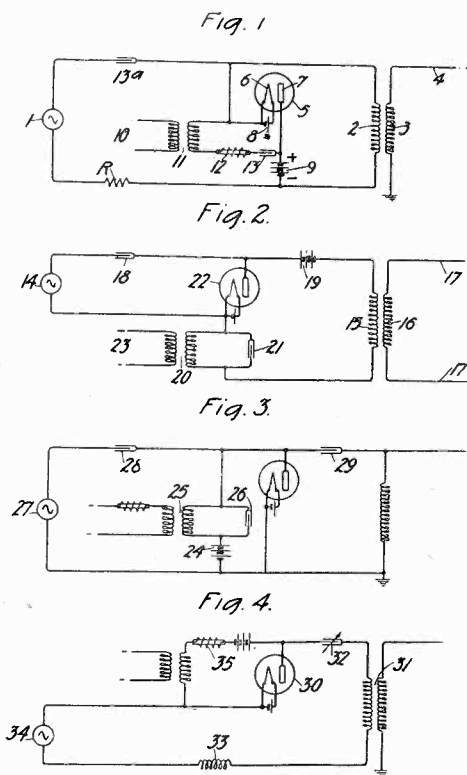
* * *



Schematic diagram showing another circuit of Mr. Clement's patent.

long or short wave length and sustained oscillations of long or short wave length, and also may act as one of a set of detectors to detect plurally modulated or modified waves.

A further object is to produce a system



Schematic diagram of Mr. Tanner's electrical signaling circuit for high-frequency currents.

De Witt C. Tanner, of Glen Ridge, N. J., has been awarded patent papers on a system for electrical signaling and more particularly to circuits and apparatus for modulating high-frequency electrical oscillations or impulses in accordance with

Investigate Before Investing!

President Alexander Eisemann, of the National Radio Chamber of Commerce, Gives an Important Interview on the Necessity of Careful Investigation Before Investing in Radio Stocks and Financing Irresponsible So-Called Experts

MILLIONS were lost in oil, but there will be many millions more lost in radio," predicts Alexander Eisemann, President of the National Radio Chamber of Commerce, and a member of the Freed-Eisemann Radio Corporation, of this city.

The radio situation, Mr. Eisemann points out, is well on the way to parallel the oil boom, and in the wake of the tremendous enthusiasm generated, unscrupulous promoters and so-called "experts" are relieving small investors of their savings. "Several cases have come to my attention within the last few months," continued Mr. Eisemann, "and in the interests of fair play and the general good, I urge the widest possible publicity to this warning.

"Hundreds of thousands of people throughout the country think that radio is a 'gusher,' that it brings back in dividends many times the principal invested. Many small business men who would think twice before investing their money in gilt-edge securities, never hesitate when the magic word 'radio' is whispered to them. They read of the tremendous strides of the radio industry within the last few months, they hear things on all sides, and make up their minds that the dollars they worked so hard for through many years, should 'get out of the bank and get into radio.'

"It is estimated that within the last three months, at least 1250 new corporations have been organized to manufacture radio apparatus. Obviously, all these cannot have technical skill of requisite standard back of them. And certainly, in all this mass of ignorance and lack of expert knowledge, many of these new corporations must fail. As an instance, let me cite the case of a personal friend, who, despite advice to the contrary, invested and lost in backing a radio-receiving set, the design of which conflicted with another manufacturer's patents.

"Shoemakers, jewelers, hair-dressers, cloak-and-suit manufacturers, are stampeding into the radio business, usually forsaking a perfectly profitable business in their haste to get into the much-advertised 'radio gold mine.' These men, usually keen in business affairs, become enthused when their office boy tells them of a new radio set he made home, at a cost of only \$2.98! This is an actual happening. Or, a self-styled 'radio expert,' formerly a wireless operator in the Army or Navy, interests a merchant by suggesting the wonderful profits that lie in store for him, if he will advance a few thousand dollars to this 'expert's' product on the market.

"A young man approached me recently and wanted to know whether I would consider backing an 'automatic antenna erector,' which operated like a jack-in-the-box and was to be erected instantaneously on all roofs anywhere! This self-styled 'radio expert' was formerly a floor-walker in a department store and tinkered around the batteries when the

electric buzzers were out of order! Yet, with all this pathetic lack of radio engineering experience and dearth of business knowledge, it is not improbable that he has found some otherwise keen-minded business man to sponsor his queer project with real, hard-earned cash!

"In addition to the basic engineering and financing problems," continued Mr. Eisemann, "there is always the manufacturing and marketing problems which must be solved before investments can pay back one penny on their principal. For example, let me cite an instance with which I am familiar.

"A jeweler decided to go into the radio business and backed a young friend's radio invention to the extent of \$20,000 on the strength of his statement that he could make a good radio set for nine dollars that could retail for twenty-five dollars, with a dealer's discount of thirty-three and one-third per cent. Of course, the young man made up a demonstration set with a cost sheet, which proved conclusively that the set could be made for less than nine dollars. However, a kind friend showed this merchant that while the set apparently cost nine dollars to make, necessary inspection at each stage of the operation brought the cost to ten dollars. Further, that when large quantities were built, experience had shown that thirty-seven and one-half per cent of the sets would be rejected before the final inspection, and would have to be either repaired or, in some cases, rebuilt! This merchant also learned at the cost of much money, that of every hundred pounds of galena crystal he tested for his sets, ninety-three and one-half pounds had to be carefully tested and rejected as useless, while only six and one-half pounds of the tested crystal could be used!

"Materials were advancing in price, and this merchant also learned that deliveries and manufacture of necessary materials were being delayed for weeks and months, and that in order to get price concessions and early deliveries, he had to buy large quantities of materials, much of which lay on his hands for months, some never to be used!

"The case of this manufacturer is typical," explained Mr. Eisemann. "Investigations made by the Freed-Eisemann Radio Corporation have brought out the astounding fact that at least thirty-seven radio apparatus manufacturers at the present time are infringing upon each other's patents, and that at least one thousand other manufacturers are infringing upon the patents of several older radio concerns! Of course, the man who invests his money in these businesses must suffer!"

To many anxious inquirers RADIO WORLD has no free list. One copy is sent as a voucher to each advertiser or advertising agent represented in current issues. All other copies are paid for on subscription or through the news trade.

Radio brings it
MAGNAVOX
tells it

An essential
part of every
receiving set

R-2
with
18-inch
horn



Price \$85.00

NO matter how carefully you have selected your radio receiving units—no matter how efficiently you have installed them—if you are still using a telephone headset you have a very pleasing experience in store.

It is Magnavox Radio, the reproducer supreme, which makes the receiving set wholly useful and enjoyable.

With the Magnavox Radio you hear every wireless program at its best—your receiving set only brings the message, while Magnavox Radio tells it clearly and in full volume to all within reach of its voice.

To secure maximum power input for your Magnavox Radio, add Magnavox Power Amplifier Model C-2 or 3 stage—designed specially for power tubes.

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

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

MAGNAVOX
Radio



MAKE MONEY AT HOME

You can earn from \$1 to \$2 an hour in your spare time writing show cards. Quickly and easily learned by our new, simple "Instructograph" method. No canvassing or soliciting; we teach you how, guarantee you steady work at home no matter where you live, and pay you cash each week.

Full particulars and Booklet free.

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Toronto, Can.

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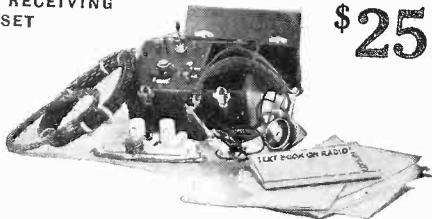
New York City.

RADIO WORLD, 1493 Broadway,

"MIRACLE"

RECEIVING SET

\$25



With Double Head Phones

Also Copper Antenna Lead Wire, Ground Wire, Insulators and all the necessary parts that will enable you to hear everything within a range of from 25 to 50 miles.

Also included is a radio text-book with complete instructions and valuable charts.

SHIPPED PARCEL POST, INSURED, UPON RECEIPT OF MONEY ORDER OR CHECK.

Send for a "Miracle" To-day!

METRO MAIL ORDER CO.
358 FIFTH AVENUE NEW YORK CITY

Is Your Tuning Device Sufficiently Sensitive

MUCH of the complaint about interference that comes from novices in radio receiving is due to the use of tuning devices that are not sufficiently sensitive, says a writer in "The Literary Digest," New York. In the usage of the experienced amateur, the type of tuning coil known as a variometer has pretty generally taken the place of the single-tapped induction coil and the familiar loose-coupler. A tapped coil serves very well where it is not necessary to distinguish too closely between wave systems; but may prove inadequate when really nice discrimination is in question. The variometer, consisting essentially of two coils, one of which rotates on its axis within the hollow of the other, permits the most infinitesimal gradation of adjustments. In one position, the two magnetic fields coalesce and mutually strengthen each other; as the inner coil is rotated, the mutual relations of the magnetic fields are indefinitely modified, and at 180 degrees they are fully opposed. The inductance of the antenna system is thus shifted from minimum to maximum, tuning for waves of all available lengths, by merely turning the knob attached to the axis of the "rotor" coil.

Some of the most elaborate radio-receiving outfits on the market use this system. One that has three stages of audio-frequency amplification has carried automatic control of rheostats and condensers to such a stage that nothing whatever is required of the operator who would "listen in" but to turn the pointer on a single dial, thus operating the variometer, guided solely by results. You have merely to turn the pointer until the sound you wish to hear is loudest and clearest—and then sit back and listen. Once the pointer is adjusted, it may be left there, and if you wish to listen to the same station on another evening, all that is necessary is to push a button, just as you turn on an ordinary electric light.

Indoor Aerials Preferred

A MATEURS of Elizabeth, N. J., says the New York "Globe," which is a hotbed of radio activity, are frankly skeptical of the experts' repeated statements that indoor aerials won't work with crystal sets.

Martin J. Corcoran, principal of the Boys' Vocational School, and one of Elizabeth's foremost radio experimenters, is one of them. Mr. Corcoran, after trying out both kinds, announces himself as in favor of the indoor variety for crystal as well as bulb sets. He states that his conclusion is based on his own experiments and trials made in Elizabeth by his pupils.

He explains that indoor aerials are found to be far superior to outside ones in cases where conditions are not ideal for the outdoor antennae, where long straightaway stretches of wire can not be erected or where tin roofs or other objects which lessen an outside aerial's efficiency can not be avoided.

Mr. Corcoran reports that in his own case, a continuous wire, 144 feet long, strung in four lengths in his attic, with one end leading to his set, gives him better results than he obtained with a 200-foot outside aerial. He states that he finds the efficiency of the indoor aerial is increased by running a loop from the free end to the section of wire leading from his receiving set.

If you were not able to get the first twelve issues of RADIO WORLD, your newsdealer can probably get the copies through his wholesaler, or copies will be mailed from this office direct at 15 cents per copy. RADIO WORLD CO., 1493 Broadway, New York, N. Y.

RADIO INVENTIONS and other ideas promptly patented by reliable Patent Attorneys and Engineers. Call or write. FREE ADVICE.

AS MANUFACTURERS PATENT CO. FOR 520 FIFTH AVE NEW YORK

SPECIAL OFFER TO DEALERS
3 and 4 inch Dials
Fixed and Variable Condensers
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ALL RADIO EQUIPMENT
NEW YORK RADIOPHONE CO.
32 UNION SQ. - NEW YORK CITY

The HI-GEE RADIO CONCERT RECEIVER

Price, \$29.50



The above instrument comes to you completely assembled, ready to wire; all parts mounted on genuine Formica Panel, set in quartered oak cabinet with hinged cover. Panel is properly shielded so that no "body effects" are experienced with this instrument.

This is truly a HI-GEE quality instrument consisting of two variometers, one vario-coupler, socket and rheostat. (Rheostat not shown in above cut).

IMMEDIATE SHIPMENTS. PREPAID.

Our catalogue is ready for distribution—send for your copy NOW.

HI-GEE RADIO MFG. CO.
Marion, Illinois

Radio Needs Trained Men

Radio is sweeping the country like wild fire. Thousands of dollars are being spent for expensive outfits. RADIO EXPERTS are needed everywhere to keep this equipment in order and to sell and install new outfits.

Be a Radio Expert

I will train you quickly and easily in your spare time, to become a RADIO EXPERT so you can install, construct, repair and sell Radio equipment. I am a Graduate Electrical Engineer and from actual experience I will give you exactly what you must know to make the really big money in radio.

FREE My Consultation Service to you is FREE. This outside help which I gladly give you is, in itself, worth more than the small cost of the Complete Course.

START NOW

Don't let others beat you to the big money. Start now and within a few weeks' time I will train you at home, at an amazingly low cost, to become a RADIO EXPERT. Write for "Radio Facts" sent free without obligation.

A. G. MOHAUPT, Electrical Engineer
American Electrical Association
4515 N. Winchester Ave., Chicago

WRITE TODAY

SO MANY READERS ARE

disappointed in not receiving their copies of RADIO WORLD on the newsstands regularly, from week to week—due to early selling out by dealers—that we suggest that you place a standing order with your newsman. Ask him to save you a copy of every issue.

OR, BETTER STILL, subscribe \$6.00 a year; \$3.00 for six months; \$1.50 for three months; either direct or through your newsdealer, who will forward your subscription to us.

RADIO WORLD CO.

1493 Broadway, New York City
(Adv.)

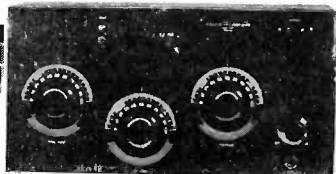
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For perfect results in receiving nothing can beat the PAN AUDIO Type 102. Here is a real Vacuum Tube Receiving Set for the Radio Enthusiast who knows what he wants at the right price.

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Dealers write for magnetic wire price lists on 1-¹/₂ and ¹/₄-lb. spools

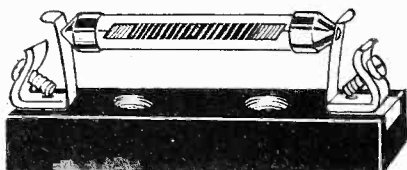
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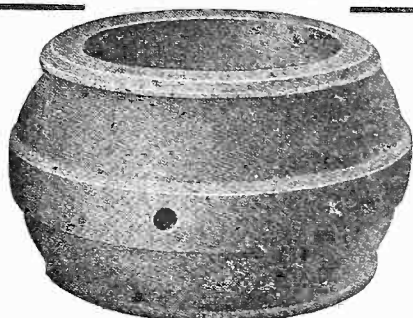


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Accuracy Guaranteed.

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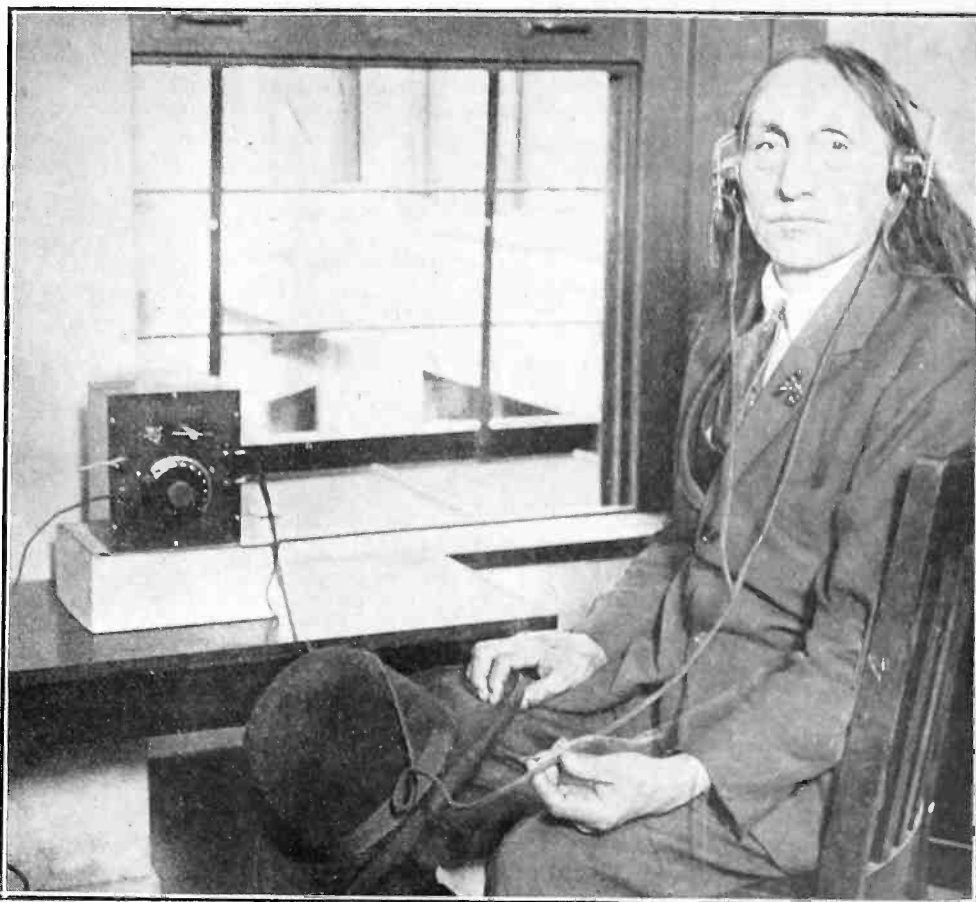
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Ask RADIO WORLD any questions about Radio. Subscribers are answered in next week's issue. New wonders of the marvelous wireless illustrated and fully described in each weekly issue. All newstands at 15c a copy. Subscriptions, 3 months, \$1.50; six months, \$3.00; one year (52 numbers), delivered to your home, \$6.00. RADIO WORLD, Room 326, 1493 Broadway, N. Y. C.

Hears White Fathers' Signal Fire



(C. International Newsreel Corp.)

Chief Sherman Charging Hawk whose only knowledge of sending and receiving long-distance messages was that of the Indian's beacon fire placed on a high hill. Here he is photographed, experiencing, for the first time, the receiving of messages by the white father's latest invention. A concert broadcast over distant leagues has given him his first idea of the world's greatest advancement.

Radio on the Farm

There was a time when there was general sympathy among city dwellers for the wives and daughters of the farmers of the country, remarks "The Evening Telegram," New York. Those who had all the resources of civilization around the corner could not understand how persons in the rural districts ever managed to endure the boredom of existence.

The flivver was the first invention to mitigate the misery of the remote.

It placed the nearest town, with its moving picture shows and other delights, at the disposal of the rustic population.

Now comes the radio to place the farmer and his family in touch with the doings of the great world that lies beyond the horizon.

It is the town dweller who has the worst of it. He or she has to travel in subways, hurry to catch trains, to be on the rush in and out of business hours all the time.

Instead of the agriculturist going to the city, the city is going to the agriculturist.

RADIO WORLD

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IMPORTANT NOTICE:

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

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Broadcast Bill's Radio-lays

By William E. Douglass

(Copyright, 1922, Westinghouse Electric & Manufacturing Co.)

WE had a bang-up party in our town the other night—I'll start at the beginnin' so you'll get the story right. Last week I shipped a car o' hogs to my friends, Swift and Coe, an' I went to the city, too; thought I'd take in a show, an' look the old town over, strollin' down some gay white way where people never start to bed till night is almost day. Now since my mind's on radio, o' course, I looked aroun' to see if wireless shops in that town could be found. Well, sure enough I found some, guess there must a been a dozen; a feller there in one of them told me he wuz a cousin of the chap that sold me my first set out there in Brussels Sprouts. He might not been a lyin', but I kinda have my doubts. I told him that I wanted two more pairs of earmuffs so my wife an' I could listen an' a pair fer little Joe. An' then he



showed me somethin' I could add on to my set to make the thing talk right out loud, I didn't hafta fret about those rubber earmuffs. You could hear this thing a block—I said, "Young fella, wrap it up." (The price gave me a shock.) To shorten up my story, t'other night we had a dance, there ain't been nothin' like it in this country here ner France. Now all the folks frum miles aroun' had gathered in the hall, an' when we waited 'bout an hour afore we had a call frum Si, who plays the fiddle; said he guessed he couldn't come. Well! gosh, you know that dern near put the party on the bum. His baby had the colic, and his wife was feelin' sick. Right then I had an idee—radio would turn the trick, an' so I beat it home an' got my bran new wireless set an' took it to the hall to try and see what I could get. An' orchestra was playin', right away the dance begun. It didn't stop till midnight, and we had lots of fun.

Radio without Interception

A Ukrainian engineer is reported to have discovered a method by which radio messages may be sent to a definite receiving station without the danger of being intercepted by other stations, says "Scientific American." It is stated that by means of a simple apparatus the so-called "locked power line" of the magnetic field may be straightened out and grouped into parallel rays. These rays are said to do away with the necessity of aerials. If this report is true, it seems that we are on the verge of a new epoch.

Radio Supplies AT A BIG SAVING

	List Price	Our Price
Radiotron UV 201 Amplifying Tube....	\$6.50	\$5.85
Western Electric Phones, 2,200-ohms, Per pr.	15.00	13.50
Murdock Phones, No. 56, 3,000-ohms, Per pr.	6.00	5.40
Federal Phones, 2,200-ohms, per pr....	8.00	7.00
Acme A-2, Amplifying Transformers Semi-mounted	5.00	4.50
Paragon Amplifying Transformers, mounted	5.00	4.50
Federal Plugs	1.75	1.50
Eveready B Battery, Type 766, 22½ Volt	3.00	2.50
Eveready B Battery, Type 763, 22½ Volt	1.75	1.35
Brach Vacuum Gaps for lightning protection, Inside Type.....	2.50	2.25
Outside Type	3.00	2.75
Paragon V.T. Sockets.....	1.00	.85
Paragon Rheostats	1.50	1.35
Thorndarson Amplifying Transformers..	4.50	4.00
Gen'l Radio Amplifying Transformers..	5.00	4.50

Through our long established connections and mail order methods, we are able to sell you standard radio supplies at less than prices at the average radio store. Satisfaction absolutely guaranteed.

Buy from an Experienced Radio Expert

Mr. Gregory's ten years' practical experience and knowledge in the radio field assures you the best quality products. Let him help you with your problems. No obligations.

Listen for 2 KL—500 Watt C.W.
Tune in 2 KL

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The publisher has reserved a limited supply of the first twelve issues of RADIO WORLD for the benefit of new readers who want to become subscribers and have their files complete from the first issue. The first twelve copies will be mailed postpaid on receipt of \$1.50; or better still, subscribe now for six months (\$3.00), or twelve months (\$6.00 for 52 issues) and have your subscription start with No. 1. Radio World Co., 1493 Broadway, New York City.

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New Broadcasting Schedule FOR Ten Metropolitan Stations

Appended is a tentative schedule of operations for the ten broadcasting stations located in the metropolitan area. This was agreed on at a meeting of representatives of the ten concerns. It is now being tried out.

Time	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
8 to 9 a. m.	Testing	Testing	Testing	Testing	Testing	Testing	Testing
9-9:15	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ
9:15-10	WHN	WHN	WHN	WHN	WHN	WHN	WHN
10:00-10:30	WAAM	WHN	WHN	WHN	WAAM	WHN	WHN
10:30-10:50	WHN	WHN	WHN	WHN	WHN	WHN	
	WAAM	WBAN	WAAM	WBAN	WAAM	WBAN	
11:00-12	WBAY	WBAY	WBAY	WBAY	WBAY	WBAY	WJZ
12:00-12:30	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ
12:30-12:50	WBAN	WBAN	WBAN	WBAN	WBAN	WBAN	WJZ
	WHN	WHN	WHN	WHN	WHN	WHN	
12:55-1 p. m. ..	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ
12:55-1:15	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	WHN
1:15-2:15	WWZ	WWZ	WWZ	WWZ	WWZ	WWZ	WBS
2:15-2:30	WHN	WHN	WHN	WHN	WHN	WHN	WRW
2:30-3:00	WOR	WOR	WOR	WOR	WOR	WOR	WBAN
3:00-4:00	WOR	WOR	WOR	WOR	WOR	WOR	WJZ
4:00-4:15	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ
4:15-4:30	WAAM	WAAM	WAAM	WAAM	WAAM	WAAM	WJZ
	WHN	WHN	WHN	WHN	WHN	WHN	
4:30-5:00	WBAY	WBAY	WBAY	WBAY	WBAY	WBAY	WJZ
5:00-5:30	WBAY	WBAY	WBAY	WBAY	WBAY	WBAY	WHN
							WBAN
5:30-6:00	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	WHN
							WBAN
6:00-6:15	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	
6:15-6:30	WOR	WOR	WOR	WOR	WOR	WOR	
6:30-6:45	WOR	WOR	WOR	WOR	WOR	WOR	WJZ
	WBAN	WBAN	WBAN	WBAN	WBAN	WBAN	WJZ
6:45-7:00	WOR	WOR	WOR	WOR	WOR	WOR	WJZ
7:00-7:30	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ	WJZ
7:30-8:00	WBS	WWZ	WBS	WBAY	WBS	WJZ	WAAT
	WRW		WRW		WRW	WJZ	WJZ
	WHN		WHN		WHN		
	WAAT		WAAT		WAAT		
	WBAN		WBAN		WBAN		
8:00-9:00	WOR	WWZ	WAAM	WBAY	WWZ	WJZ	WJZ
9:00-10:30	WJZ	WJZ	WJZ	WBAY	WJZ	WJZ	WJZ
10:00-12	WJZ	WJZ	WJZ	WBAY	WJZ	WJZ	WHN

Key—WJZ, Westinghouse, Newark; WWZ, Wanamaker, New York; WBAY, American Telephone and Telegraph, New York; WBS, May & Co., Newark; WHN, Ridgewood, N. J.; WRW, Koenig, Tarrytown; WAAT, Jersey City; WBAN, Wireless Phone Company, Paterson, N. J.; WAAM, Nelson, Newark; WOR, Bamberger, Newark.



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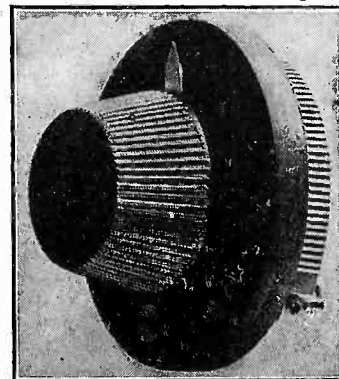
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Send 50c for 20 Blue Print
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Estru Lattice Type Vario Couplers..... 4.50

These are small compact instruments of the lattice type with no unnecessary frame work. Maximum efficiency, sharp tuning. Ideal for portable sets and for those who build their own because of easy accessibility.

3" Bakelite Dials with knobs..... \$.75
43-Plate Variable Condensers..... 4.00
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These condensers are of the very highest quality. Fully guaranteed.

Macca Receiving Sets 2 stage amp.....\$110.00

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**Government Examinations
for Radio Inspectors**

THE United States Civil Service Commission is conducting an open competitive examination for radio inspector. These examinations are being held in cities where an office of the commission is located. July 19 is the closing date.

Vacancies in the positions of radio inspector and assistant radio inspector in the Bureau of Navigation, Department of Commerce, at \$1,800 to \$2,200 a year, and in positions requiring similar qualifications at these or higher or lower salaries, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

Appointees whose services are satisfactory may be allowed the increase granted by Congress, of \$20 a month.

All citizens of the United States, from 21 to 50 years of age, who meet the requirements, both men and women, may enter this examination; appointing officers, however, have the legal right to specify the sex desired in requesting certification of eligibles. For these positions in the Bureau of Navigation, men are desired.

The duties of radio inspectors will be primarily to inspect the radio apparatus on steamships, to insure its compliance with the law, and to inspect shore stations. The inspectors may also be called on to examine radio operators. The duties of radio inspectors require some office experience, therefore competitors should outline fully in their applications any office experience they may have had.

The duties of assistant radio inspectors will be primarily the assisting of radio inspectors in the enforcement of the wireless communication laws. Assistant radio inspectors will be required to inspect the radio equipment on board vessels and in land stations, which involves the carrying of 30 or 40 pounds of testing and measuring instruments. The inspection work requires a knowledge of the installation and operation of the several types of radio installations, including the adjustment and tuning of transmitters and receivers.

Applicants must have received a bachelor of science degree from a school of recognized standing, such educational training to have included a special course in radio or kindred sciences, or show that they are senior students in such institutions; or have had the equivalent of a high-school education and at least two years' experience in special radio work, such as the manufacture, installation, or adjustment of commercial or governmental wireless apparatus. It is essential that applicants be wireless telegraph operators.

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Radio Set Complete

Enjoy Daily Concerts, Weather Crop
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Can be installed in 30 minutes
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Full instructions with each set.
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\$4.50

Our selection of materials and built-up type design give assurance of low energy loss and high efficiency.

Agents and Jobbers write for information

KEYSTONE MOTOR COMPANY

OAKS, MONTG. CO., PA.

Will Radio Bring a Universal Language?

A POWERFUL station near New York recently held conversation with a Cuban station. Two nations of different languages were thus connected. The official representatives of the radio interests of five great nations—United States, Great Britain, France, Italy and Germany—met in Paris to arrange for greater harmony in the developing field of radio. They decided that some international code or medium of communication must be selected. Europe, with her more than twenty-five languages, feels the need of an auxiliary for the radiophone in an international language. Even this country, with one language from the Arctic down to Mexico and Cuba, may find herself handicapped to the degree in which she fails to acquire a simplified tool of international communication. What shall it be? Partisans of Esperanto are urging the adoption of that language. A campaign is being planned in the interest of Latin, which has the distinction of being the only language that was ever international. Without some such medium, how can the persons in various countries who happen to be interested in relativity profit by the broadcasting of an Einstein lecture from Berlin at 2,097½ meters?—The "Evening Post," New York.

Watch Your Batteries

Some of the "frying" noises caused in the loud speaker originated from the B batteries. These should be watched very carefully, and if they give any trouble should be replaced. None of this trouble can be eliminated by placing a fixed condenser across the B battery. Such a condenser can be purchased in a flat, metal

container, and its capacity should be either 1 or 2 mfd.—New York "Tribune."

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"SERVICE"

THE ANCHOR BRASS & ALUMINUM CO.

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CINCINNATI, OHIO

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 ten-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands ten days after copy reaching us.

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

Mailing Lists—Canadian radio operators' addresses \$4 per 1,000. Atelier Trade Service, London, Ontario.

For Sale—Regenerative Receiver, Tubes, Batteries, Detector Two Step with Phones. Sell cheap. E. Schuessler, 2209 Wheeler St., Cincinnati, Ohio.

Sneeze Powder, greatest fun-maker on earth. Bottle 10c. Cliff Fenner, 2401 Jefferson, Louisville, Ky.

For Sale—Complete two-inch spark set. Mesco Coil, condenser, pancake helix, gap, key. \$10.00. F. W. Frost, Prospect Ave., Princeton, N. Y.

RADIO APPARATUS and SUPPLIES. Circular free. CONRAD RADIO COMPANY, 76 Boylston St., Jamaica Plain, 30, Mass.

WRITE for catalog showing complete line of Elmco Shielded Radio Apparatus, tuners, detectors, amplifiers, transformers and sockets. Electric Machine Corporation, Indianapolis, Indiana.

DEALERS and JOBBERS

Write for our attractive proposition. Shipments and satisfaction—not disappointments. Service unexcelled. Complete line. G. S. NYCUM, Manufacturer NYCO Radio Supplies, 507 Penwood Ave., Wilkesburg, Pa.

Exchange jolly interesting letters through our Club! Stamp appreciated. Betty Lee, 4254 Broadway, New York City.

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model. Price of blueprints varies as to subject desired. Ask for bulletin No. 349. Experimenters' Information Service, 220 West 42nd St., New York City.

AGENTS WANTED in every city and town to sell standard radio apparatus. Attractive discounts given. If interested, write at once, stating age and radio experience. Wilmington Electrical Specialty Co., Inc., 912 Orange Street, Wilmington, Delaware.

PATENTS—Electrical cases our specialty. Pre-war charges. B. P. Fishburne, Registered Patent Lawyer, 386 McGill Bldg., Washington, D. C.

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Crystal Set That Gets Radio Concerts. Build it right, boys. Plans and full instructions for building at low cost, high grade fine adjustable Crystal Receiving Set, fifty cents postpaid. Dept. R. D. Shaw Mfg. Co., Galesburg, Kan.

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TYPE R-3 MAGNAVOX TYPE R-2

We can make immediate delivery on a limited supply of Type R-3 Magnavox, \$45.00, 14" Horn, and Type R-2, 18" Horn, \$85.00. Dealers and agents, discount 10% on 1, 15% on 2 or more. C. O. D. or cash with order. THE KEHLER RADIO LABORATORIES, Abilene, Kansas, Dept. W.

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DON'T BUY until you have investigated our line of Radio Instruments BECAUSE radio apparatus requires scientific knowledge and mechanical skill in the design and manufacture. Our experts have embodied these in our Special Broadcasting Receiving Sets. Audio, Radio-Frequency and Power Amplifiers, Loud Speakers and complete line of parts manufactured by us. LEE RADIO CORPORATION, HADDONFIELD, NEW JERSEY.

\$1.00 COMBINATIONS—BY MAIL, \$1.05

No. 1—100 ft. No. 14 antenna wire; 20 ft. No. 14 insulated ground wire, 1 ground clamp (solid copper); 1 single pole double throw lightning switch. No. 2—1 8 by 3 1/2 inch insulated tube, wound with enameled wire; 2 slides and 2 brass rods to fit; 4 nickelplated brass binding posts. No. 3—2 60c. switch-levers (1 1/2 inch); 20 contact points with nuts; 4 stops, 4 binding posts, 1 detector stand (unmounted). No. 4—1 set of 4 radio tubes, 8 inches long by 3-3/4—4-4/4 dia.; one spool No. 24 cotton covered wire, 375 feet; one wood rotor. Enclose Money Order or Checks, but no stamps. Brilliantone Radio Products, 874 Columbus Ave., at 103rd St., New York.

DEALERS

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Drop us a line
Everything for radio

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ANNOUNCING STANRAD ADAPTER

for the RAC3-Meyers-tube. Enables the Amateur to use the above tube in the standard socket. Price \$1.25 P.P.

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Well known established concern manufacturing WIRELESS specialties offers investors an opportunity to participate in big profits to be made in the WIRELESS INDUSTRY EXPANDING BUSINESS. Not a promotion.

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Factory, offices and demonstrating rooms, Testimonials open for inspection. Strictest investigation invited. Call or write for information.

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26 Cortlandt Street, New York

Radio a Public Utility

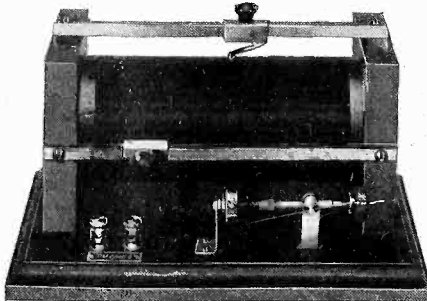
Many people are raising the question as to who will maintain radiophone broadcasting stations in the future, says "Radio," San Francisco. The answer is found in the recommendation of the Washington Radio Conference "that radio communication is a public utility," and in the fact that definite bands of wave-lengths have been set aside for broadcasting from government stations and public institutions. The broadcasting of information of all kinds will soon become as much of a public necessity as are good roads.

Fifty-two issues for \$6.00. Sub. Department, Radio World, 1493 Broadway, N. Y. C.

THE B-K RECEIVER

PRICE \$8.50

with pair 2200 ohm phones \$15.00



No Crystals furnished with this set. Woodwork solid mahogany, highly polished. All metal parts nickel plated. Conservative phone range 25 to 30 miles with proper antenna.

Write for bulletin No. 1. Dealers write us regarding above receiver, also our vario-couplers and variometers.

BONDUAUX & KNIGHTS
1115 Kelly Street Bronx, N. Y.

"ARROW"

Knockdown variometers ready for winding. 2 mahogany stators 1 1/4"x4 3/4"—mahogany rotor—3 3/4". Winding form and brass hardware complete. Shipped freight prepaid \$1.65.

Cash or Money Order

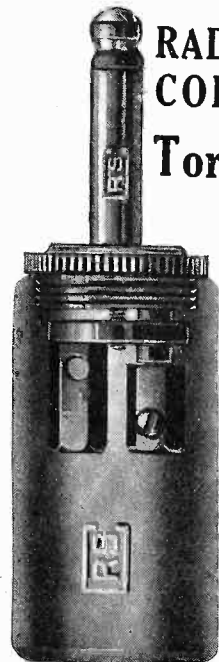
ARROW WIRE COMPANY

Radio Department
557 WEST 35th STREET, NEW YORK CITY

Subscribe for RADIO WORLD. \$6.00 a year, \$3.00 six months, \$1.50 three months.

RADIO STORES CORPORATION
Torpedo Plug

LIST, \$1.25



All conductive parts are of heavy machined brass, insulated throughout. Screw binding post terminals.

Handle is of light, strong insulating material.

Designed to secure rigidity and durability. Each plug packed in an attractive carton.

Pat. Pending

Manufactured by
Radio Stores Corporation

National Distributors and Manufacturers
218-222 West 34th St. New York City

Table of Magnet Wires for Winding

By Frederick J. Rumford, R. E.

The number of feet contained in each pound of magnet wire, of all sizes ranging from No. 20 to 40, is given in the appended table.

The beginner, amateur or experimenter will find this table useful when computing the necessary amount of magnet wire needed for a coil of a known diameter or length. The table will be found useful in other ways:

B & S Gauge	Single-wound cotton	Double-wound cotton	Single-wound cotton	Double-wound cotton	Enameled
20	311	298	319	312	320
21	389	370	398	389	404
22	491	461	504	493	509
23	624	584	645	631	642
24	778	745	795	779	810
25	958	903	1004	966	1019
26	1188	1118	1240	1202	1286
27	1533	1422	1615	1542	1620
28	1903	1759	2023	1917	2042
29	2461	2207	2625	2485	2570
30	2893	2534	3335	2909	3240
31	3483	2768	3820	3683	4082
32	4414	3137	4876	4654	5132
33	5688	4697	6243	5689	6445
34	6400	6168	7757	7111	8093
35	8393	6737	9660	8534	10197
36	9846	7877	11907	10039	12813
37	11636	9309	13474	10666	16110
38	13848	10666	16516	14222	20274
39	18286	11907	22261	16516	25519
40	24381	14222	26947	21333	32107

The above gives the correct number of feet of magnet wire per pound for various sizes and coverings. To get 1/8, 1/4, or 1/2 pound amounts it will be necessary to divide the fraction or the whole by the fraction thereof.

R K M for This Week

By Roy K. Moulton, the famous humorist of "The Evening Mail," New York. Copyrighted by Mail and Express Company.

7.10 p.m.—Recovering golf balls by Laddie Boy, the White House Airedale.

7.28—Airplane flight by Congressman Manuel Herrick of Oklahoma, who hates to get his name in the papers.

7.47—Gunfight between Izzy Einstein and a Brooklyn saloon keeper.

7.56—Steeplejack climbing flagpole on the Equitable Building.

8.01—Governor Nathan Miller declining renomination for governorship. (Exclusive showing.)

8.43—Warren and Helen in breakfast table chat. Helen hits Warren for two bucks and Warren hits Helen with the coffee percolator. Happy home stuff. Great for the children.

8.59—Materialization of dinosauri and other prehistoric animal spooks by Dr. A. Doyle Cone.

9.17—Rudolpho Valentino and Gloria Swanson in wrestling scene from famous love fillum. Very exciting. No bigamy in this exhibition.

9.37—Modeling in clay by Dardanella La Rue of Greenwich Village.

10.00—Correct time from George Ehret's brewery, where they have nothing but time.

10.00 to 11.00—Ice skating by Charlotte.

11.00—Good night.

"SPAGHETTI"

VARNISHED TUBING

"EVERYTHING IN INSULATION"
VARNISHES, COMPOUNDS, PAPERS, ETC.

MITCHELL-RAND MFG. CO.

24 VESEY ST., NEW YORK, N. Y.

PHANTOM ANTENNA

Reduces static, eliminates lightning arrester and unsightly outside aerial. Ideal for apartments and city users who cannot erect aerial.

Fine oak cabinet and nickel fittings with green silk cord and plug ready to attach to nearest lamp socket. Price postpaid \$5.00. Dealers and jobbers wanted.

A. C. PENFIELD

Conneautville, Pa.

—NACO—

Radio Receiving Sets

\$20.00

Scientifically built to insure dependable service under exacting conditions with which radio communication has to meet. For clear hearing and pleasing tone use a Naco set.

Naco Radio Accessories

Telephones, Knock-Down Sets, Condensers, Coils, Detectors, etc.

STATE MANAGERS WANTED

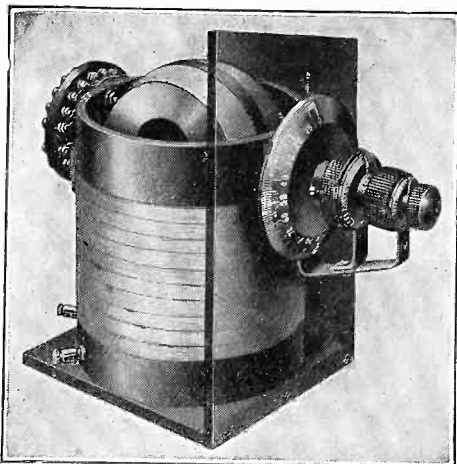
National Motor Accessories Corp.,
47 Vesey Street, New York City

SELECTOR—VARIO—COUPLER

Three units in one.

Self-contained.

Minimum static disturbance.



Space Saver.

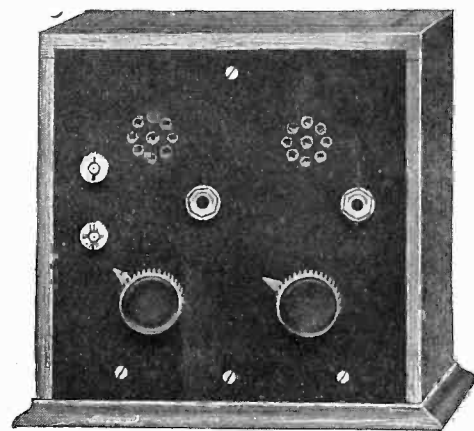
Neat, Compact and Efficient.

Send for Circular.

NORRIS RADIO CORPORATION

Dept. 46

126 LIBERTY STREET, NEW YORK CITY



Have you Radio worries? Weak signals — blurred music — distorted loud - speaking? You will want our B-2 two stage amplifier which increases music or signals from any Detector - set mounted on Bakelite-Oak Cabinet. By money order **\$37.50**

Beacon Radio & Electric Co.
246 Greenwich Street New York City

Latest broadcasting map 15c. That is, a complete broadcasting map appeared in Radio World, No. 8, dated May 20. Mailed on receipt of 15c. Radio World Company, 1493 Broadway, N. Y. C.

Eventually—

CLARION CLEARSTONE* HEADPHONES

FOR EFFICIENT RADIO RECEPTION

*Designed
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Radio
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*Approved
By
Radio
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CASE—
Highly polished
aluminum

CAP—
Highly polished
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CORD—
Six foot long.

HEAD BAND—
Popular Navy Type

"The Phones You Will Eventually Own"

SPECIAL FEATURES

COILS—Wound with commercially pure copper wire. Enamel insulation. Each coil is wound to six hundred and twenty-five ohms. A total of two thousand five hundred ohms for each set.

DIAPHRAGM—Selected to respond to radio frequencies. Is rustproof.

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If you are not receiving satisfactory results your trouble may be due to inefficient headphones. CLARION CLEARSTONE* HEADPHONES give complete satisfaction. Order them from your dealer. If he cannot supply you mail us eight dollars and receive a set prepaid, by return mail.

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CLARION CLEARSTONE* HEADPHONES are built to satisfy particular radio enthusiasts. If you have not already placed your stock order, it will pay you to do so. Prompt attention given to orders and inquiries.

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