MARCH 6

15 CENTS

RADIO WORLD

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Vol. 8 No. 24 ILLUSTRATED Every Week

A 1-TUBE, 1-DIAL RECEIVER

COILS FOR SLF CONDENSERS

AN ASTATIC CRYSTAL ET

DIAMOND EFFICIENCY DATA

"ME WANTS MORE DX!"

From a pastel by G. J. Klein

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RADIO WORLD

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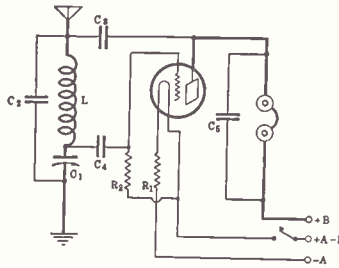
The Old Salt *One Tube One Dial*



CIRCUIT diagram of the 1-control set.

By Capt. P. V. O'Rourke

SEEING an old salt box lying around the house, which had been discarded by friend wife, gave me the idea for constructing the unique receiver shown in the photos and in the circuit diagram.

The salt box is used as a cabinet. Only one dial is employed. There is not even a rheostat to turn. Therefore simplicity in tuning is certainly assured.

Appraisal of Set

The receiver is, of course, not the most selective or the most voluminous ever designed, but it is one of the simplest as well as amply efficient for the parts and space employed. Another interesting factor is that a dry cell tube is used. The hookup used is of the single circuit regenerative type, with the grid and plate capacitively coupled to the antenna and ground systems. The complete receiver takes up no more than a 5" space. Only the variable, and fixed condensers and the coil are in the cabinet. The socket for the tube, grid leak and the ballast resistor as well as the dial are on the outside of the cabinet. A switch may be put at the rear. The A and B batteries take up more space than the receiver itself.

Fig. 1 shows the type of salt box that was employed to make the cabinet. Even if you haven't this in the house, it can be bought at a hardware or chain store for a few cents. The incline where the lid is, rises usually 8 or 9". It is a good idea first to scratch the words Salt from the cabinet with a penknife or sandpaper them off with some emery paper. Now look at Fig. 1 and note the little hole at the top of the box. You will also note that the portion surrounding this hole stands alone and can easily be sawed off. This we see being done in Fig. 3.

The Sawing Process

However if you just saw this piece off and try to push the lid, so that it acts the panel, there is large space above the lid. Therefore you will have to saw this piece off also. This is being done in Fig. 3. The best way to do this, is to draw a line parallel to each inclining line on each side of the box. Then when you saw the top and the sides off, you will have a nearly perfect square box, with just a small slanting place for the placing of the panel. The lid is used as the panel.

FIG. 1, showing the plain salt box.

Fig. 4 gives a clear idea of how the cut portions appear.

Now sandpaper the complete cabinet with emery paper. Wipe the dust off and give the box a coat of shellac. Let it dry. Then obtain some stain, the color of which may be best determined by the builder. Black pitch is the color I picked and it certainly makes a clean looking job. Mahogany stain is very difficult to place on the wood. Most of these boxes are made of soft wood. Therefore the absorbing nature of the wood is too pronounced. The mahogany stain therefore will not apply smoothly over the wood. The black spreads more readily. Let the box stand for a couple of hours until the stain has soaked into the wood. A coat of shellac may be placed over the coat of stain if desired. This gives the box a glossy coating. Of course before adding each coat of paint or shellac, the wood has to be absolutely dry.

Now take the lid out of the box. Drill a hole exactly in the center. This lid is approximately 4½" square. Therefore 2¼" from the top and the bottom as well as the sides, drill a hole for the shaft of the variable condenser. Now on the side opposite to that where the dial will appear, on the panel proper, place a piece of tin foil, which should be about 2" square. This tin foil should be glued to the panel, but placed in such a manner that it does not touch the condenser proper.

LIST OF PARTS

One antenna coil, L.
One .0005 mfd. variable condenser, C1.
Two .00025 mfd. fixed condensers, C4 and C2.
One .0005 mfd. fixed condenser, C3.
One .001 mfd. fixed condenser, C5.
One 2 megohm grid leak, R2.
One ¼ ampere ballast resistor, R1, (Amperite, No. D-11).
One salt box.
One Bruno Magic dial.
One switch.
One socket.
Accessories: One dry cell tube (WX12), one pair of phones, five binding posts, connecting wire, 2" square piece of tinfoil, screws, A and B batteries, etc.

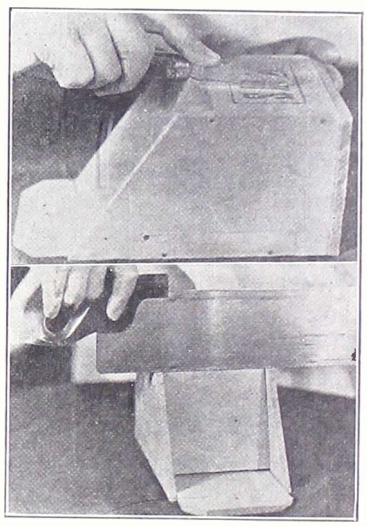


FIG. 2 (top), scraping the word "salt" off the wood. Fig. 3, (bottom), sawing the box.

Mounting Advice

Now mount the condenser. If you use the same type of dial as in the photograph, (Bruno Magic Dial), you will simply drill a hole for the holding of the dial in place. The dial requires no screws or bolts for mounting. The condenser used in the receiver pictured is one that requires only a single hole for mounting, therefore, it is necessary only to drill these two holes. To hold the panel in place, holes in the side of the box have to be drilled. There should be two on each side. The exact position of these holes depends upon the thickness of the wood in the box.

The socket and the resistances are to be mounted now. The socket, which is of the standard type, is placed in the center of the top as per Fig. 8. The filament posts should face the left-hand side while the plate and the grid posts should face the right-hand side. This means that the posts will be on the opposite sides, with no posts in the front or back. The ballast resistor is mounted opposite the filament posts of the socket. The grid resistor (leak) is placed opposite the G post on the socket.

Drill four holes opposite each post of

Assembly of the 1-Tube Set

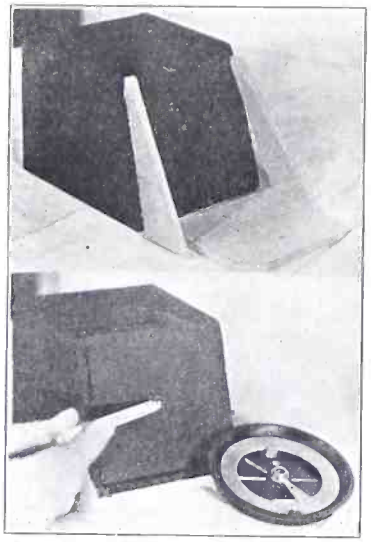


FIG. 4, (top), showing the sawed off portions, with the stained box. Fig. 5, (bottom), pencil pointing to the center hole for the variable condenser. Note the hole on the top, drilled for the purpose of holding the dial in position.

the socket, so that the connections from the coil can be brought through the wood. The coil, which will be described shortly, is mounted in the back of the cabinet proper and not on the variable condenser. The binding posts for the Ant., etc., are placed on the back of the cabinet. This will be the portion of wood opposite to the portion holding the dial and variable condenser.

Coil Data

We now turn our attention to the construction of the coil, which is of the spider weave continuous winding type. This coil consists of 70 turns of No. 24 single silk covered wire. A regulation spider weave form about 5½" outside diameter, with a center hub of 1½", is used. In Fig. 9, the spokes, of which there are nine, are shown being taken out. In order to make the windings hold, cotton is placed in through the turns (where the wire passes under and over the spokes). The under two and the over two method is used in winding the coil.

Now in order to mount the coil, get some strips of hard rubber, 7" in length and ⅛" in width. Run this through the large spaces of the coil. Get four angle irons. Mount one on each side of the strip in the inverted L shape. Now mount the other two angles, one on each side in the regular L form. This means that you will have a square form which has one side knocked out, on each side of the coil. Where the screw joins the two angle irons, place regular posts and bring the leads from the coil. The coil now mounted will have its surface 1" above the surface of the base. The coil, instead, may simply be mounted on a dowel driven into the wood, or, rather frailly, on a matchstick.

Now that all the parts are placed, the wiring of the receiver shall be attended to.

Wiring Directions

The beginning of the coil goes to the antenna binding post. It also goes to one terminal of C3 and to one terminal of C2. The other terminal of C3 goes to

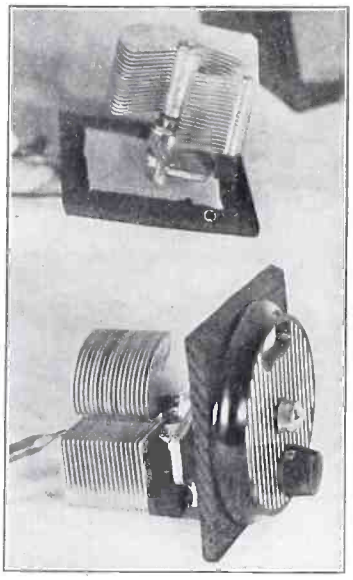


FIG. 6 (top), showing the tin foil placed on the back of the lid or panel. Fig. 7 (bottom), showing the spacing between the plates of the condenser.

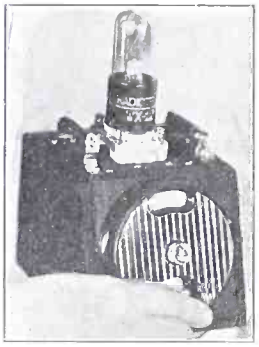


FIG. 8, the completed receiver showing the dry cell tube and Bruno Magic dial, as well as the socket, Amperite and grid leak.

the P post on the socket. This connection will have to go through the top of the board. These small fixed condensers are held in place by the connections. A wire from the P post goes to one phone post and to one terminal of C5. The other terminal of C2, one terminal which was connected to the antenna binding post, goes to the rotary plates of the variable condenser, C1, and to the ground post. The stationary plates of this variable condenser, goes to the ending of the coil and to one terminal of C4. The other terminal of C4 goes to one terminal of the grid resistance, R2, and to the G post on the socket. The other terminal of the grid resistance goes to one terminal of a filament switch. The other terminal of the filament switch goes to the A plus, B minus posts. This means that this tube has a positive grid return. A ¼ ballast resistor, R1, is placed in series with the minus side of the filament. The other terminal of the fixed condenser, C5, goes to the other phone post and to the B plus post. The tin foil is grounded.

When wiring this receiver, either flexible or regulation bus wire should be used. The bus wire serves as a better holder of the fixed condensers, but the difference between the conductivity of the two is nil.

Hints on Successful Operation

A 1½ volt battery is used to supply the filament voltage. Do not use a single unit, but place two or three batteries of the same voltage in parallel. The plate of the tube should receive about 45 volts. However, if you find that the tube does not oscillate freely enough, then increase the voltage to about 67½. The proper plate voltage is a very important factor in determining the oscillatory action of the tube. The variable condenser is used to tune in stations. If you find that the set oscillates too much, decrease plate voltage. The taking out of the fixed condenser, C5, may also increase the volume of the signals to a certain extent.

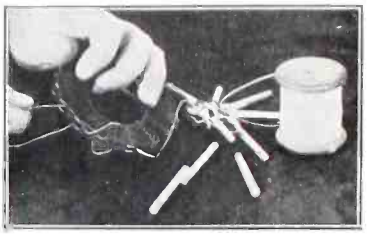


FIG. 9, placing the cotton in between the turns. Note the pegs of the form.

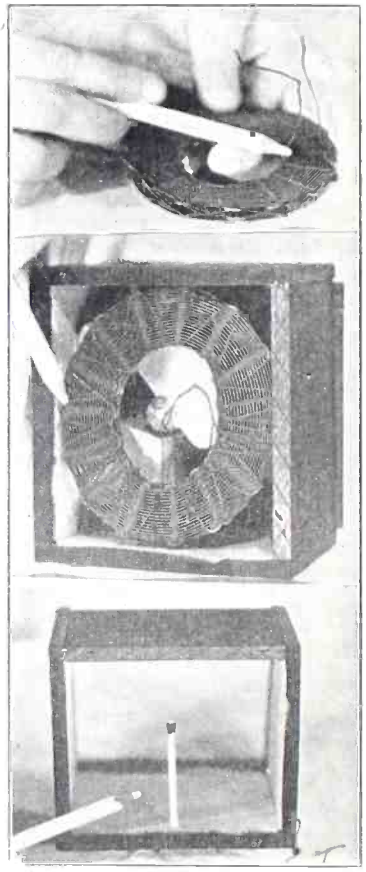


FIG. 10, showing how to mount the coil on a matchstick, instead of the more complicated affair, explained in the text, and how to construct and bind coil.

The Dial

A word about the dial. Used with a straightline capacity condenser—the semi-circular plate type—it converts the tuning to a straight-line frequency basis.

Coils for SLF Condensers

Memory Data Given for the Most Popular Capacities.

HEREWITH are given data on winding radio-frequency transformers and 3-circuit tuners, whereby secondaries of both the RFT and the tuner may be shunted by the three popular model variable condensers, .00025 mfd., .00035 or .000375 mfd., and the .0005 mfd. SLF types. Solenoid type forms are used. These include loose basket weave, air and solid forms. In the loose basket weave form, the spokes are ⅛" in diameter.

The tickler in each case is wound with No. 26 single silk covered wire. The primary in each case consist of 10 turns of the same kind of wire used on the secondary spaced ⅛" from secondary.

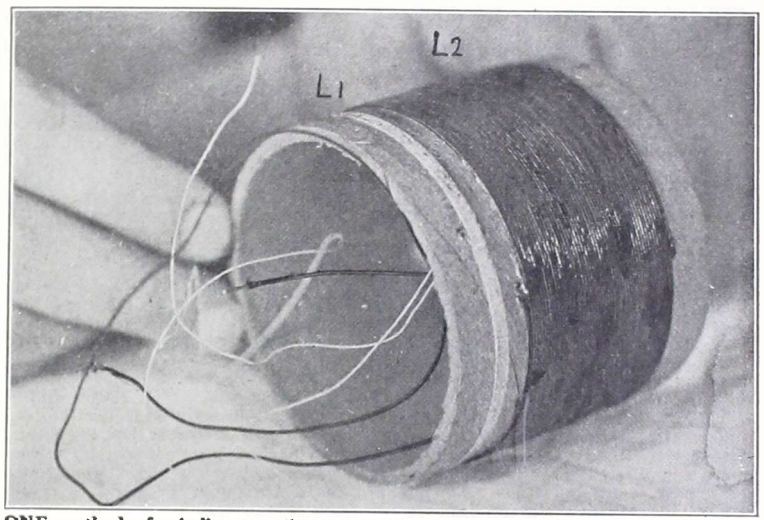
Coil Data

No. 20 DCC wire:—.00025 mfd. SLF variable condenser.
Secondary—2½" diameter,—128 turns. Tickler—1¼" diameter, 40 turns.
Secondary—3"—80 turns. Tickler—2"—35 turns.
Secondary—3¾"—70 turns. Tickler—2¼"—30 turns.
No. 20 DCC wire:—.000375 or .00035 mfd. SLF variable condenser.
Secondary—2½"—93 turns. Tickler—1¼"—50 turns.
Secondary—3"—70 turns. Tickler—2"—45 turns.
Secondary—3¾"—53 turns. Tickler—2¼"—30 turns.
The tickler windings are of the same in the following instances as for previously cited equal diameters.
No. 20 DCC wire:—.0005 mfd. SLF variable condenser.
Secondary—2½"—70 turns.
Secondary—3"—46 turns.
Secondary—3¾"—38 turns.
No. 22 DCC wire:—.00025 mfd. SLF variable condenser.
Secondary—2½"—110 turns.
Secondary—3"—70 turns.
Secondary—3¾"—66 turns.
No. 22 DCC wire:—.000375 mfd. SLF variable condenser.
Secondary—2½"—88 turns.
Secondary—3"—60 turns.
Secondary—3¾"—46 turns.
No. 22 DCC wire:—.0005 mfd. SLF variable condenser.
Secondary—2½"—66 turns.
Secondary—3"—45 turns.
Secondary—3¾"—35 turns.
No. 24 DCC wire:—.00025 mfd. SLF variable condenser.
Secondary—2½"—102 turns.
Secondary—3"—65 turns.
Secondary—3¾"—55 turns.
No. 24 DCC wire:—.000375 mfd. SLF variable condenser.
Secondary—2½"—78 turns.
Secondary—3"—56 turns.
Secondary—3¾"—42 turns.
No. 24 DCC wire:—0005 mfd. SLF variable condenser.
Secondary—2½"—62 turns.
Secondary—3"—44 turns.
Secondary—3¾"—32 turns

When winding the tickler coil, where the number of turns is so great, that a single layer cannot be made, the haphazard manner should be employed.

For winding basket weave coils the same number of turns may be used, with the same wind of wire.

PART 2 OF RADIO WORLD'S B BATTERY ELIMINATORS appeared in RADIO WORLD dated Dec. 19. Other great articles in that issue. 15c per copy or start your sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.



ONE method of winding a coil on a solid solenoid form with the primary, L1, alongside of the secondary, L2, is shown above.

Forecasts of Reception Conditions Are Planned

By Thomas Stevenson

Washington.—Forecasts of radio reception by the Government, somewhat along the lines of daily weather reports, are awaited with interest. Such a daily service to the millions of radio fans has been considered by several Government agencies at Washington. Experimental work has been done by the Bureau of Standards to establish the connection between the weather and radio reception. Officials of the Bureau of Standards are none too well pleased with the progress of these experiments, but they are confident the time will come when they will know more about it.

Weather Bureau experts do not believe the experimental work has yet progressed to a point where it would be safe in the near future to prepare daily radio reception forecasts.

Washington officials have been watching with particular interest the experiment of the Nebraska Wesleyan University in preparing daily radio forecasts.

For the past several months, J. C. Jensen, of the Department of Physics of the Nebraska University, has prepared a daily radio reception forecast which is broadcast through Station WCAJ at 4:30.

"As a result of years of study and investigation," says Mr. Jensen, "the United States has come to be depended upon as a reliable source of information concerning weather conditions. Farmers cut their hay when fair weather is predicted and city folk delay their automobile picnics over unpaved roads when the forecaster says 'Thunder storms probable.'

"With so many people now depending largely on radio for their entertainment, and with the quality of that entertainment varying so much from night to night, any plan by which receiving conditions may be predicted with reasonable accuracy should be of general interest. If the radio fan can be forewarned that static will be unusually bad, he can change his plan for a radio party, and go to the movies.

"If he knows beforehand that signals will be weak from the southeast but good to the north and west, he can save time by tuning directly for Los Angeles, or Denver, or Minneapolis, instead of saying 'Why can't I get Havana tonight?' after a prolonged effort. That this very thing may soon come about as a regular feature of weather forecasting is not at all improbable.

"Many studies have already been made in this field. Among them may be mentioned the researches of Dr. L. W. Austin of the U. S. Naval Laboratory at Washington, Dr. G. W. Pickard of Boston, Professor Van Cleef of Ohio State University, the American Radio Relay League, and the U. S. Bureau of Standards.

"It is well known that heavy static is worst in the southeast quadrant of a low barometer area, and that the cloudy to clear days following the passage of a storm are favorable for radio work. It is also known that signals are stronger at night than in the daytime, and that fading is much less troublesome in daylight.

"In the radio laboratory at Nebraska Wesleyan University the measurement of signal audibilities and the recording of fading curves has received considerable attention. A paper on the relation of radio audibilities to weather conditions, by M. P. Brunig, was published three years ago in the Monthly Weather Review. Being located in the center of the United States with broadcasting stations in every direction, this laboratory has unusual opportunities for plotting fading curves from the four points of the compass, and hence from regions of different barometric conditions, in the same evening.

"On the basis of these studies, a daily radio forecast is prepared by myself and broadcast from WCAJ at 4:30 P. M. The following forecast for December 15, 1925 is typical:

"'For eastern Nebraska: A good radio night; free from static. The best ranges may be expected from the east, northeast, and northwest. Considerable fading is probable from the south.'

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The Chemistry of Batteries

The Importance of Chemical and Physical Control of Materials Entering Into Storage Batteries is Discussed by an Expert.

By A. R. Reid

Chief Chemist, U. S. Light & Heat Corp.

THE service received from any storage battery is dependent entirely upon the material which enters that battery and, as with anything else, it will break down at its weakest point. No matter how strong or of how high quality the rest of the battery may be it will last no longer than if all its other parts were but as strong as its weakest point.

The only guides to strength and quality of materials are in the analyzing and testing of such materials. This is a far more complicated task than the average person, or even the average battery service station man, realizes and requires not only extensive equipment but also the utmost skill.

Effect on Life and Performance

To make clear the importance of such accurate control it is best to consider what effect defective materials will have on the performance and life of a battery. In taking this point of view let us first consider the lead antimony alloy that goes to make up the grids. As a battery continues in service the grids become corroded deeper and deeper, allowing any impurities in the metal to be dissolved by the electrolyte and so become active within the cell. The more common impurities in the grid metal are arsenic, tin, copper and iron. The effects of arsenic and tin are not very pronounced, though they tend to cause internal discharge of the negative plate when the cells are idle.

Copper brings about the same result, but its action is much more pronounced, consequently it must be more carefully guarded against and much smaller quantities permitted in the metal. These metals act by depositing on the active material of the negative plate and there setting up minute voltaic cells which act to discharge the plate. A very peculiar yet very harmful effect is the result of two or more impurities acting in this way, in that their discharge of the negative is far more pronounced than would be the case if both were free to act alone. This condition adds considerably to the hazard of metallic impurities.

Iron Most Injurious

Iron, whose behavior is somewhat different from the aforementioned metallic impurities, is probably the most injurious of all those commonly met in storage battery materials, for its action is to rapidly discharge both the positive and negative plates on open circuit. Because practically all the equipment used in making up the lead alloy and the battery oxides is of iron the resulting materials are invariably contaminated to some extent with this very undesirable impurity. Iron exists in two forms, the ferrous or vivalent and ferric or trivalent. Under proper influences it readily changes from one to the other and it is this property which renders it so troublesome in the cells of a storage battery.

The ferric iron migrates to the negative plate, where it changes to the ferrous by loosing one of its charges to the plate. As this charge is positive it tends to discharge the negative plate. The ferrous iron then migrates again to the positive plate, where it is again oxidized to the ferric condition, taking a charge from the positive plate and thereby tending to discharge it. This action goes on constantly and discharge is proportional to the quantity of iron present. Realization of the extent of the harmful influence of iron can only be effected when it is known that at normal temperature it takes but .5 of one per cent of iron in the electrolyte to completely discharge a battery on open circuit in 20 days.

Lead Oxide Effects

To go to the next and most important material entering into a battery we must consider the lead oxides of which the active materials are formed. Unlike the grid metal all impurities contained in the lead oxides are introduced 100% into the electrolyte, where their detrimental effects take place as soon as the battery is built. It is for this reason that the most rigid specifications are given to cover the oxides and unless these are strictly adhered to trouble is bound to result. In the oxides iron is the most common impurity found and unless the manufacturer exercises the utmost care it will enter the material in excessive quantities and once there it cannot be removed.

Copper is also found to some extent but this can be kept at a minimum by selecting only low copper lead for oxide manufacture, whereas iron is accumulated during the process of manufacture. Because of better control in the production of pure lead for subsequent oxidation than is possible with the grid alloy the other metallic impurities are in almost negligible quantities, yet a broad analytical control is necessary to avoid their occurrence through variations in the lead ores or through some failure in the refining processes.

As the performance of a battery depends upon the physical characteristics of the oxides it is necessary to exercise physical control over these materials along with chemical search for impurities. The apparent density and the texture of the oxides are very important and must be uniformly maintained. Chemical tests to determine the activity of the oxides are also necessary. This physical and chemical control of the oxides is of the utmost importance in maintaining quality and uniformity of the product and interpretation of the results of the tests requires the greatest analytical and engineering ability.

While different characteristics are demanded by different services or by the various manufacturers it is absolutely necessary that the material be held uniform or wide variations in the performances and lives of the resulting batteries will follow.

As the processes of manufacture have a great bearing on the resulting oxides, and in a number of cases the manufacturers even vary their processes at will according to conditions or demands, the number of different grades of oxides on the market is very great. While most are crystalline in structure the variations come through the texture of these crystals, a source of variations which is unlimited. While the crystals through their texture play a very important part in the subsequent active material, yet a consideration of them alone will lead to naught unless their behavior to other tests is also taken into consideration.

Effect on Density

Different crystal combinations have a great bearing upon the apparent density and activity of the oxides, yet these two properties may not run proportionately. Densities, however, have a very great bearing on costs as it is this factor which makes plates light or heavy.

Capacities, especially at high rates, show a tendency to follow activity of the oxides but treatment in processes may completely alter this; therefore, without knowing the effect of a particular process on an oxide it is impossible to state what the battery performances will be from a study of the characteristics of the oxides. On the other hand, a battery manufacturer may have a certain process through which but one oxide or combination will work successfully. Should he use any other grade of material he may suffer an appreciable loss of service from his product or an increase in cost or both.

Having considered the metal and oxides entering into a battery we can now turn to the third material which plays an important part in every battery, a part which is entirely chemical in nature and in which all impurities are in their active states. This material is the electrolyte, dilute sulfuric acid. It is into the electrolyte that the impurities in the oxides and grid metal find their way in the form of soluble sulfates and in which form they are harmfully active in that they cause internal discharge.

Iron in the Acid

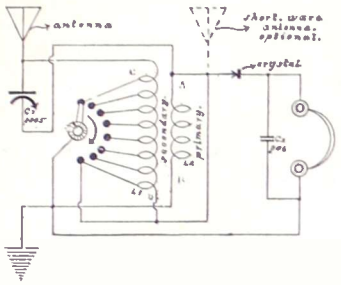
The chief impurity found in battery acid is iron again. However, it is not as apt to occur in as great percentages as it does in the oxides, yet unless extreme care is exercised in the manufacture of the acid it will occur in large quantities. While the manufacturers use every care possible to keep it at a minimum yet it is always present to some extent and therefore requires consideration lest its percentage run above the allowable limit.

Another class of impurities met in the electrolyte but not in the metal or oxides is foreign acids. Unlike the metallic impurities the foreign acids have a tendency to increase the capacity of a battery but only at the expense of its life. Their action is that of a corroding agent, attacking the active materials and the grids, making them more porous or spongy and causing a washing away of the very materials themselves. Because of their almost unbelievable corroding power they are sought out in the electroylte by the most sensitive chemical analyses possible. To illustrate how important it is that they be absent and how powerful their corrosive action it is only necessary to stop to consider that the limit of nitric acid present in battery electrolyte as specified by the U. S. Government, is four one-thousandths of one percent. Other foreign acids are also limited to about the same quantity and if present in excess show corrosion of the active materials and grids with appreciable shortening of life. Ammonia and organic matter sometimes find their way into battery electrolyte. In small quantities of less than .005%, they are not considered dangerous, but should they occur in large quantities they certainly are injurious. Ammonia tends to decrease the capacity of the cell while organic matter retards charging of the positive plates. Ammonia is permanent in a cell while on the other hand organic matter is gradually destroyed.

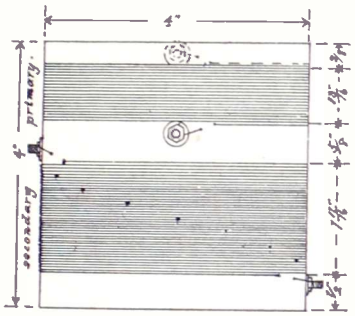
Needs Supervision

While the occurrence of each or both of these impurities in excessive quantities is not very common, yet it must be guarded against or very serious results may be encountered.

An Astatic Crystal Set



THE WIRING DIAGRAM of Freer's Astatic Crystal Receiver, which he says cuts out powerful Locals. (Fig. 1).



THE DETAIL of the fixed coil. (Fig. 2). A variocoupler may be used instead, the primary being variable, but the gain is slight, Mr. Freer reports.

By Frank Freer

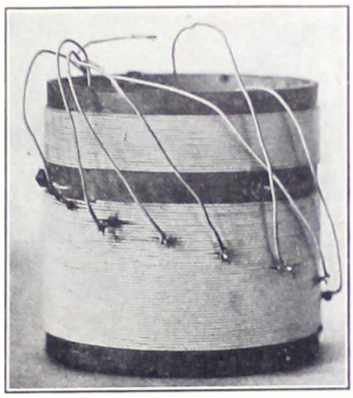
THIS hookup of an astatic coil crystal set has been used by me about four years. Located in Newark, N. J., about three miles from station WOR and two and a half miles from stations WBPI and WGCP, the set separates these stations and tunes in and out stations WEAF and WJZ. This set was tested in Maryland, about 20 miles from Washington, and the Washington stations were as loud as on a good 1-tube set. Reception of radio signals in Washington is much better than what we enjoy in the vicinity of New York.

A medium-sized antenna will run this set. My antenna is a flat-top V-type, which is led in and connected to a double-pole, double throw switch. The antenna, with lead-in, is about 100 feet long. The advantage gained by erecting this type of antenna is, you can often overcome considerable local interference and can cut the length of your antenna in half when using a regenerative tube set.

The inductance in this set is astatic, of which little is known.

In the schematic diagram of the set (Fig. 1) you will notice that the top of the primary coil, at A, is connected to the bottom or end of the secondary coil at D. If these coils were regular solenoids this connection would cause a short circuit, and no signal would be received. But the primary and secondary are wound in opposite directions and then connected together. This evidently prevents the short circuit which would occur if the coils were standard selenoids. (Fig. 2) shows the coil detail and (Fig. 3) the photo of the coil.

Take a cardboard or other tubing 4" in diameter, and 4" long. Use No. 6 3/8" round head machine screws for your connections. Fasten a screw with a washer on both sides of the tubing, just even



FIXED STATIC COIL used by the author. (Fig. 3).

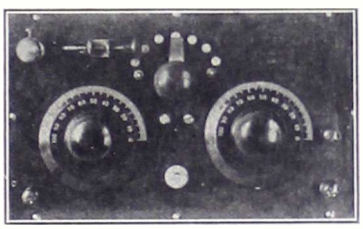


FIG. 4, panel view of the set when a variocoupler was used. With a fixed coil, omit the dial at right.

with the top edge of the tubing. Turn the tubing around and on the opposite side measure down 1 7/16" from the top edge of the tubing and fasten another screw. These are the fastenings for your primary winding.

For your secondary winding measure down 1 5/8" from the top at the left side of the tubing, and fasten another screw directly opposite, and 3/8" from the bottom of tubing fasten another screw. Use No. 20 double cotton covered wire. Connect the wire at A and wind 20 turns and connect to B on the opposite point of the tubing at the top. This completes your primary.

For your secondary winding, connect your wire to the third screw, C, at the left, and wind 40 turns, taking a tap every 5 turns, 7 taps in all, and connect to D at the bottom of the tubing. This completes the winding of the secondary coil.

Connect the aerial to the stator plates of the condenser, C1, and also to terminal C of the secondary coil, this is the only antenna connection.

Connect to crystal to rotor plates of the condenser, and lead to A of the primary coil. Connect A of primary to D of secondary at bottom of coil and connect to last switch point. Connect switch arm to B, to jack and to ground. Connect catwhisker side of detector to other side of jack. The fixed condenser C2 is shunted

LIST OF PARTS

One astatic wound coil L1L2.
One .0005 mfd. variable condenser, C1.
One .006 mfd. fixed condenser, C2.
One 7x10" hard rubber panel.
One open circuit jack.
One crystal detector.
One spool 1/4 lbs. No. 20 DCC wire.
One dial.
One tap-switch (8 points, 2 end stops).

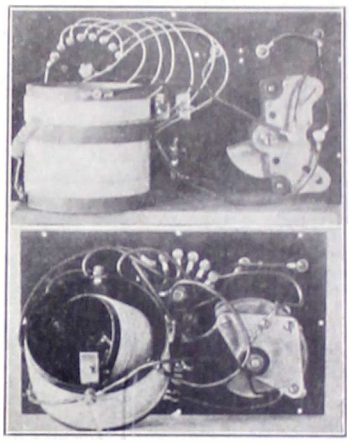


FIG. 5 (top), the rear view of the Astatic crystal set. The lower photo (Fig. 6) despicts the variocoupler set.

across the phones in the usual manner. the lap loops of the secondary are brought to the switch points.

Fig. 4 is a photo of front of set that brought in KDKA from Washington, using a 4" variocoupler to wind the coil on. This set is mounted on a panel 6x10".

The condenser will tune stations varying 100 meters on one tap of the switch. The second tap is best for station under 300 meters with any aerial.

The third tap is for 400-meter stations, and the fourth tap for 500-meter stations. The additional taps will bring in higher wavelengths. I use these extra turns to increase volume.

When the short-wave antenna is used the input is reversed, that is the ground is substituted for the antenna. This reverses the tuning and the switch taps increase from right to left. So used, this set just goes to 550 meters.

Dill Bill Discussed; Senate Action Urged

WASHINGTON.

Hearings on the Dill radio bill to give the Secretary of Commerce additional authority to regulate radio were resumed in the Senate. Senator Watson, chairman of the Interstate Commerce Committee, is convinced of the urgent necessity for radio legislation this session of Congress, and he is determined that his committee shall report out some kind of bill in time for consideration by the Senate.

First Show Is Held By Spokane Dealers

SPOKANE, WASH.

One of the largest groups of radio receiving sets ever assembled at one time was shown at the first radio show held at Spokane, Wash. Dealers confined themselves to their particular sets and all callers had the benefit of expert information on interference problems and other general radio problems, the dealers providing a booth for the Radio Listeners' Association.

HERMAN BERNARD, managing editor of RADIO WORLD, broadcasts every Friday at 7 p. m., from WGBS, Gimbel Bros., N. Y. City, 315.6 meters. He discusses "What's Your Radio Problem?" Listen in!

Educational Use of Radio

By C. W. Warburton
Director of Extension Work, U. S. Department of Agriculture

"THIS is Station KSAC, the College of the Air, Kansas State Agricultural College at Manhattan."

This is the announcement for which hundreds of folk all over the central United States are listening at 7:30 each Monday to Friday, when the Kansas State College broadcasts its regular course of educational lectures. Similarly, other educational institutions are extending their fields beyond the college campus. The Kansas College, however, was one of the first to recognize the educational value of radio and to make systematic use of it.

From the beginning of the school year in September until late in the following spring, a regular schedule of lectures is broadcast to hundreds of listeners who are registered for these courses. In addition to those who are registered, correspondence received at the college indicates that several times as many listen in more or less regularly on the educational talks. The lectures cover a wide variety of topics, such as crop and livestock production, dairying, poultry raising, foods and nutrition, household economics, English, chemistry, botany, zoology, and the several major engineering fields.

The Personal Contact

These radio lectures constitute a sort of glorified correspondence course in that those who are taking the course have the opportunity to hear the voice and thus have, in a measure, the personal contact with the teacher which heretofore has been limited to the classroom. After each lecture is given, mimeographed copies, with such additional tabular and illustrative matter as may be desirable, are mailed to the registered listeners-in. At the end of the course an examination is given and those who show evidences of proficiency are given a certificate. In some institutions definite credit toward a college degree is given for satisfactory completion of radio courses.

Registration for the radio courses given by the Kansas State Agricultural College during the college year 1924-25 includes 1,771 individuals registered for a total of 11,431 courses. While the major portion of these individuals reside in Kansas or nearby states, the far-flung possibilities of radio are demonstrated by the fact that there were registrants from more than 30 states, from several of the Provinces of Canada, and from Mexico. The growing popularity of the courses is indicated by the fact that the total registration was nearly double that of the previous year, while the average number of courses for which each individual registered increased from 2.5 to 6.8.

One of the Pioneers

I have gone thus fully into the radio courses presented by the Kansas State Agricultural College because this institution was one of the pioneers in the field and its faculty is exceedingly enthusiastic about its possibilities. Kansas State University, the State University of Iowa, Iowa State College, Ohio State University, Michigan Agricultural College and Oregon Agricultural College are other institutions which are giving regular courses of instruction over the radio. An interesting feature of the programs of several of these institutions is the half-hour of opening exercises which they are broadcasting for schools. The State University of Iowa broadcasts opening exercises for high schools which are received by some 200 of these schools. The Kansas State Agricultural College broadcasts exercises

GILDA GRAY, popular dancer, writing to Radio World as to the type of program she would like to have, every evening. (Foto Topics)

for rural schools and in one or two states plans are under way for broadcasting messages to schools by the state departments of public instruction. One of the broadcasting stations in Mexico is operated by the Secretary of Public Education.

Features Not New

The utilitarian and educational use of the radio is not a new thing. In fact, one of the first public uses which was made of radio broadcasting was the sending out of weather reports and storm warnings by the United States Weather Bureau. A little later the same means of giving wide and prompt distribution to market reports was utilized by the Federal Department of Agriculture. Now the broadcasting of weather reports is a regular feature of the program of many of the commercial broadcasting stations, as well as of those which are maintained by educational institutions.

An interesting and useful type of market reports has been worked out by the Pennsylvania State Department of Markets and the Fruit and Vegetable Marketing Division of the U. S. Department of Agriculture. This is a consumer's news service, which consists of frequent radio broadcasts from Philadelphia stations, which tell the housewife just what food products are on the local market in quantity or in specially good quality. Coupled with this is usually a brief talk by a home economics expert on how to utilize most satisfactorily the articles of food discussed in the market broadcast. This kind of information serves the consumer, in helping him to buy and utilize food products most advantageously, and at the same time serves the producer by tending to prevent market gluts and consequent ruinously low prices.

Scientific Talks

Many of the commercial broadcasting stations which are devoted primarily to entertainment features introduce occasionally, and in some cases regularly, educational broadcasts. This is particularly true of stations which serve the more important agricultural areas. They have found it advantageous to introduce in their programs, in addition to weather and market reports, talks on a wide variety of agricultural subjects. These are contributed by members of the staffs of agricultural colleges or by the farm press, and by successful farmers and rural leaders. A feature of many broadcast programs, particularly during the morning hours, is a talk to housewives.

A striking example of the educational use of the radio is the fifteen-minute popular talks on scientific subjects which are arranged by Science Service, an adjunct of the National Research Council, for broadcasting by one of the radio stations at Washington, D. C. These talks are prepared by eminent scientists and constitute a definite effort to present scientific facts to the public in an interesting and entertaining way.

Needs Textual Adjunct

To be most effective, radio lectures should be combined with mimeographed or printed copies of the text, which are mailed to the listeners, together with such additional tabular and illustrative material as may be desirable. Some institutions broadcasting radio courses mail copies of the lectures to those who are regularly registered for them, just as soon as each lecture is completed. Others send summaries of the lectures at the end of the course, together with answers to questions which have come in from listeners. It is manifestly impossible, however, to register or to send the printed text to the great majority of those who hear the lectures. It is equally impossible to measure the benefits which will result in a more broadly educated people and one which is better satisfied with its home life, whether in the city or in the country.

While the agricultural colleges are finding the radio of particular value in reaching rural people, its advantages in an educational way are not by any means limited to this class of institutions or to farm homes. The program manager of the broadcasting station of one of the state universities tells me that his station broadcasts courses in education, appreciation of literature, history, sociology, journalism, political science, botany and zoology. He sees great possibilities for broadcasting in other fields, such as appreciation of music, popular astronomy, economics and government. Incidentally, one of the most popular features of the program from this station is a Sunday evening half-hour of popular hymns.

A Glimpse Into the Future

What is the future of education broadcasting? The educational use of the radio is so new that, like other uses, no man can say what form it will take a year or five years from now. Just as newspapers and magazines appeal to different groups of people according to the character of reading matter they print, so each radio station is likely, it seems to me, to build up a following according to the program it presents.

Like the magazines, most stations will have to depend largely on advertising for their support, though this advertising may be so carefully and completely sugar-coated as not to be recognized as such by the casual listener. On the air, to an even greater extent than on the printed page, it is difficult to segregate advertising from other matter.

If certain commercial stations of the future are to be devoted primarily to advertising, they must carry a certain proportion of educational and entertainment features to maintain their following. Educational features in such programs, however, are likely to be more or less casual and incidental. The expense of providing these features and the competition with advertising and entertainment is likely to cause them to remain a comparatively minor factor.

On the other hand, radio broadcasting has greatly widened the field of the colleges and universities. They have ready at hand a large number of experts who can provide educational programs at comparatively little added expense.

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Dah—Dit—Dah—Dit—Dah!

By Irving Philip Wolfe

2APJ

8 CZA in Detroit informs me that there is a bunch of Austrian hams. He has gotten a list of them and it consists of the following:

AF, AR, AW, BE, BH, CP, DA, FG, FH, FL, HF, HI, HR. JA, JL, KH, KK, LA, LM, LP, MH, NA, OA, OP, RF, RH, SF, SJ, SV, TA, TM, TO, TW, WA, WM. He doesn't know their wave, but he does know that they want QSLs sent to Oesterreichischer Versuchssenderverband Klubsaal des Hotel de France, Schottenring 3, Wien 1, Austria. The "Radio Express" of the Hague is their official magazine.

* * *

Marcellus L. Jacobs of Culbertson, Mont., says that his spark coil CW outfit has a daylight range of easily 75 miles and a much greater nightime range.

* * *

1 AOA reports that the most consistent 2s worked during the afternoon are 2 BM and 2 AX. He also says that the twos are the most courteous fellows to talk to on the air. The sixth district reports him as being one of the loudest stations on the east coast and every one he works gives him an R7 or an R8. He is using a 250-watt tube now with the WNP type circuit.

* * *

Mrs. 2NZ was asked why she didn't learn the code and get on the air as the feminine department of the station. Her reply was that somebody in the house had to remain sane. Hi!

* * *

2 ALS had the great honor of handling the first official army amateur message ever to be transmitted in amateur communication. The message was a 50 worder and was sent to him from 4 FX down in Knoxville, Tenn. The purpose of this message was to determine whether or not relaying was better than direct communication on the army amateur 40-meter band. ALS is using a 50 watter and has been reported in all parts of the world.

* * *

I have a few new QRAs, so better get out a pencil and jot them down on call book, om. John R. McKenna of 2805 Eighth Ave., Astoria, Long Island, N. Y., is using a UV 203a on 40 meters. He was assigned the call 2AVB. Another new brass-pounder is 2ARD. Eric Lutz, of 924 Summit Ave., New York City, has that call. Another new second district ham is 2 ANX, J. Toman, Jr., 410 East 17th St., New York City. His power is 5 watts on 80 and 170 meters. A 450 volt motor-generator supplies the plate juice.

* * *

I am informed through the first district representative that 1 AIV, the old-time commercial, is coming down on 40 meters to help improve the QRM around Newport.

* * *

A new Q signal that might be put into good practice is QTK. Whenever some ham tells you that you are about R9 pounding in all over the room just say QTK and he will then proceed to blush with shame. It all means that QTK is "Quit The Kiddin'." Hi.

* * *

I want more Calls Heard, gang. At present there are just a few reporting. Don't forget—the more the merrier. By the way, if there are any new hams in any part of the world who see this or if their friends see it, just send in a card with news of the new stations. Also include with this the address of the new ham.

* * *

9 AML, G. N. Bragg, is now located at Blue Springs, Nebr. He is using 100 watts fone and was reported in Kittaning, Pa.

* * *

In regard to the Sixth Annual Convention of the Executive Council, Second District, which will be held March 10-13 inclusive, one of the judges of the Broadcast Receiver contest has been given to Herman Bernard, manager editor of Radio World. He has also promised to give a talk on Trouble-Shooting in Broadcast Receivers, Friday, March 12, at the show.

* * *

The ERCO annual initiation will also be given on Friday evening. The tickets will be $1.50 apiece and may be purchased by addressing the council at its headquarters, 74 Cortlandt St., New York City. The sale of ERCO tickets will be closed on Wednesday, the first evening of the convention, so you better grab one quick. The banquet will take place on Saturday evening, March 13. Tickets for the banquet are $5 apiece and may be purchased either directly from headquarters or through any of the official second district clubs. The banquet ticket also includes a "season" ticket to the show and all activities, such as trips to local ham and broadcasting stations. Among the exhibitors at the show will be A. H. Grebe & Co., Cardwell, Hammarland, Radio Engineering Laboratories, Bruno Radio Corporation, RB Radio Co., Priess, General Radio, Powertone Electric Co., and many other of the best known and reliable manufacturers.

* * *

2 AJE, of the Yonkers Radio Club, is now slamming out a mean signal on 80 meters. His DC note is a wow to copy.

* * *

2 BLF is temporarily off the air. He says that the reason is his being QRW YLs so I expect him back pretty soon. Perhaps his "bug" decided that it was sending too many dots lately—or his "H" tube might have taken a short strike, you never can tell. Hi!

* * *

2 APV, 2 QH, 2 MA, and 2 BDZ banded their interests together and are now engaged in business.

* * *

As you can easily see it is 3 CDQ, our friend from Washington, who has the pictorial part of my article this week. 3 CDQ is owned and operated by Miss Elizabeth M. Zandonini, whose QRA is 3320—19th St., N.W., Washington, D. C. Miss Zandonini has a 100 per cent American Radio Relay League station (emphasize on the 100 per cent. and the Relay).

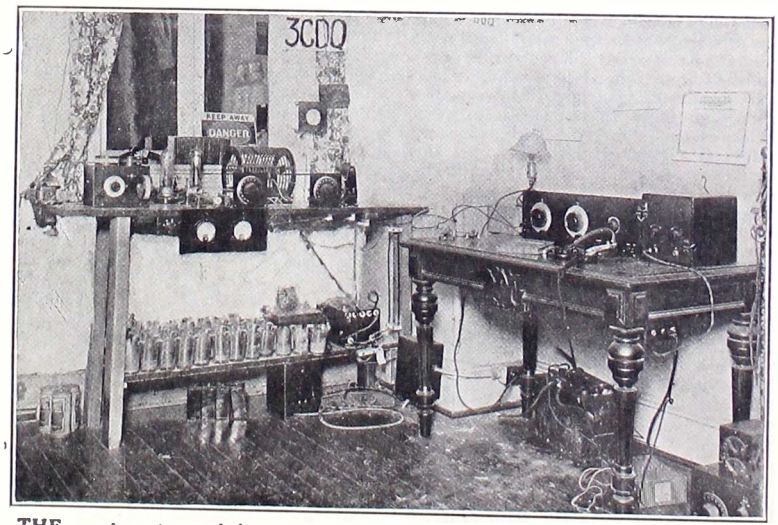
The transmitter at 3 CDQ consists of two 50-watt tubes, using the standard Hartley loose-coupled circuit. On 40 meters .5 amp. is put into the antenna system. The inductance used is an old 200 meter coil, cut and spaced. The set is kept within the proper wavelength band by use of a wavemeter calibrated from WWV's test signals. The wavemeter has interchangeable coils and can be used from 20 to 161 meters. The receiver is a low loss Schell tuner also using interchangeable coils. It tunes from 35 to 500 meters; loud-speaker volume is procured from a two step audio-frequency amplifier unit.

The power supply is the most interesting part of 3 CDQ. A 10 ampere Westinghouse Elec. Co. Cooper Hewitt mercury arc tube is used for rectification. This rectifier will be shown next week, and was installed by Donald Basim, 3 CKQ. An excellent rectified AC note is delivered from this type of power supply.

Miss Zandonini is Radio Aide at the Bureau of Standards (NKF) in Washington and is one of the most active members of the Washington Radio Club. She would be glad to supply the hook-up of her rectifier and other equipment.

* * *

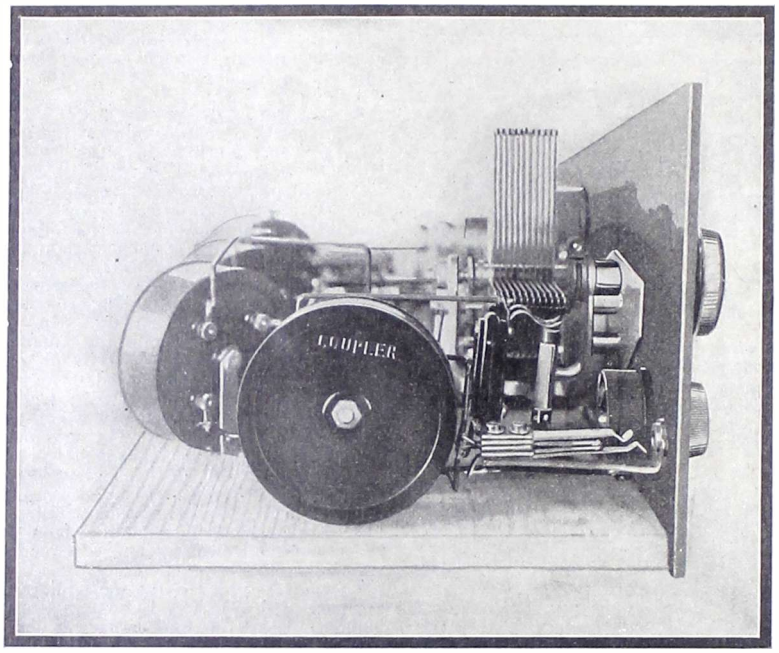
QST-QST-QST-de-2APJ-2APJ-2APJ — Don't forget to send those Calls Heard, new QRA's, bit of news and queries to 2APJ, Irving P. Wolfe, Amateur Editor, Radio World, *145 E. 45th Street, New York City or call 2APJ on the air, 40 or 150 meters.*



THE amateur transmitting station of Miss Elizabeth Zandonini, Radio 3 CDQ, of Washington, D. C. On the table at the right is the receiving apparatus. The chemical rectifier, located under the transmitter at the left, has been replaced by a new mercury arc rectifier. The new calibrated wavemeter can be seen at the left of the transmitter.

Wiring the Victoreen Set

Arrangement for First Detector



THE INPUT END of the Victoreen, showing how the antenna coupler is placed, how the grid leak-condenser unit is mounted and how the leads are brought from the loop jack. The tuning condenser, C1, is shown at half setting.

[Part I of the 3-part article on the construction of the Victoreen, an 8-tube Super-Heterodyne, was published in the February 20 issue of Radio World, *while in the February 27 issue, Part II was printed. Following is the instalment dealing with the actual wiring. Trouble-shooting will be discussed in next week's issue, dated March 6.]*

PART III.

As efficient parts are used in the Victoreen, the results obtainable from the completed set will depend largely on the manner in which the receiver is wired. The wiring problem was simplified by the detailed description of placement of parts, published last week, and which concerned both the front panel and the baseboard. From that point forward it is simply a matter of connecting the wires properly to the posts to which they should go, and this is the burden of the present instalment.

Keeping the oscillator coil safely distant from the radio-frequency transformer (Type 160) is a good precaution and it is assumed this has been done, as directed. While some other location of the oscillator coil would give fine results in many instances, it is better not to experiment with this, unless one is thoroughly versed in Super-Heterodyne design. This advice is repeated so that the constructor will not make a mistake which would necessitate rewiring much of the receiver.

Options Discussed

The wiring was done with Celatsite, and an Acme 5-lead vari-colored cable was used to connect to the batteries. Thus no binding posts were employed, but wherever a connection was to be made to battery, it was established directly, without passing through a binding post. That was simply the method adopted, although any who prefer to use a terminal strip may incorporate that, too. It would have to be added to the list of parts, not being a member of the kit family.

Three more added starters should be discussed. If the Kurz Kasch E-Z-Toon dials are used it will be necessary to procure two dial pointers. The ones used are known as the Eureka.

The fixed condenser, C4, shown in the schematic diagram last week, is not a part of the kit, either, and would have to be obtained additionally. It is not a necessity, but simply safeguards against blowout of tubes should one accidentally short the stator and rotor plates of the oscillator condenser, C2. The value of this fixed condenser is .006 mfd., which is too high to affect in any material way the tuning of the oscillator condenser. Do not use a smaller fixed condenser here. One may see from a glance at the schematic diagram (page 14 of the February 27 issue) that should C2 be shorted, as described, the B battery voltage of 45 would be placed on the tube filaments. This is because one side of the condenser goes to plate of the oscillator tube (a B+ 45 lead), the other side to A minus, through the grid coil L4.

The other added starter is a set of battery cable tags.

Wiring Directions

The identity of the rheostats was established last week, in respect to their panel location and function, hence it will be assumed that the reader is familiar with these points.

As the set will work right off the reel, if directions are followed, we will proceed on the basis of immediately turning out the completed receiver.

First wire the A battery leads, especially so far as they concern direct current purposes. Run a spaghetti-covered busbar lead, beginning 5½" from left and 2" from the panel rear, and going to ¾" from the panel rear. Looking at the rear of the panel, this lead is turned to the right until it reaches the switch, where it is soldered. The remaining open side of the switch goes to the left-hand side (or center) of each of the rheostats and to the right-hand side of the potentiometer, R3.

The A Plus Lead

As seven of the sockets are in a row, spaghetti is scraped off one long lead, running about 18", so that the lugs at the plus posts of these sockets may be turned up and the lead soldered to each of the seven points, on the F plus wire. The oscillator tube is directly in front of the third intermediate tube (4), so the A plus or F plus lead is carried from the post on socket (4) straight to the corresponding post of the oscillator socket, then around to the left-hand side of the potentiometer and to the left-hand rear post of the oscillator coil.

Now return to the A minus lead and carry the remaining sides of the rheostats to the proper destinations. The right-hand rheostat R1, 30 ohms—still remembering that we are facing the back of the panel—is connected exclusively to the first tube socket's F minus post. The open side of the next rheostat, R4, 6 ohms, which is between the potentiometer and C1, goes to three F minus posts, one on each of the three intermediate frequency amplifying tube sockets (3), (4) and (5). The open side of the rheostat R6 (6 ohms) goes to three places, two of them being the F minus posts of the detector and first audio sockets, (6) and (7). The last tube is taken care of through the filament-control jack, J3. This jack is mounted with the springs on top, which is the conventional style. The top spring is joined to the common F minus lead already established on two sockets, while the adjoining spring, second from top, goes to the F minus post of the final audio socket. The jack in question is the lower of the two that are mounted on the panel, one directly above the other. The top spring is represented at extreme right in the schematic diagram published last week, while the second from top spring is next to it, or second from right. This completes the A battery wiring, on a direct current basis.

Next take care of the positive grid returns. These are two—the return of L2 through L3, and the return of the intermediate frequency transformer that is just ahead of the second detector tube (6).

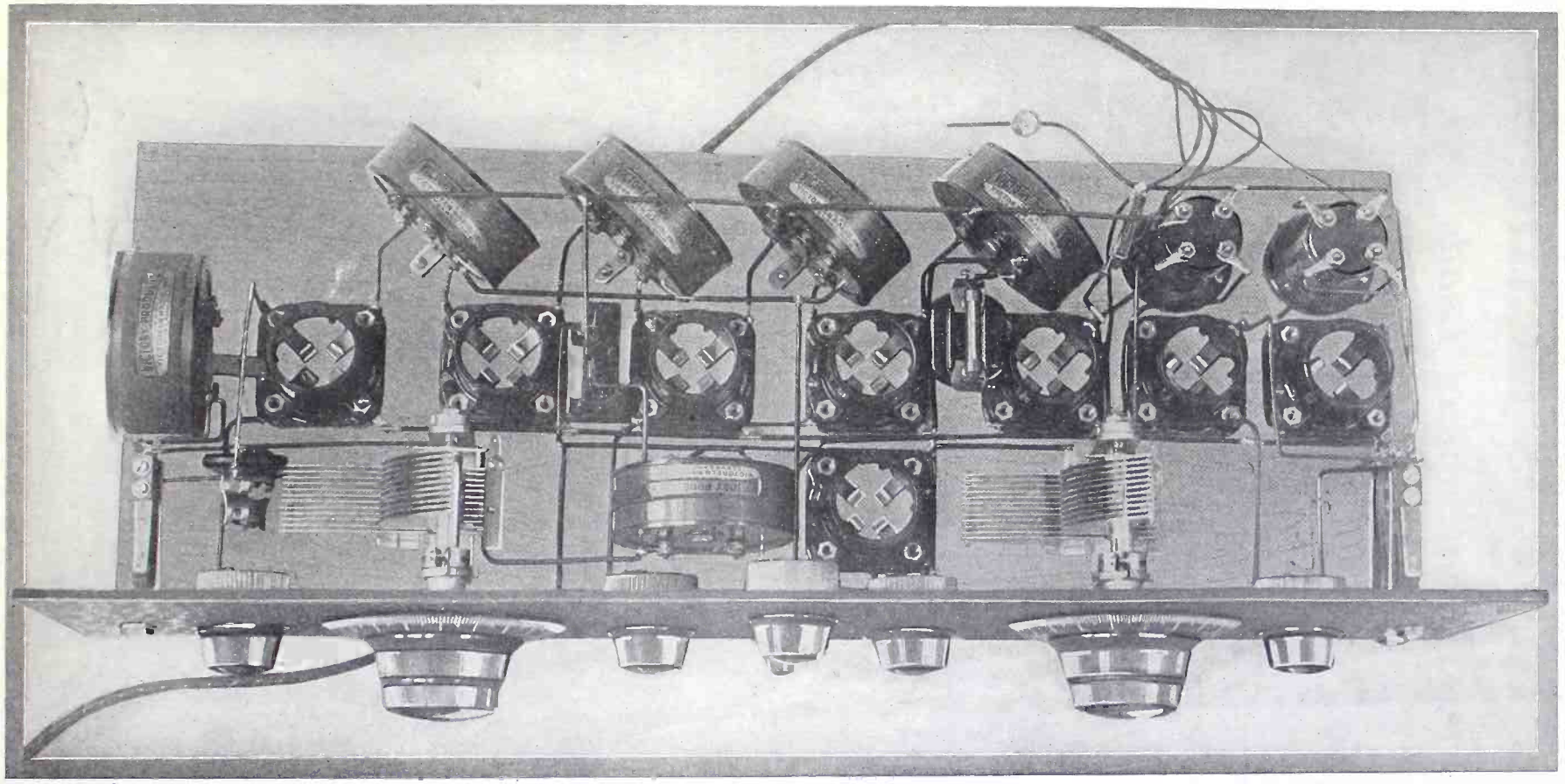
Radio Frequency Wiring

The bottom spring or lug of the loop jack, J1, is connected to the rotor plates of C1 and to the rear right-hand post of the oscillator coil. The left-hand post already has been connected to positive A. The F post of the final 170 transformer is connected to A plus on socket (5 by bending the wire to the right, then forward, then, for a ⅜" length, to the right, to meet the lug on the socket. It is advisable to establish this lead at this time, because otherwise difficulty would be met in locating the grid leak condenser combination or R5C6, according to the layout of the original model.

Variable Grid Returns

The F posts of the other intermediate frequency transformers are joined to the mid-post of the potentiometer. This lead is carried directly toward you, in other words, at right angles to the panel, and is soldered to a lengthwise lead that joins

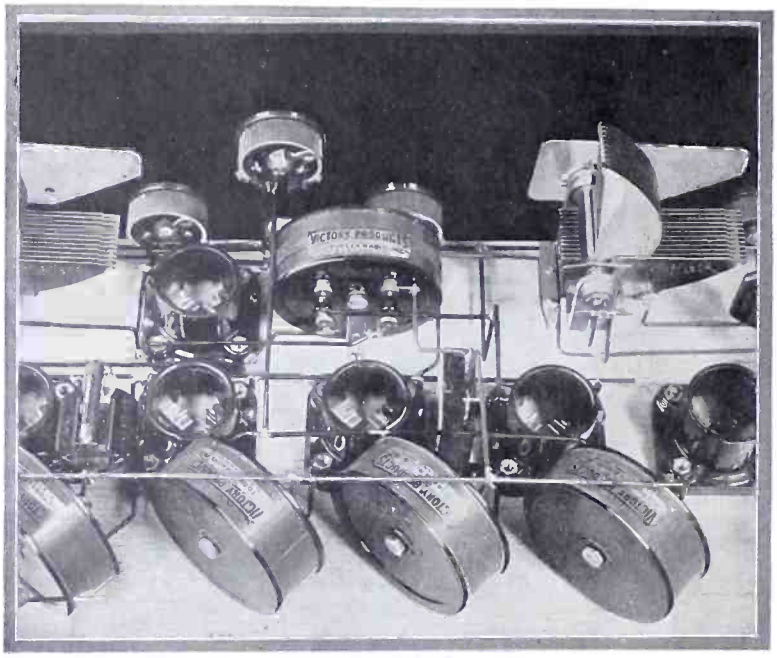
Top View of the Victoreen



THE ASSEMBLY and wiring of the VICTOREEN is greatly simplified by a study of this reproduction. The photo corresponds to the wiring directions.

Final Steps in the Wiring

B + and Potentiometer Leads



THE LOCATION of the by-pass condenser is shown, likewise the position of the grid leak-condenser combination for the second detector. The B plus detector lead is in foreground, while the potentiometer midpoint lead, jutting toward you, is shown established to the F lead three of the medium frequency transformers. The F post of the one at left goes to A plus, instead of to the potentiometer.

these three F posts of the transformers. All three posts are at top, left.

The G post of the antenna coupler, Type 160—the coil that has the word "coupler" on the casing and which has the larger visible winding—goes to the second from top spring or lug of J1. The top spring of J1, the loop jack, connects to the stator plates of C1. One side of the grid condenser C3 is soldered to this lead, too, so that the grid condenser, which has mounting clips for a leak, is at right angles to the baseboard. The other or top side of this fixed condenser is joined directly to the grid post of tube (1). The grid leak R3, which is 2 megohms, is placed in the clips. The bottom lug goes to rotor plates of C1 and to the rear right-hand post of the oscillator coil. The second from bottom lug of J1 goes to F of the antenna coupler.

Now for the remaining connections to the oscillator coil. The P post of the oscillator socket (2) is connected (through condenser C4) to the stator plates of C2, while from P of the socket the lead is continued to the right, to the P post on the oscillator coil (right front). This P post on the coil is shown at the lower end of L5 of the schematic diagram. The F post of L4, left-hand upper front of oscillator coil, goes to A minus, to the rotor plates of C2 and to C5. This fixed condenser, 1.0 mfd., has not been located, up to this point, but it is between tubes (3) and (4) and is screwed onto the baseboard at right angles to the panel. The main F minus lead, running ⅜" away from the panel, is scraped, to remove insulation, so that the present connection can be made thereto and to the fixed condenser and the coil. Now wire up six B posts. These are the plus posts of the four intermediate transformers (upper right), the B plus post of the first audio transformer and the plus post on the oscillator coil, upper right. The oscillator plus B plus lead is carried to a common point where the down lead to the second intermediate transformer is joined to the horizontal B plus bus, and on the way is soldered to the remaining open side of the fixed bypass condenser already discussed. The posts of the medium frequency transformers are connected to plate of each preceding tube, and in each instance this lead will be 2" long or less. The G posts of the four transformers go respectively to the grids of the succeeding tubes, in three instances, and these leads each will be less than 1" long. The fourth case is that of the second detector input, and instead of going direct to grid the G post of the coil connects to one side of the grid condenser, the other side of which condenser, C6, goes to grid of tube (6). The leak, R5, is slipped onto the mounting with which this condenser is provided.

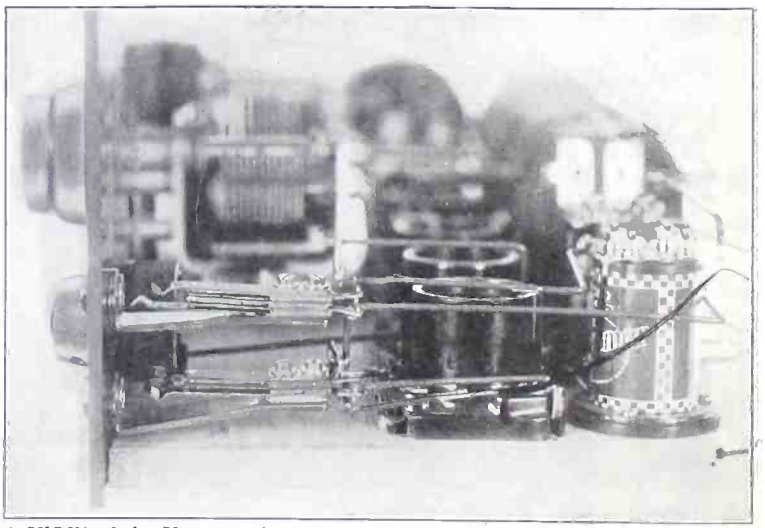
Join the F posts of the two audio-transformers and let the lead stick out temporarily 4 or 5" to the right. The fixed condenser C7, .001 mfd., may be connected right onto the lead, the other side of the condenser to the plate post of the second detector socket (6). This puts the condenser to C plus, instead of merely to A minus, as shown in the diagram. There is no difference in effectiveness.

The G post of the first audio transformer is connected to the grid of the first audio tube (7), while the plate of that tube goes to the top spring of the top jack to your left (J2). The next adjoining spring or lug, second from top, goes to the P post of the final audio transformer, while the third one goes to the B plus post of the final audio transformer. The fourth or bottom lug is joined to the bottom lug of the lower jack and, later on, to the B plus amplifier lead. G of the final AF transformer goes to grid of the last tube, while F already has been accounted for. The second from bottom lug of the jack J3 (lower one) goes to plate of the last tube (8).

The battery cable is yet to be connected. This is brought to the set at about the point where the first audio transformer is. The brown cable branches to the left, as you look at the rear of the set, and is soldered to the lower lug of the lower jack at left. This is B+ ampli-

(*Concluded on page* 29)

The Audio Jack Connections



A VIEW of the Victoreen from the audio side. J2 is the top jack, J3 the lower one. Notice the interconnection of the bottom lugs of both jacks. The B plus amplifier lead juts blackly to the right. The second from bottom lead of the lower jack goes to plate of the last tube.

The 4-Tube DX Dandy

By Herbert E. Hayden
Photographs by the Author

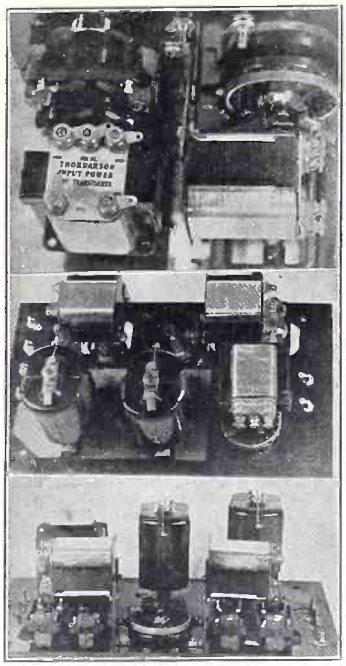


FIG. 11 (top), close-up showing the location of the Input Power Transformer method of socket upholstery and rheostat for the two push-pull stages. Fig. 12 (center), view of rear panel showing layout of parts. The transformers are held to the panel by brass brackets 3" long. Holes have been provided in these brackets, so that one end (at right angles) is fastened to the panel, and the other to the bases of the transformers, by using 6-32 machine screws and hexagonal nuts. Fig. 13 (bottom) rear panel view showing layout and mounting.

[*Part I of this article was published last week, issue of January 27. Part II, the conclusion, follows.*]

THE photographs and captions published this week clear up many points on the construction of the 4-tube DX Dandy and little more need be said, except on the point of aerial and ground connections, and on tuning.

The aerial goes to the left-hand side of condenser 1, 2, 3 or 4, which, counting from top to bottom of the pictorial diagram published last week, means .0005, .0001, .00025 or .00001 mfd. The aerial lead is not shown in the diagram, but the word aerial is printed, as it is understood that the connections are made to the fixed condensers, through the jack posts. Two separate leads are brought from the aerial lead-in and a phone tip is soldered to each terminal, as shown in Fig. 14. The other or bottom piece in Fig. 14 is about 7" long and has a phone tip soldered to each end. This is used as a jumper. It connects to 3 or 4 only or 3 and 4, never to 1 or 2.

How Posts Run

Figs. 17 to 20 show the fixed condenser posts, for aerial connection in four instances and ground connection in two. The captions elucidate the usefulness of these points. Back to front in the specified photographs, these posts run in numerical order—1, 2, 3 and 4.

The circuit is a very simple one. The first variometer, at left, is for wavelength tuning, the fixed condensers serving an auxiliary purpose, governing volume, selectivity, etc. The other variometer is a volume control, too, since it

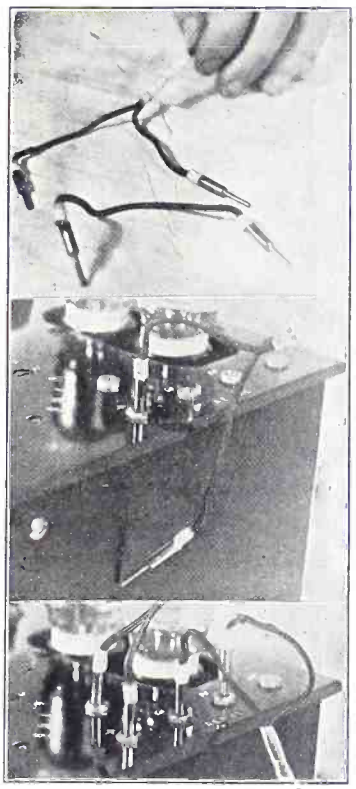


FIG. 14 (top), the various connections to the set providing for certain limits of wavelengths, and slight change in circuit from single to more selective, are arrived at by using an aerial cord with two separate phone tips soldered to it. The leads on these phone tips are about 6". Another piece of flexible silk covered wire about 7" long has a tip soldered to each end. This is used as a jumper connection from the ground post to post 3 or 4, depending on the connection desired. Fig. 15, aerial connected for low-wave single circuit to point 4.
FIG. 16 (bottom), long wave for very small aerials. Notice jumper from ground post to post 4 of aerial jacks.

supplies the regeneration. It is connected in the plate circuit of the detector tube.

How to Tune the Set

Thus, to tune the set, turn the wavelength variometer to a given setting, and advance the other variometer until a hiss is heard in the earphones or speaker, but do not turn the variometer so far that a squeal will develop. It may be possible to turn the wavelength variometer over a considerable portion of the scale or dial, without changing the plate variometer setting, to bring in a station. In that instance, however, the station most likely would be a local one, and if the volume is not sufficient, turn the plate variometer so as to supply more regeneration. If that method fails to bring in your first

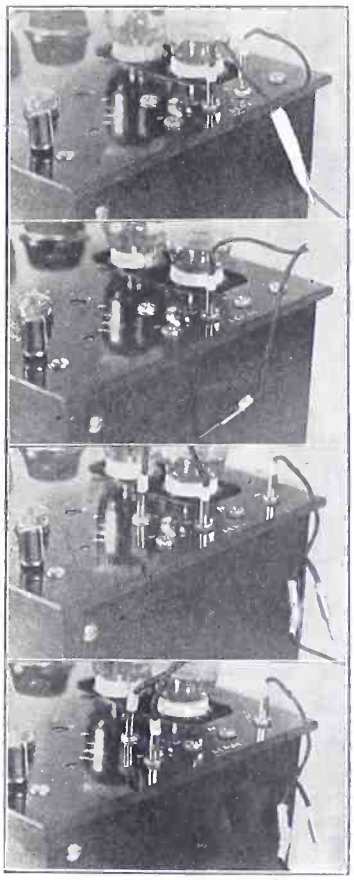


FIG. 17—Long-wave single circuit connection. Both aerial tips used as shown. Fig. 18 (second from top), medium wave single circuit aerial connection. Fig. 19, long wave selective circuit. Aerial on post 1, jumper connection from ground to post 3. Fig. 20 (bottom), low wave selective circuit. Aerial on post 1, jumper on post 4.

FIG. 21—The set is tuned, after aerial connections are made, by moving the tuning variometer handle slowly over the scale. Volume and regeneration are controlled by moving the variometer in the plate circuit toward an oscillating condition.

station, try advancing the plate variometer slightly, each time you turn the tuning variometer to a higher wavelength setting.

As there are only two dials the set will not prove a difficult one to tune. One will learn best from experience which fixed condenser to cut in for a given range of wavelengths, and many of course will find that excellent results are produced by leaving the aerial at a given fixed condenser. This depends on aerial conditions, and as these differ, no set rule can be established.

Radio University

A QUESTION and Answer Department conducted by RADIO WORLD for its Readers by its staff of Experts. Address Radio University, RADIO WORLD, 145 West 45th St., N. Y. C.

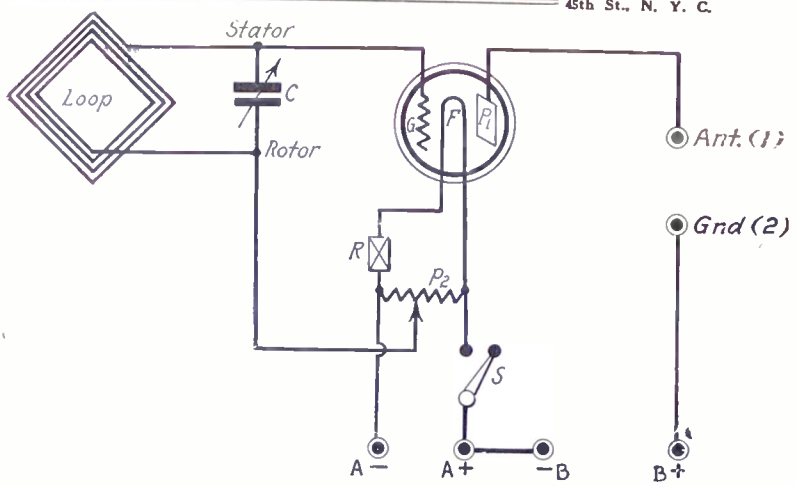


FIG. 271, showing the special loop schematic diagram.

I WOULD be pleased to have a circuit diagram illustrating how to connect a loop to a standard 5-tube Neutrodyne receiver. I understand an extra tube will have to be employed.—Robert Johns, Unionville, Ill.

Fig. 271, shows the schematic diagram you request. P2, the 400 ohm potentiometer, is not an absolute requirement. R is a ¼ ampere ballast resistor, provided the —01A type of tube is used. This of course depends upon the type of tubes used in the receiver proper. If 199 type tubes are employed, then a 199 type tube should be used in the loop unit. A .06 ampere ballast resistor, better known as the No. 4V-199 Amperite type, should be used. The condenser, which shunts the loop should have a capacity of .0005 mfd. S is a filament switch. The loop is of a standard size consisting of 14 turns of No. 18 bell or annunciator wire, wound on a frame 2 feet square. The antenna and the ground have to be disconnected, if the loop is to be placed into use. A voltage of 67½ should be applied to the plate of the tube.

I WAS going to build the 1926 Model Diamond of the Air, but I notice that at least 135 volts have to be placed on the plates of the amplifier tubes, in order to get the loudest signals. Now I have a B Battery Eliminator, which delivers only 90 volts at maximum. Is it possible to use 90 volts on the plates of the tubes and still get good volume, or will the volume be poor?—A. M. Putlz, Sioux City, Ia.

The volume obtained will be good.

IS IT possible to place a fuse in series with the filament or across the filament and the plate so that the tubes will be safeguarded against accidental blowouts, from touching the B battery and the A battery. Where can it be purchased?—Fred Mucks, 160 East 25th St., Paterson, N. J.

Yes. See advertising columns.

I AM interested in the 1926 Model Diamond of the Air. Will it be possible with this receiver to tune out the local station WTIC, which has an output of 500 watts so that I would be able to bring in WEAF WJZ and other stations in N. Y. City? (2) Where can I purchase the complete kit so as to make this receiver?—Edward W. Creighton, c/o The Phoenix Insurance Co., 30 Trinity St., Hartford, Conn.

(1) Yes, provided you have a good antenna, ground and the set is constructed strictly along the lines of the description. (2)—See the advertising columns of this issue.

I AM going to build The Set a Baby Can Build, described by Herbert E. Hayden in Aug. 29 issue of RADIO WORLD. Instead of only having one tube, I wish to add a stage of audio-frequency amplification. Can I have an explanation of how to do this?—Einar Ekdahl, P. O. Box 140, Reidsville, N. C.

First disconnect the phones, which are inserted in series with the end of the tickler winding. Then insert a double circuit jack. The top terminal of this jack goes to the end of the tickler winding. The next terminal from the top goes to the P post on the AFT. The third terminal from the top goes to the B post on the AFT. The bottom post goes to the B+ Det. post. The G post on the AFT goes to the G post on the second socket, which is going to hold the amplifier tube. The P post on this socket goes to the top terminal of a single circuit jack. The bottom terminal of this jack goes to the B plus Amp. terminal. The F plus terminal of this socket goes to the A plus B minus terminal post. The F minus terminal on the socket goes to one terminal of a ballast resistor which is of the 99 type, passing .06 amperes. The other terminal of this resistor goes to the A minus terminal post. A 4.5 volt C battery is inserted in series with the F minus post of the AFT.

I AM going to build a Browning-Drake 4-tube receiver. Now I woud like to know if the placing of the parts would have anything to do with regenerative effect of the receiver. That is, would the set oscillate any more if the RFT and the 3-circuit tuner were placed nearer or further apart from each other?—Storey M. Jones, Presque Isle, Me.

By placing the RFT and the tuner at right angles to each other and about 6 in. apart the oscillatory action of the RFT and the detector tubes will be well under control.

I BUILT a 1-tube receiver using a Birnbach 3-circuit tuner. The primary of this tuner has 12 turns. The secondary consists of 37 turns. The ticker coil consists of 30 turns. The primary and the secondary are wound on a tubing 3½ in. in diameter, while the ticker is wound on a tubing 3 in. in diameter. A 199 type tube is being used. The secondary is shunted by a .0005 mfd. variable condenser. I do not hear any signals.

The hookup used is of a standard model The primary is in parallel with the antenna and the ground. The beginning of the secondary winding goes to the A minus post and to the rotor plates of the variable condenser. The ending of the secondary winding goes to the stationary plates of the variable condenser and to one terminal of the grid condenser and leak. The grid condenser has a capacity of .00025 mfd. while the leak is of the variable type from 1 to 10 megohms. The other terminals of this leak and condenser combination go to the G post on the socket. The beginning of the tickler coil goes to the P post on the socket. The end of this winding goes to one terminal of the phones and to a .001 mfd. fixed condenser. The other terminal of this condenser goes to the other terminal of the phones and to a B plus post. The rheostat, which is of the 20 ohm type, is in series with the negative leg of the filament post. The plus post of the A battery goes to the minus post of the B battery.—Ernest Mosseau, 65 Main St., Cohoes, N. Y.

Correct the secondary end that now goes to A minus, to A plus instead. Take out the fixed condenser which is shunted across the phones. Test the tuner (primary, secondary and tickler) leads for shorts or open circuits. Try another tube in the same position. Push the prongs of the sockets up, so that they make positive contact with the tube terminals. Your method of hooking up the set is all right. The tube may be dead (not blown out).

IT HAS been my pleasant experience to have constructed the 1-A portable receiver described by Herbert E. Hayden in the March 28, April 4 and the April 11 issues of RADIO WORLD, which set is one of the most efficient receivers that I have ever had the opportunity of constructing. I would like to build this receiver so that it could be used as a portable. I wish to use a form 2½ in. in diameter. The rotor forms will be 2 in. in diameter. No. 26 double silk covered wire is to be used. How many turns shall be placed on the various forms?—A. M. Parker, 11623 88th St., Edmonton, Canada.

The wavelength rotor E consists of 50 turns. The modulation rotor F consists of 25 turns. A consists of 25 turns. B consists of 25 turns. C consists of 13 turns. D consists of 13 turns. L and P consists of 25 turns. F consists of 50 turns.

I HAVE a 3-circuit tuner made by Forman & Co., which I would like to use in the 4-tube Diamond of the Air, as described in the Jan. 23 issue of RADIO WORLD, by Herman Bernard. All the windings are made with No. 32-38 Litz wire. The primary consists of 15 turns. The secondary consists of 42 turns. A form 3 in. in diameter is used. The ticker coil which is wound on 1¼ in. tubing, consists of 40 turns. Can this tuner be used? (2) How many turns should be placed on the primary and the secondary windings of a form 3 in. in diameter, to constitute a radio-frequency transformer which is matched with the tuner? Leslie O. Trembly, 62 Champion St., Carthage, N. Y.

(1) Reduce the number of turns on the primary of the tuner to 10. The rest of the turns should remain as they are. (2) The primary of the RFT consists of 10 turns. The secondary consists of 42 turns. Use No. 32-38 Litz or No. 22 double cotton covered wire.

IN REFERENCE to the 4-tube Diamond of the Air, which appeared in the Jan. 23 issue of RADIO WORLD, I have a 3-

circuit tuner. The stationary form, which is 3¾ in. in diameter, contains a primary winding of 16 turns, while the secondary consists of 48 turns. The tickler form is 2" in diameter and consists of 36 turns. No. 22 double cotton wire is used. I wish to make a radio-frequency transformer to match this tuner. How many turns should be placed on a tubing 3¼ in. in diameter to make this RFT?—W. J. Ewart, 4314 Courner St., Houston, Tex.

Reduce the number of turns on the primary to 10. The primary of the RFT should also consist of 10 turns. The secondary of the RFT should consist of 43 turns. The number of turns on the secondary of the tuner should also be reduced to 43.

WHAT IS the most efficient way of placing the primary in inductive relation to the secondary? 2) How many inches separation should there be between the primary and the secondary winding if both the windings are made on one form? (3) I live 1¼ miles from WBZ and am troubled frequently by interference. Is there any wave trap that was described in Radio World recently that when inserted in this receiver, which is a 5-tube manufactured type will cut out this station, without hindering the reception from any other station?—Charles H. Jordan, 291 Bay St., Springfield, Mass.

This depends on what part of the set the primary serves to couple and other functions. Placing the primary winding alongside of the secondary winding is a good way for general use. The primary winding inside the secondary, at filament ends has a small edge over the side-by-side winding in some hookups. (2) A ¼" or ⅜" separation between the primary and the secondary windings is all that should be made, unless the primary has an unusually large number of turns. (3) The regenerative wavetrap described by John F. Rider in the Dec. 26 issue of Radio World will cure your trouble.

WILL THE regenerative wavetrap described by John F. Rider in the Dec. 26 issue of Radio World work well in the standard neutrodyne consisting of five tubes?—Dr. Ralph McWhirter, Allison, Ia.

Yes.

ON LOOKING over the Dec. 12 issue of Radio World, I was quite taken up by the B battery eliminator described by Lewis Winner. I have an Elkay 5-tube receiver and I am somewhat puzzled as to how I am going to get the 22½, 90 and 135 volt leads. At present, there are only two voltages that can be obtained. I would appreciate the information on how to obtain these.—F. Eugene Zeiner, 250 West Ivy St., New Haven, Conn.

Instead of the resistance wire or substance terminal going to the B plus post, place this post to an arm of another variable resistor, as B plus Det. This arm connection goes to the 90 minus volt post. The resistance post goes to the B plus Amp. or 135 volt post.

IN A 3-tube regenerative receiver, using 3-circuit tuner with two stages of transformer coupled audio-frequency amplification, will two 199 type tubes and one 120 type tube give as much volume as three 201A type tubes? (2) Will Bremer-Tully coils and condensers work all right in the 1926 Model Diamond of the Air? (3) Can a tandem variable condenser be successfully used in the 1926 Model Diamond? (4) Will the volume obtained from a 3-tube regenerator of the first mentioned type be as much on DX stations as on 1926 Model Diamond?—L. R. Ellerby, Burford, Ont., Canada.

(1) No. (2) Yes. (3) Yes. (4) No. The volume on DX stations when using the 1926 Model Diamond will be much greater than that from the 3-tube receiver.

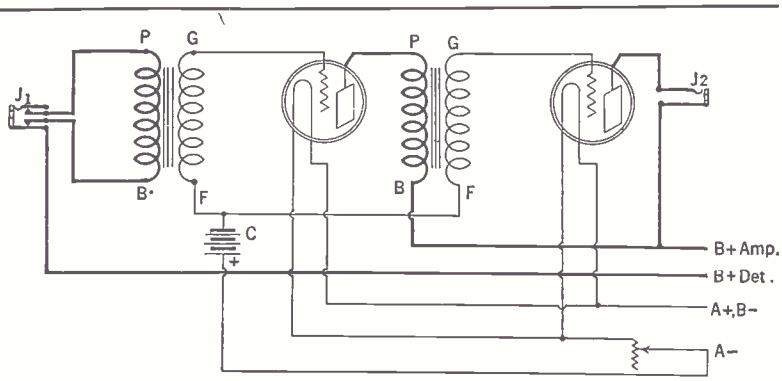


FIG. 272, showing the 2-stage amplifier, Mr. Elhdert requested.

PLEASE PRINT an electrical diagram of a 2-stage audio-frequency amplifier, using transformers, telling the ratio of the transformers, type of tubes to use, etc. —Fred Elhdert, Rosedale, Ark.

Fig. 272 shows the schematic diagram of the transformer coupled AF amplifier. The ratios of both these transformers are about 3 to 1. The —01A type of tube should be used. A 10-ohm, ½-ampere rheostat should control the filaments of both the tubes. About 90 volts should be placed on the plates of both tubes. AC battery voltage of 4.5 should be used. J1 is a double circuit jack. The top prong of this jack goes to the plate post of the preceding tube. J2 is a single circuit jack. A ballast resistor may be employed, instead of the rheostat.

* * *

I AM quite puzzled as to the exact placing of the ballast resistors in the 1926 Model Diamond of the Air. It states that three ¼ ampere ballast resistance each are used to control the RF, the detector and the last audio-tubes, or R, R1 and R7. Then it seems that a ½ ampere ballast resistor should be used where R1 is placed which is used here?—E. B. Polk, Cheriton, Va.

R1 is a ¼ ampere ballast. R2 is the ½ ampere ballast, as the filaments of first and second audio tubes are controlled by it.

I AM building a 1926 Model Diamond and wish to use the Raytheon Plate Supply Unit described in the Jan. 16 issue by Lewis Winner. According to instructions in other magazines the fact that the filament circuit of the receiver must be grounded is stressed upon. In the Diamond receiver, there is no direct connection between the filament circuit and the ground. Would it affect the circuit in any way if the filament circuit was grounded or is there no need to ground the circuit at all?—W. J. Spellman, Newark, O.

By mounting the parts on a metal sheet as per Jan. 16 issue of Radio World, you accomplish the same result as if the filament circuit of the receiver were grounded. The metal mounting is even more efficient than the grounding of the filament circuit. What can be done, though, is to run the actual wire to the B minus post.

I HAVE a 3-tube receiver wherein the first tube is a regenerative detector, using a Bremer-Tully 3-circuit tuner, while the two stages of audio-frequency amplification, using transformers, follow. Now the first tube works well, but when the loud speaker or phones are plugged in the first or second stage of AF amplification, a soft whistle is heard. When I put my finger on the G post of the first transformer it will stop, but if I put my finger on the G post of the last transformer, the whistle gets louder. I tested my AFT for shorts and open circuits and am sure they are O. K. How can I cure this trouble?—Louis A. Sunde, R. F. D. 2, Box 3, Valley City, N. D.

Place a .001 mfd. fixed condenser across the plate and the grid posts of the first AFT. Try a 1 meg. leak from grid to negative A battery in these tubes.

HERMAN BERNARD, managing editor of RADIO WORLD, broadcasts every Friday at 7 p. m., from WGBS, Gimbel Bros., N. Y. City, 315.6 meters. He discusses "What's Your Radio Problem?" Listen in!

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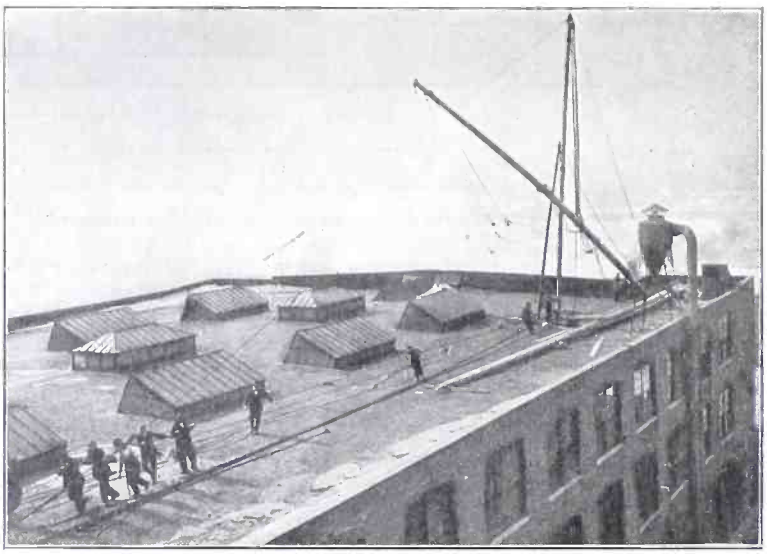
Gimbel's Transmitter Moved to Better Site



BECAUSE it was hemmed in all all sides by skyscrappers, the steel frames of which absorbed the power of their signals, station WGBS moved its transmitting station outside of the center of New York City, to a little arm of land extending into the East River, at Astoria, Long Island. The station in its new location has water on three of its sides and flat, open land on the other. A group of men is hauling up one of the 160-foot poles which support the antenna system of the new transmission location. The studio and speech amplifier remain at the Gimbel Bros. Store, 33d Street and Broadway. Before this microphone, at 7 p.m. each Friday, Herman Bernard discusses radio problems. (Kadel & Herbert).

So WGBS may reach a greater area and may penetrate the blanket of steel and other air obstructions in New York, engineers of the Gimbel Brothers' Station in New York have moved the transmitting plant from the congested district at 33rd St., Manhattan, to a location in Astoria. The studio proper remains in the Gimbel building and the programs are sent by landwire to the new transmitter located in one of the best possible sections of Greater New York for broadcasting purposes.

WGBS suspended operations on a Tuesday night, after the broadcasting of "Charlot's Revue." Transmitting equipment was dismantled at once and the engineers worked the greater part of the night moving the plant to Astoria. Wednesday and Thursday the staff was busy practically day and night getting the new transmitter ready for broadcasting.

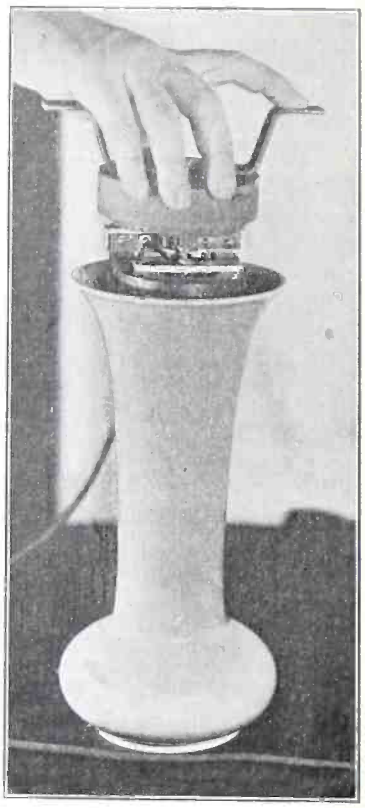
Friday morning early—shortly after midnight Thursday—WGBS put on a test program for several hours which resulted in reports coming in from all parts of Manhattan, the Bronx, Brooklyn, Staten Island and parts of Jersey, all of these mentioning an increase in reception and an obliteration of "dead spots." From the new location, a radiation one-third of the radiation from the old location, the increase in audibility was found to be 325 per cent. All reports mentioned an excellent quality, the distant reports telling of greatly increased volume.

The new transmitter is on a small peninsula of Astoria, approximately opposite 80th St., Manhattan, surrounded by water on three sides. The site chosen is the result of many months of careful experimenting by the WGBS engineers. WGBS for the time being is only broadcasting short programs daily with a view to determining the results of the new location.

Aromatic Broadcaster

RUTH FALLOWS, former Follies girl, telling her "sisters of the radio audience," all about the delightful scents, which come from atomizers, which she holds in her hands. The broadcasting was done through station WJZ, N. Y. City. It seems as if Miss Fallows is trying to transmit the odor in the same manner as her voice is being broadcast. Let's hope she succeeds in doing this some time. (Kadel & Herbert)

Tone Quality Tests



A SPEAKER unit, with reed, as used in cone speakers, may be placed against a bell-like vase for tonal effect.

COMPARE this with the quality of sound emitted from a wide bell, like this glass vase, that acts in a combination of cone and horn effects.

An Harmonious Four

THE Blue Ribbon Male Quartette, heard every Tuesday evening from 8:00 to 8:30 through WEAF, WEEI, WFI, WCAE, WWJ, WGR and KSD.

Mari

Miss Ma
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audience,
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listened to
Rye," "Una
plauded, gr
Jacob A.

Talley's Debut Delights Nation

(Photo by International Newsreel)

Talley made her radio debut at Aeolian Hall, ..., through station WJZ. Her four songs came ... e air, and a few minutes after she concluded ... all over the East and as far South as Alabama ... gan to arrive, bringing congratulations.

...ctly a Kansas City night. Besides the 150 ... d come all the way to New York to watch and ... ear-old friend sing, there were 15,000 gathered ... Hall in Kansas City and a few thousand more in ... k Building there, where another station con... al wire from Chicago was broadcasting. As Miss ... her last song, "Home, Sweet Home," she paused ... then sent a greeting which spread over the ... to her fellow-townsmen who had had faith in

... thanks to all my friends in Kansas City," she ... yal support for more than three years has been ... couragement. And to my friends of the radio ... affectionate greetings."

... Talley was singing in the small broadcasting ... ger sat just outside the door, her father stand-

... third floor her fellow townsmen, who had ... Talley sing "Caro Nome," "Comin' Thro' the ... e poco fa" and "Home, Sweet Home" and ap... her as she came down later on the arm of ... feld, who led the delegation to New York.

Medal Award Broadcast For Heroine's Comfort

Presentation by radio of a medal awarded for life saving was the ceremony performed for the first time between the two widely separated points of Ottawa and O'Brien, in northern Quebec, Canada, the radio serving as the link.

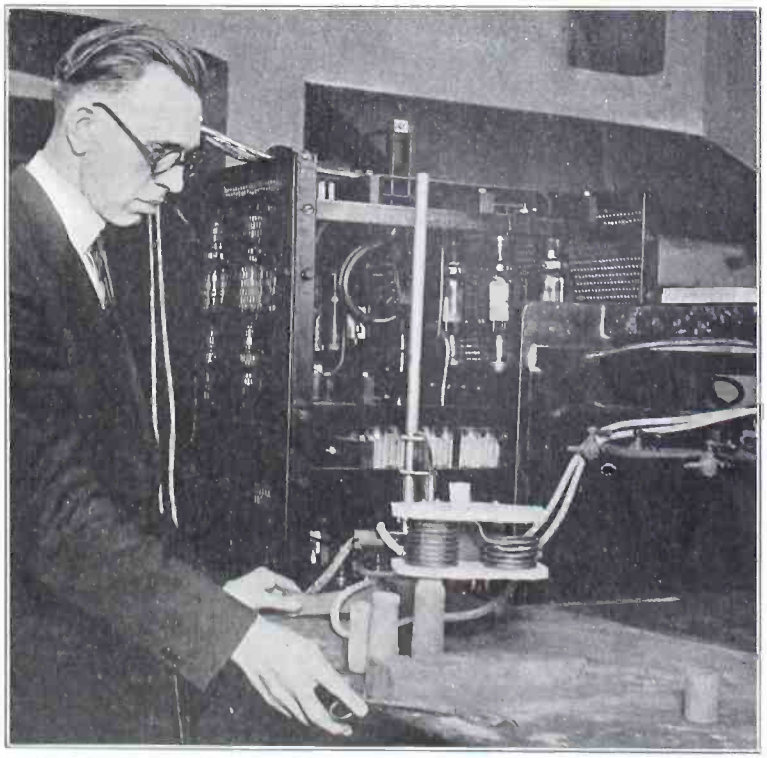
In her home at O'Brien, Mrs. K. G. Polybank, wife of a civil engineer in the service of the Canadian National Railways, heard the voice of Sir Henry W. Thornton, K. B. E., in Ottawa, tell the story of the manner in which she risked her life to save a friend's child. Before the microphone in CNRO, Sir Henry recited the facts which had stirred the Royal Canadian Humane Society to make the award of a medal granted only in most meritorious cases where life has been saved at personal risk.

It had been found difficult for Mrs. Polybank to leave her home and family cares, so radio was called to the aid of the interested parties. An official representative of the Canadian Royal Humane Society proceeded to O'Brien. When Sir Henry had reached the appropriate moment in his address the medal was handed to Mrs. Polybank.

The deed for which the award was made took place at Long Lac, Ontario, Canada, Mrs. Polybank plunged overboard from a motor boat to save the young child of a friend who had slipped over the side. Mrs. Polybank swam to the child, maintained it afloat, divested herself of clinging clothing and calmly awaited the arrival of rescuers, being practically exhausted when reached.

MRS. K. G. POLYBANK in her home receiving a medal for bravery at the psycological moment, the award being broadcast from a station miles away.

Heats Furnace by Radio



A RADIO OPERATED FURNACE has been installed in the metallurgical section of the Bureau of Standards for the purpose of melting platinum and other precious metals. The wavelength of this high-frequency induction furnace is 1,000 meters. Louis Jordon of the Bureau of Standards is seen regulating the heat of the furnace. (Harris & Ewing).

RADIO WORLD

The Last Connecting Radio Fan Dealer, Jobber, Distributor and Manufacturer

Radio World's Slogan: "A radio set for every home."

TELEPHONES BRYANT 0558, 0559
PUBLISHED EVERY WEDNESDAY
(Dated Saturday of same week)
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Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order is automatic acknowledgment of their subscription order. Changes of address should be received at this office two weeks before date of publication. Always give old address

ADVERTISING RATES

General Advertising

1 Page, 7¼"x11"	462 lines	$300.00
½ Page, 7¼"x5½"	231 lines	150.00
½ Page, 8¼" D. C.	231 lines	150.00
¼ Page, 4⅛" D. C.	115 lines	75.00
1 Column, 2¼"x11"	154 lines	100.00
1 Inch		10.00
Per Agate Line		.75

Times Discount

52 consecutive issues	20%
26 times consecutively or E. O. W. one year	15%
4 consecutive issues	10%

WEEKLY, dated each Saturday, published Wednesday. Advertising forms close Tuesday, eleven days in advance of date of issue.

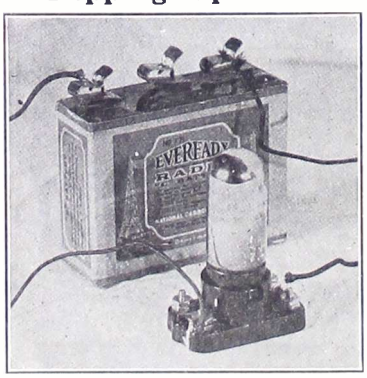
CLASSIFIED ADVERTISEMENTS

Ten cents per word. Minimum 10 words. Cash with order. Business Opportunities ten cents per word, $1.00 minimum.

Entered as second-class matter, March 23, 1922, at the Post Office at New York, N. Y., under the act of March 3, 1879.

MARCH 6, 1926

Pepping Up Tubes



IF a tube shows signs of declining pep, burn it for an hour or more with the A battery connected directly to the filament. The photo shows a —99 type tube being treated this way, a 4½-volt C battery being used as the A battery. If —01A tubes are used, connect the A 6-volt storage battery leads direct to filament also. No B battery is used in either case. This remedy applies only to the XL thoriated filament tubes. It will not work on the —11 and —12 type tubes.

Sir Eric Drummond Links Radio and Peace

By Eric Palmer

Freed-Eisemann Radio Corporation

Statesmen of the world are striving not only to bring about lasting peace among the peoples of mankind, but with broader vision than ever before in history are seeking to effectively promote the age-long crusade against ignorance, bigotry, and disease, aided by the right-thinking, public-spirited private citizens of every country, whose wealth is being contributed to the great cause.

It was my privilege and pleasure to hear such encouraging words at the beautiful palace in which the experts of the League of Nations are studying these problems, in conjunction with representatives of all member-nations and with distinguished economists, scientists and philanthropists of the United States.

Of especial interest to me, as semi-official representative of the American radio public in connection with the recent international tests, was the statement of Sir Eric Drummond relative to the vastly increasing importance of radio in carrying on the great work, which regardless of all political considerations, meets with universal approval.

Sir Eric truly remarks:

"All we can say at the moment is that we are at the beginning of a new era whose potentialities we can hardly guess!"

Sir Eric dictated a statement of tremendous interest to the radio listeners (and probably everyone else) in every country. Before doing so he pictured his own thrills at hearing song and story over the ether and appearing before the microphone. In one instance he reached the Lapps in Northern Sweden.

Sir Eric's Statement

This is what the Secretary-General had to say on the general subject of wireless communication:

"Radio and the League of Nations are both in their youth. They were born at approximately the same time, and are growing and developing on somewhat the same lines. Assuredly their fruitful co-operation will make for the peace of the world.

"How rapidly civilization has travelled! Only a few centuries ago Columbus took three months to reach America. A century ago it took weeks to send news to the Far East. Today information can be put on the air in London, received in New York, re-transmitted and heard in London in the space of seconds.

"It is not easy, even for those who serve the cause of peace, to realize the enormous new force that now makes for better understanding between peoples, on which peace ultimately must depend. Before it, distances and time almost cease to have importance. People hear of each other and know each other. Before such contacts, war recedes to a distant background. The full development of radio must render international co-operation, and therefore the task of the League, infinitely easier.

"Up till now, the League of Nations has perhaps hesitated to take up any position with regard to radio. The science is so new and the developments so rapid that there has been a natural tendency to wait until the situation becomes clearer. Despite this, however, the League is following developments with the utmost interest and sympathy.

"The first incident involving the good relations between nations, in which radio played its part with the League of Nations, was in connection with the recent Greco-Bulgarian frontier crisis. At that time, hours before word had appeared in the Press, wireless information was picked up in Geneva which gave League officials the first intimation they had had of the seriousness of the crisis and allowed certain preparations to be made which measurably advanced the peaceful action of the League. The value of a few minutes of time in such a crisis can be fully apreciated if I say that the necessary telegrams, sent because of League intervention, instructing the opposing forces to cease any hostile action, arrived less than two hours before the moment when a clash would have occurred.

Instantaneous Information

"The League's second use of wireless is in the establishment, for the first time in history, I believe, of an almost instantaneous information service whereby the outbreak of plague or other serious epidemic disease in any Far Eastern port is immediately made known to all neighboring administrations, who are thus put on their guard against any ships from the danger areas. Under this system all Far Eastern port authorities send in regular reports of diseases to a central League bureau created at Singapore with the aid of the Rockefeller Foundation. These reports are each week brought together into one, telegraphed to the French wireless station at Saigon in French Indo-China and from there broadcast throughout the Far East and wirelessed to France, telegraphed to Geneva, and in turn distributed through the European ports. Thus an opportunity is afforded to check the spread of disease almost from its source.

"Thirdly, this year for the first time, certain speeches at the Assembly of the League of Nations were broadcast throughout Europe. The Prime Minister of France, Monsieur Painleve, made his opening speech not only to the Assembly, but to many thousands of people who listened in in other countries. Sir Austen Chamberlain, British Foreign Secretary, was also broadcast and there can be little doubt that as the years go on more and more of the debates will go out over the air.

"One problem which occupies us at the moment is the provision of proper wireless transmitting facilities for the new Assembly Hall. This building, which is being planned for a capacity to accommodate the representatives of 65 nations with some 1,000 journalists, will undoubtedly be the centre of some of the most important of international debates.

"The future of radio is a matter on which speculation can run wild. I myself, however, can foresee the day when many League conferences and debates will be put forth on the air; when many important declarations will go forth from Geneva; one can even imagine that extraordinary sessions of the Council might be held by direct radio between statesmen in different capitals. We can really hardly estimate the change that may be made in international relations if people in various countries become accustomed not only to the thoughts but even to the actual voice of the statesmen of other countries. All we can say at the moment is that we are at the beginning of a new era at whose potentialities we can hardly guess."

Diamond Efficiency Data

By Herman Bernard
Associate, Institute of Radio Engineers

THE radio public is becoming extremely critical. That is a healthy state of mind. When the public wants only the best, and that to the fullest degree, then those serving them are spurred to meet the demand, otherwise radio and all else with which the public is concerned might slump into a slothful state.

Courtesy vs. Wantonness

Take the 1926 Model Diamond of the Air, for instance. Some readers of RADIO WORLD and other publications may have sensed that a few words are being published on the subject of the Diamond. "Radio in the Home," the handsomely printed and attractively edited product of H. M. Neely's brainy work, in its February issue published an original article on how to build the Diamond, and gave more than generous credit to RADIO WORLD for the design and popularization of the circuit. But the "Radio Review and Radio Listeners' Guide and Call Book," for March, the newly consolidated product, reprinted from RADIO WORLD, word for word, John F. Rider's laboratory analysis of the Diamond, and even published physical cuts loaned to it, then purposely (according to an editor's admission) omitted any credit line, thus making it appear that the matter was original with "Radio Review." Although no trace of credit or acknowlegment is given to RADIO WORLD "Radio Review" had no reason from past experience to be so offensive, although no hard feelings are harbored on this side.

The Philadelphia Enquirer is publishing construction data on the Diamond, so are the Bridgeport Evenings News and other newspapers. The N. Y. Herald-Tribune published such an article a few weeks ago. These papers are using original articles, exactly following, however, the circuit as designed by me and popularized by RADIO WORLD, and it is comforting to see such a good hookup receive so much respectable attention.

Reasons For Variety

However good the hookup is, some persons will build the set and fail to get all the results that they hoped for. As was pointed out before, against the barrier of screened location, or an otherwise poor reception point, the Diamond has nothing to offer more than the run of receivers. In certain steel-walled apartment houses, in mines, in hollows of the countryside where iron ore abounds, and amid similar conditions, poor reception may be expected. Fortunately nobody has yet reported that he could not hear anything on his Daimond, due to location trouble, although a few complained of poor volume. In one instance this was due to the constructor having mistaken the primary of his audio transformer for the secondary—although they are plainly marked and the textual directions identified these markings no less emphatically than did the many wiring diagrams. So he had a step-down transformer. If volume was low, what else was he to expect? The connections thereupon were reversed and now the fan is the contented owner of a set that gives all the volume that his voracious ears demand.

The New Ballast Hookup

Since its inception the 1926 Model Diamond has undergone no wiring change, except that the Amperites were rearranged, so that four ballasts were used, where there were only three. The booklet on how to build the set deals with the newer hookups, which is the same one published last week on page 21 of RADIO WORLD. To clear up the matter for any who may be trying to follow a previous diagram, the following list is given:

R is a No. 1-A Amperite and controls only the RF tube.

R1 is a 1-A Amperite and controls only the detector tube.

R2 is a 112 Amperite and controls BOTH the first and second audio tubes.

R7 is a 1-A Amperite and controls only the final audio tube.

This arrangement only affords greater flexibility. The last audio tube may be a power tube that draws .5 ampere at 6 volts, in which case short-circuit or omit R7. If a 112 power tube is used in the last stage, R7 should not be the 1-A Amperite but should be, like R2, a 112 Amperite. The fact that the 112 Amperite is used for R7, although governing only one tube here, is due to the doubled drain, the —01A tubes drawing .25 empere at 5 volts and the 112 twice at as much at the same filament voltage.

Moreover, if the audio tubes are extinguished, for detector listening alone, the RF tube still has the correct and unchanged filament heating.

B Battery Voltages

The B battery voltages are important. The higher the voltage on the RF tube plate the greater the tendency to oscillation, until the point of paralysis is approached or reached. Usually 67½ volts on the plate of the RF tube will do very nicely, while the detector plate will stand 45 without any trouble. B plus amplifier had better be 135, which means three 45-volt B batteries in series connection, but if only 90 volts are available, then get along with that. The volume will not be much less, but the tone may not be quite so good.

Synchronized Tuning

The two dials used for wavelength tuning—those that actuate the variable condensers—may be made to read in step, but in most cases there will be a divergence at first, however slight, due to the wiring, the plate capacity effect, etc. This can be remedied. Take off half a turn at a time from the coil tuned by the dial that gives the lower reading.

It is assumed that lower numbers on the dial represent lower capacity setting, but if the low readings represent the higher wavelengths, then remove turns from the con coil tuned by the dial that gives the lower of the two readings for the same station.

Sometimes a fan inadvertently uses a coil intended for a .00035 mfd. tuning condenser, in conjunction with the prescribed .0005 mfd. condenser in the Diamond. The other of the two coils used is all right. Immediately the fan notes a wide difference in dial readings, also is chagrined not to be able to receive the lower wavelength stations. By taking turns off the oversized coil, or putting in a new coil of the right size, his problem is solved.

One man wrote me a bitter letter, saying he had built the Diamond because he had read of the wonderful results obtained by others. His complaint was that the dials did not read together, but were from 3 to 7 degrees apart, although he could tune from 180 meters to 555 meters (!) Also all he was able to get with plenty of volume on the speaker was a consistent 750-mile range (!!) He had an 8-tube Super-Heterodyne once that could not get that far, he admitted (!!!)

How to Get DX

While remarkable instances have been bridged by the Diamond, one must not expect Coast-to-Coast reception. Location has more to do with distance traversal than anything else, granting the set is properly made of good parts and the tubes, batteries, aerial and ground are in condition. Next comes the ability to tune in DX, which is a thing personal to the set owner or operator, and this ability is acquired only by experience. It does not take months, sometimes not even weeks, to acquire, but any one possessing a Diamond or any other set should give it a two or three-weeks trial before passing judgment. This is said in behalf of all receivers, home-made, factory made or made for you by some service man.

Safe and Sane Set

The Diamond hookup is a tried and true one, embodying nothing fantastic or theoretical. Its only departure from electrical conventionalism is in the absence of any rheostats, it being assumed that circuit design should start with the filaments of the tubes heated at the specified voltage that the manufacturer has spent thousands of dollars to confirm. That is 5 volts for the —01A. Few circuits ever have been published omitting a band rheostat from a detector stage, although many omit it from RF stages more critical than the detector stage as to filament heating. Another departure in the Diamond is mechanical rather than electrical—the scheme for immediate availability of the Diamond audio in conjunction with any other tuner the fan may be working on. How often have you longed to have an audio hookup at hand for some 1-tube or crystal set you've just made! When you build the Diamond you have a 2-tube set (the detector output), a 5-tube set and also a 3-stage quality audio-amplifier, each separate, yet all in one!

GET THE OFFICIAL BOOKLET ON HOW TO BUILD
Radio World's 1926 Model
DIAMOND OF THE AIR
The text of the official Diamond booklet was written by HERMAN BERNARD, designer of the 5-tube circuit which offers the most in selectivity, volume, tone, quality and DX. Price, per copy 50c
CERTIFIED BLUEPRINT FREE with every copy OF THE OFFICIAL Booklet. Bernard's signature is on every booklet and every blueprint. Both sent FREE to new yearly subscribers.
News and Radio Dealers: Send for Wholesale Prices. Order direct from American News Co., Inc., 131 Varick St., N. Y. C., or American News Co. Branches.
RADIO WORLD, 145 W. 45th St., N. Y. C.
Enclosed find 50c. Send me copy official Diamond Booklet, with FREE blueprint. Or both free with $6.00 for yearly subscription.
NAME .....
ADDRESS .....
CITY..... STATE.....

THE 4-TUBE DIAMOND OF THE AIR, by Herman Bernard, appeared in RADIO WORLD dated Jan. 23. 15c. per copy, or start subscription with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

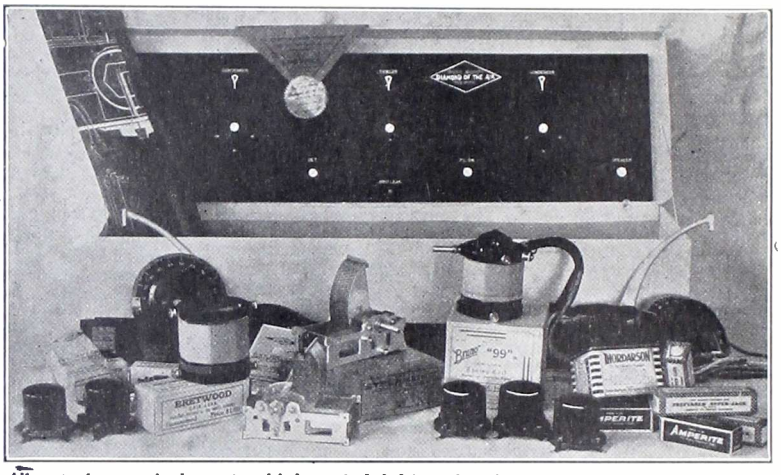
KITS—KITS—KITS AND STILL MORE KITS!

The Demand for the 1926 Model

DIAMOND OF THE AIR KIT.....$35.00

Is Exceeding Our Wildest Expectations. The Country Is Going DIAMOND Crazy! Recognition Like This Must Be Deserved!

Each kit is comprised of parts which were specially chosen by Mr. Bernard only after months of experimentation. The boxed and sealed kit contains parts which function in complete harmony, giving a balanced receiver that has proven its worth to thousands of builders all over the world. Each unit is carefully tested before being packed for shipment so as to avoid any annoyances on the part of the purchaser.



All parts down to the last nut and bolt are included in each sealed kit as shown in this photograph.

The Diamond of the Air circuit is comparatively new and was first presented by Mr. Herman Bernard only a short while ago. In that time its fame has spread not only throughout this country, but all over the world as well. Radio experts and engineers were quick to recognize a circuit far better than the average, which accounts in every way for the tremendous popularity of this circuit.

We are pleased to announce that each kit will contain Sidney E. Finkelstein's special 16-page booklet, with a new full-size blueprint, which gives all data necessary for the construction, care and operation of the Diamond of the Air.

We are able to supply set builders with a copy at 50 cents each.

Folks! Meet Mr. Herman Bernard, brilliant managing editor of RADIO WORLD, one of whose outstanding achievements was the designing and perfection of the 1926 Model Diamond of the Air.

B. C. L. SPECIAL

A Combination Loud Speaker and Lamp

In the living room of the up-to-date home the common loud speaker is quite unsightly, and therefore we asked one of the leading manufacturers of table lamps to make for us a special lamp which can be used as a loud speaker. The loud speaker unit can be inserted in the bottom of the lamp, and the lily shaped stand has all the qualities of the best loud speaker.

It is supplied with fancy silk shades in blue, gold, and old rose, with fringe to match. Some shades are round, some oval and others have pleasing odd designs.

They are all one price and in ordering please state your preference.

Combination Loud Speaker and Lamp **$10.50**

Combination Loud Speaker and Lamp with Baldwin Loud Speaker Unit and Cord **$15.45**

Officially Sealed Kit for The 1926 Model **Diamond of the Air** Using Parts Specified by Herman Bernard

This seal, which bears the signature of Herman Bernard, is your guarantee of a receiver that is equal to if not better than any 5-tube set on the market. Insist upon this seal when purchasing your kit.

Just off the press—RADIO RESEARCHES, an interesting monthly bulletin in booklet form containing a blueprint issued from the reports of the laboratory staff of the Bruno Radio Corp. With each purchase of five dollars or over a free copy of this booklet will be given. Single copies 10c each.

The following pages will show the confidence of leading manufacturers whose parts were selected for use in the Boxed and Sealed Diamond of the Air Kit. You may see a completed Diamond on display at the New York Radio Show, held at the Hotel Pennsylvania, beginning March 8, at Booth No. 13.

Write for FREE Catalogue!

B-C-L RADIO SERVICE CO., 221 FULTON STREET, N. Y. C. TELEPHONE CORTLANDT 4467.

MacMillan received and sent with Thordarson Transformers

If you were commissioned to explore the polar regions, you too would be very particular to select the best equipment — especially in radio, your sole means of communication.

ZENITH
KENNEDY
WL
Radiodyne
C L
Pfanstiehl
Howard
Thermiodyne
GLOBE
Deresnadyne
ADLER-ROYAL
MURDOCK
MU-RAD
Valley
Silver-Marshall
OZARKA
ULTRADYNE
Newport
LEICH
NUNN-LANDON
KUSTOMBILT and
many others
use

THORDARSON Super Amplifying Transformers — the identical transformers sold by dealers everywhere and used in a majority of quality sets—have been the exclusive choice of MacMillan on his Arctic expeditions.

Surely no greater tribute can be paid to the actual supremacy of Thordarson Transformers, product of the world's oldest and largest exclusive transformer specialists. Faultlessly they amplified programs and messages from great distances on the 1923-1924 expedition — and came back "as good as new." Equally successful was their performance on the last expedition.

The wisdom of MacMillan's choice is further confirmed by the fact that year after year, leading builders of fine sets— makers of fine instruments especially noted for distance and superb tone qualities—use more Thordarsons than all competitive transformers combined.

Standard in the "Diamond of the Air" Kit

Thordarson Super Amplifying Transformers have also been chosen for the "Radio World's" famous 1926 DIAMOND OF THE AIR kit, described by Radio World as "the best receiver for home construction"—and, therefore, worthy of the finest audio frequency amplification to be had.

Thordarsons cost more to build — but no more to buy. Dealers everywhere. Interesting bulletins on amplification mailed free.

The Thordarson "Autoformer" All Frequency Amplifiers are our latest development. They amplify clearly the lowest as well as the highest notes of any instrument. An adaption of impedances, resistances and capacities. Write for the Autoformer Hook-up Bulletin—it's free.

Autoformers are $5 each. Other Thordarson Radio Transformers: Audio Frequency (subpanel or top mounting types), 2-1, $5; 3½-1, $4; 6-1, $4.50. Power Amplifying, $13 the pair. Interstage Power Amplifying, each $8. If dealer cannot supply, order from us.

THORDARSON ELECTRIC MANUFACTURING CO.
Transformer specialists since 1895
WORLD'S OLDEST AND LARGEST EXCLUSIVE TRANSFORMER MAKERS
Chicago, U.S.A.

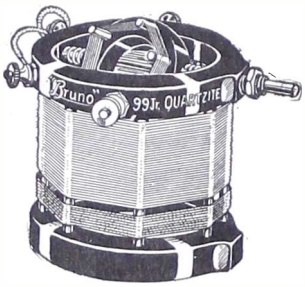
THORDARSON
Super
AMPLIFYING TRANSFORMERS
Standard on the majority of quality sets

"Bruno" Quartzite Inductances

The most efficient coils of their type made. The heart of the 1926 Diamond of the Air, chosen by Herman Bernard for his circuit after exhaustive tests for comparative efficiency.

Trade Mark Reg. U. S. Patent Office

This is the Matched Pair of Bruno Coils Used in the Diamond of the Air Circuit



Bruno "99" interstage coupler wound on quartzite glass rods with newly designed tickler, giving maximum efficiency on all wavelengths. Tunes with .0005 condenser and covers range of from 175 to 575 meters. Price $5.50

The inventive genius, Mr. William A. Bruno, is busy in his laboratory, which is a sure sign that new and far more efficient apparatus than has appeared on the market up till now will be produced. Among the items upon which Mr. Bruno is devoting much of his time is a new condenser which is bound to make an instant "hit" with the radio fans who appreciate efficient apparatus. It will pay you to watch closely the developments of Mr. Bruno's work, and these will be announced in advertisements which will appear shortly.

In order to keep the fans who are interested, informed more closely of Mr. Bruno's work, a monthly bulletin, known as RADIO RESEARCHES, will be issued at 10c per copy.

Bruno "55" or "99" R.F. coil, which is matched to tune with the Bruno "99." Also wound on quartzite glass rods, which insures minutely small losses. The primary is green colored and the secondary is of orange color, giving this coil a handsome appearance. Price $3.00

BRUNO RADIO CORP., 223 FULTON STREET, N. Y. C.

Philadelphia Office: 611 Widener Building
Detroit Office: 159 E. Elizabeth Street
Chicago Office: 337 W. Madison Street
San Francisco Office: 274 Brannon Street

"Send Me Another BRETWOOD Variable Grid Leak"

Thank you for introducing me to the Bretwood Variable Grid Leak! I have installed one in my Three Circuit Tuner according to your instruction and find that it does all you said it would and more.
S. R. HUBBS,
180 Quincy St.,
Brooklyn, N. Y.

The grid leak I sent for arrived and has been installed in a 4-tube regenerative set. I have tried them all, but have never had the pleasure of a real grid leak before. It is just a wonderful little instrument.
F. K. WEISER,
Haskell, Oklahoma.

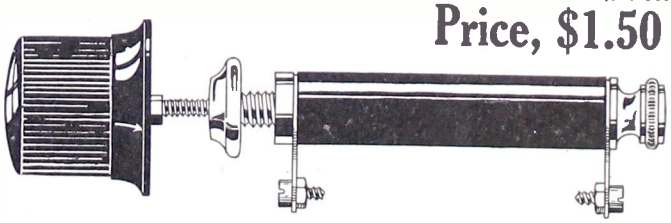
Gridleak received and tested out, and find it is the only variable leak I ever used that is really variable.
Enclosed find $1.50 for which please send me another one.
F. E. STALTON,
Box 240, Ardmore, Okla.

I think it is about the best grid leak I have ever used. Have made quite a few sets and this beats them all. Get DX very plainly and clearly.
WM. HEBERSON,
2510 N. Franklin St.,
Philadelphia, Pa.

This leak is used in King George's Palace and by the U. S. Shipping Board; over 270,000 sold in last four months

Specified for the Diamond of the Air

Price, $1.50



¼ to 10 Megohms

Bretwood, Ltd., London, Eng., Sole Patentees and Owners

More DX, Clearer Reception, Smoother Control in Regenerative Sets Assured

The Bretwood Variable Grid Leak may be installed in any set in five minutes by single hole panel mounting.

The North American Bretwood Co., 145 W. 45th St., N. Y. City

Sole Distributors for United States
Canadian Distributor, Radio, Ltd., Phillips Square, Montreal

NOTE TO RADIO MANUFACTURERS

Write for Wholesale Rates

A set with a FIXED Grid Leak may work perfectly where tested, while it needs a VARIABLE Grid Leak so that set may be adjusted to the locality where used.

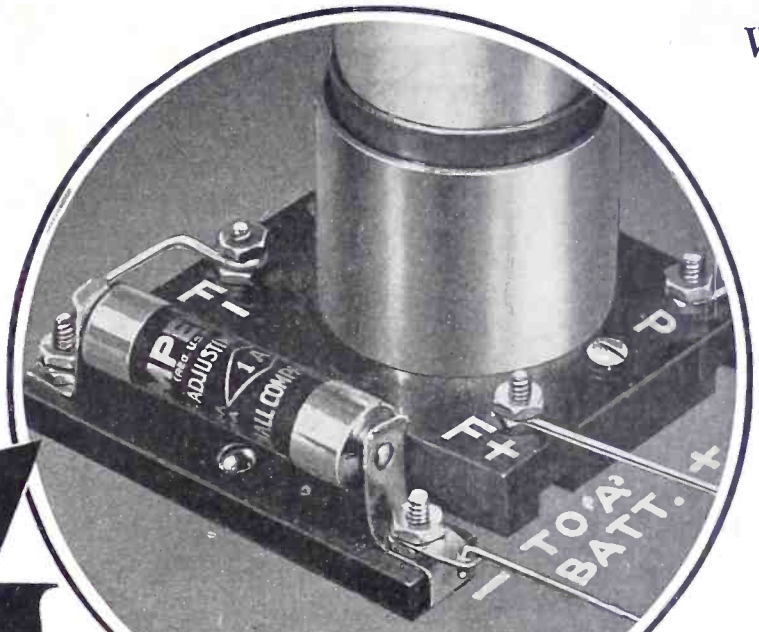
THE NORTH AMERICAN BRETWOOD CO.,
145 West 45th Street, New York City.

Gentlemen: Enclosed find $1.50 for which you will please send me one Bretwood Variable Grid Leak prepaid. Satisfaction guaranteed or my money back after trial within ten days of receipt by me.

NAME .....
STREET .....CITY .....
STATE .....

In the Famous "Diamond of the Air"

Write today for FREE Hook-Ups



AMPERITE

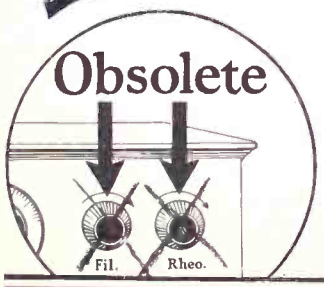
REG. U.S. PAT. OFF.

The "SELF-ADJUSTING" *Rheostat*

Sold Everywhere
$1.10 complete with mounting
(in U. S. A.)

Insures Perfect Automatic Tube-Control Because AMPERITE—

1—Eliminates Hand Rheostats, thereby simplifying control.
2—Permits use of the latest types of tubes or any combination of tubes.
3—Simplifies and reduces set-wiring, thereby making for greater compactness and avoids losses.
4—No moving parts, hence no grinding noises; clear and full tones.
5—Prolongs tube-life by keeping filaments at a constant temperature.
6—No filament meters needed.
7—Brings the most out of each individual tube—automatically—no guessing.
8—Makes every set-owner a master operator, no knobs to turn.



For the new tubes:
Amperite No. 112—for the UX-112 and CX-112
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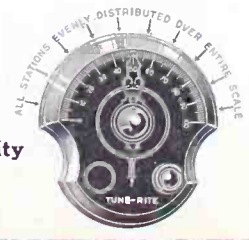
Manufacturers of
TUNE-RITE
"The STRAIGHT LINE FREQUENCY Tuner"



Radiall Company

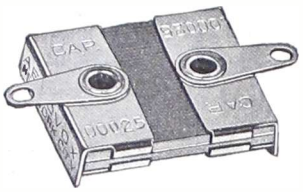
Dept. R.W.-16 50 Franklin Street New York City

Be sure that the set you buy or build is equipped with AMPERITE

SPECIFIED

FOR THE

"DIAMOND OF THE AIR" CIRCUIT



AEROVOX

FIXED MICA CONDENSERS—BY-PASS CONDENSERS

BUILT TO BE BETTER

AEROVOX WIRELESS CORP., 489-491-493 Broome St., New York City

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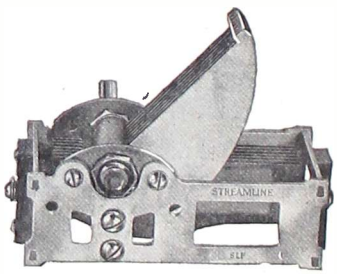
STREAMLINE

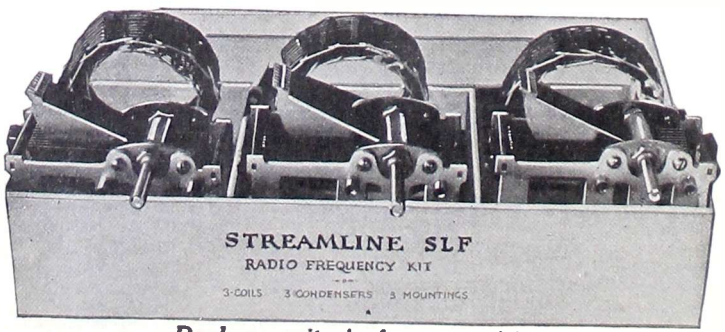
The Straight-Line Frequency Condenser of Unfailing Performance. Enables tuning from 175 to 560 meters. Logging is Made Easy. Even a Baby Can Tune a Set That Uses Streamline Condensers.



.00025 mfd. **$2** .00035 mfd. **$2.25** .0005 mfd. **$2.50**

The Streamline Condensers are officially certified for use in RADIO WORLD'S 1926 Model Diamond of the Air.

Streamline Low-Loss Straight-Line Frequency Kit $7.50



Dealers, write in for proposition.

Distance and Volume at Your Command! Build a Tuned-Radio-Frequency Set, Using the Streamline Kit! Coils and .00035 mfd. Condensers positively Low-Loss!
(With Three Bruno Slo-Moshen Vernier Dials, $12.50)

Enclosed find $..... for which send me at once—

.....Streamline SLF tuned radio frequency kit.

.....Streamline SLF tuned RF kit, with Bruno Slo-Moshen Dials.

.....Streamline SLF condensers; capacity .....

Name .....

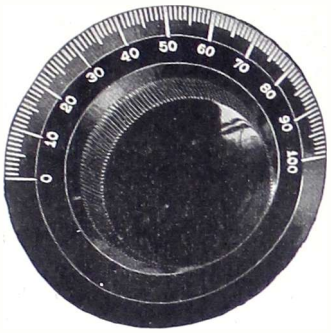
Address .....

City..... State.....

STREAMLINE RADIO CO.
223 FULTON STREET
New York City

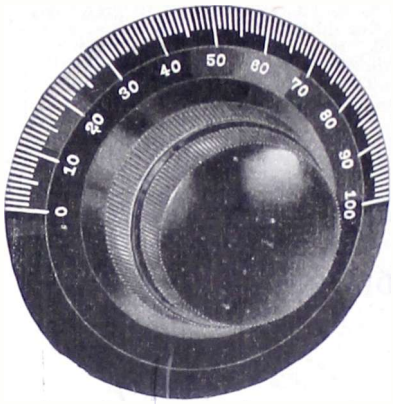
KURZ-KASCH *Aristocrat*

Chosen for DIAMOND OF THE AIR KIT



More manufacturers have adopted Kurz-Kasch product than all others combined.

The world over Kurz-Kasch Aristocrat E-Z Toon is recognized as the real "Key to Simplified Tuning"



KURZ-KASCH ARISTOCRAT DIAL

The supremacy of Kurz-Kasch Aristocrat dials is further exemplified by the choice of Aristocrat Dials for the famous "Diamond of the Air" kit. The beauty of workmanship—the care in moulding—the expert mould making—all combine to make Kurz-Kasch Aristocrat dial the choice of the big majority. The famous Kurz-Kasch split bushing method of mounting is an exclusive feature found only in Kurz-Kasch Aristocrat dials. Kurz-Kasch dials "Align Rite"—"Hold Tite.'

KURZ-KASCH ARISTOCRAT E-Z TOON

Gives that close tuning so necessary, with stations numerous and close together. Simple to install, remove your present dial and slip on an E-Z Toon. Kurz-Kasch workmanship and quality brings in stations you never heard before. Famous Kurz-Kasch split bushing method of mounting. You'll never realize how simple it is to tune your set until you use Kurz-Kasch Aristocrat E-Z Toon.

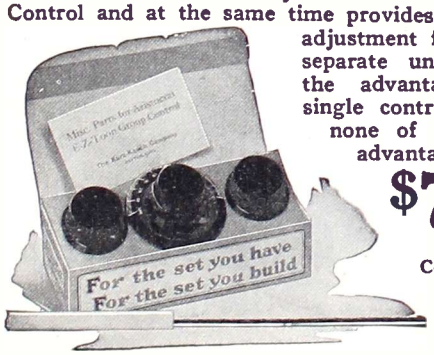
KURZ-KASCH *Aristocrat* E-Z-TOON (EASY TUNE)

GROUP CONTROL

For the Set You Have!

For the Set You Build!

Tunes two or more units by means of one Master Control and at the same time provides vernier adjustment for each separate unit. All the advantages of single control, with none of the disadvantages.



$7.50

LIST

Complete

Simple to install, comes complete, nothing else to buy. No panel to drill, complete instructions with each kit. Nothing to get out of order. Simplifies tuning without loss of efficiency. Any dealer can supply. Write for illustrated folder.

Manufactured by

THE KURZ-KASCH COMPANY

Largest exclusive Moulders of Bakelite

FACTORY and OFFICE: :-: DAYTON, OHIO

Diamond Deluged with Praise

RESULTS EDITOR:

I have built the Diamond of the Air. I have heard over 60 distant stations. The volume on all these setations is terrfic. As for tone quality, it is the best I have ever heard. Some of the stations I have received are: CNRO, KFL, KOA, WMBF, etc. The selectivity of this set is superb.

ROBERT J. BERLUND,
1520 16th Ave.,
Rockford, Ill.

* * *

RESULTS EDITOR:

I have built the Diamond of the Air using 1½-volt tubes, and am obtaining great distance with loudspeaker volume. During the recent international Tests I received stations in Mexico City and Havana.

EUGENE UNSWORTH,
1413 Louisiana Ave.,
New Orleans, La.

* * *

RESULTS EDITOR:

I have written before, expressing the great results which I obtained with my 1926 Model Diamond of the Air, but recently I pulled a stunt which I think is worthy of special mention. KFI, KGO, KOA and CZE (Mexico City), were tuned in while all the local stations were going full blast. The wavelength difference between WCAP and KFI is 1½ meters. I could separate them perfectly without any trouble. WSAI was also tearing up the ether when I tuned in KOA. WDAF was sightseeing around Kansas City when KGO was tuned in. CZE, Mexico City bothers me when KGO is on the air. Ha! Ha! Boy, this is some set!

G. H. THOMAS,
Care The Peoples Bank of
Hartsville,
Hartsville, S. C.

* * *

RESULTS EDITOR:

Have built the Diamond of the Air, with parts that I bought from the Enter City Radio Store of 223 Fulton Street, N. Y. City. I find the above set the best set for volume and selectivity that I have ever built. To day I have logged 46 long distance stations while locals were on, on the speaker. I can recommend this set to anyone.

DAVID WHITE,
514 West 177th St.,
N. Y. City.

USED IN THE DIAMOND OF THE AIR CIRCUIT

U. S. Patent No. 1,549,308

Use a Loose Band On Your Earphones

If the band on a pair of earphones is very tight it should be loosened up by bending it outward, as the tight springiness exerts too much pressure on the head. One radioist, who in his younger days was an ardent amateur, habitually used earphones that clung too tightly to him, and as a result he has less hair on that semi-circumference where the phone band rested than he has on the rest of his head. He wears this blemish as a badge of honor and devotion to his hobby. Most of us would rather forego the honor, so let's do it!

1926 DIAMOND OF THE AIR BOOKLET, containing complete constructional data and diagrams, with blue print, 50c. Columbia Print, 145 W. 45th St., N. Y. C.

VEBY TUBES Will Give You Greater Satisfaction If You Are Using Resistance Coupled Amplification for Your Receiver

TRY VEBY DRY CELL

Hi-Mu Tubes (Type DXA)
Power Tubes (Type DXP)

Increased volume without distortion and lower plate voltage are some of the advantages obtained by using VEBY AF20 Tubes for resistance coupled amplification. They are especially designed for this purpose and have an amplification factor of 20 as compared to 7 or 8 of ordinary tubes.

VEBY POWER TUBE

While designed for use in the last stage of a resistance coupled amplifier, the VEBY AF6 Power Tube is guaranteed to give more volume and eliminate distortion on any receiver, regardless of type of amplification used.

VEBY— AF 20 Amplifier Tube, DXA Dry Cell Tube — $3.00

(FOR RESISTANCE COUPLING)

VEBY— AF 6 Power Tube, $4.50; DXP Dry Cell Power Tube, $3.00

VEBY RADIO COMPANY
47-51 MORRIS AVENUE NEWARK, N. J.

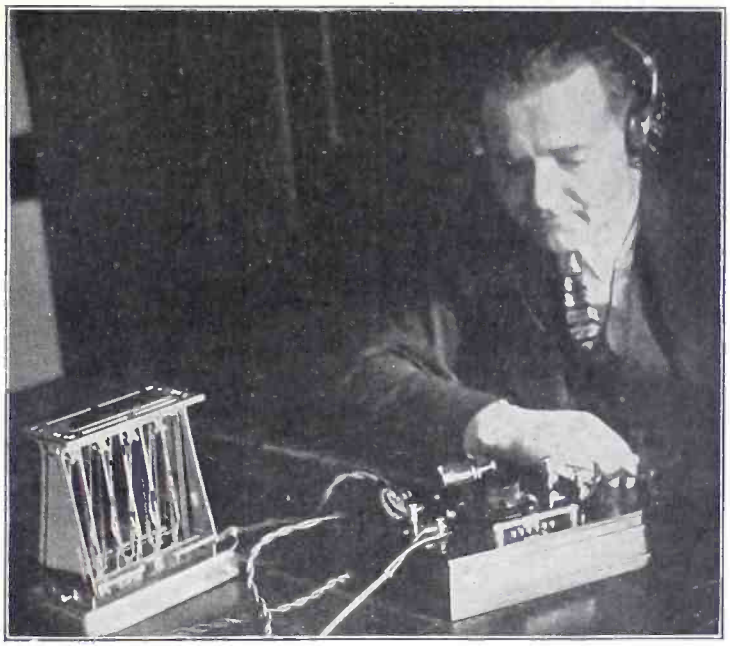
VEBY Resistor No. 100

VEBY RESISTORS ARE SPECIFIED BY
HERMAN BERNARD
FOR USE ON THE
"DIAMOND OF THE AIR"

Manufactured in a Complete Range of Values From 2,500 Ohms to 10 Megohms.

Veby 3-stage resistance-coupled amplifier, $10.00
Equipped with new UX socket arrangement.

Electrical Toaster Used as Aerial



DAVID B. KOPP, of Boston, is shown using an ordinary breadtoaster as an aerial for a crystal set. Local stations come in with great clarity, while using the toaster aerial. (Underwood & Underwood).

Writing by Radio

THE "RADIO PEN," one of the latest wonders in radio development, is another of the inventions of C. Francis Jenkins of Washington, D. C. No human hands are required to operate this pen. It is actuated by radio waves sent out from a broadcasting station. In a recent demonstration, it was operated by radio waves from a transmitting station four miles away. (Harris & Ewing).

CHANGES OF ADDRESS

should be sent to Subscription Department at least two weeks in advance of publication in order to insure early and proper attention. RADIO WORLD'S subscription list is so large that it is necessary that changes be sent in as requested. Address, Subscription Department, RADIO WORLD, 145 W. 45th St., New York.

Good Back Numbers of RADIO WORLD

The following illustrated articles have appeared in recent issues of RADIO WORLD:

1925:

July 4—The Handsome Portable, by Herbert E. Hayden. The Freedom Reflex, by Capt. P. V. O'Rourke.

July 11—The Baby "Super," by J. E. Anderson. A 1-Dial Portable Receiver, by Capt. P. V. O'Rourke.

July 18—Anderson's 6-Tube Super-Heterodyne. The 3-Tube Marconi Receiver, by Percy Warren. A Good Battery Connector, by Herbert E. Hayden.

Aug. 1—Enormous Volume on DX Stations, by Sidney E. Finkelstein. The Metropolitan Local Set, by J. E. Anderson.

Aug. 8—The Evolution Reflex, by Capt. P. V. O'Rourke. The Midget—A 3-Tube Set in Sewing Machine Cabinet, by Herbert E. Hayden. How to Build Your First Set, by Herman Bernard.

Aug. 15—Capt. P. V. O'Rourke's Favorite Audio Amplifier. A Set That Takes Ingenuity, by Lewis Winner. The Loop Jack in The Diamond, by Herman Bernard.

Aug. 22—The 5-Tube Diamond, by Sidney E. Finkelstein. A Home-Made Toroidal Coil, by George R. Hostetter. Crystal Sets That You Can Log, by Herman Bernard.

Sept. 12—The 1926 Model Diamond of the Air, (Part 1), by Herman Bernard. A 25-to-110 Meter Receiver, by Sidney E. Finkelstein.

Sept. 19—Diamond of the Air (Part 2), by Herman Bernard. A 1-Dial, 2-Tube Speaker Set, by Percy Warren. A Tube B Battery Eliminator, by Lewis Winner.

Sept. 26—The 8-Tube Super-Heterodyne, by Sidney E. Finkelstein. Diamond of the Air (Part 3), by Herman Bernard. The 5-Tube Browning-Drake, by Capt. P. V. O'Rourke.

Oct. 3—The Thordarson-Wade Set (Part 1), by Herman Bernard. A Fixed Grid Leak, by Herbert E. Hayden. Trouble Shooting for Diamond of the Air.

Oct. 10—The 3-Tube, 3-Circuit Tuner, by Capt. P. V. O'Rourke. The DX Set That Thrilled Jack, by Lewis Winner. The Thordarsen-Wade Set (Part 2), by Herman Bernard.

Oct. 17—The Thoroughbred (1-Tube DX Set), by Herbert Hayden. O'Rourke's Favorite SW Set, by Capt. Peter V. O'Rourke. The Thordarson-Wade Set (Part 3), by Herman Bernard. Trouble Shooting Article.

Oct. 24—A Phonograph Cabinet Set, by Lewis Winner. The Thoroughbred, by Herbert Hayden (Part 2).

Nov. 7—A 3-Tube Dry-Cell Circuit, by Capt. P. V. O'Rourke. One of the Best Crystal Sets, by Herbert E. Hayden. 1-Tube DX Set, Herman Bernard. The 4-Tube Robers Receiver, by Neal Fitzalan.

Nov. 14—The 4-Tube DX Special, by Herbert E. Hayden. The Set That Water Loudened, by Capt. P. V. O'Rourke. A Receiver for Music Lovers, by Lewis Winner.

Nov. 21—A DX Super-Heterodyne, by J. E. Anderson. A Resistance-Controlled Set, by Percy Warren. A 4-Tube A-A Receiver, by Herbert E. Hayden.

Nov. 28—The Zero Potential Loop, by Frank Freer. The 1-Tube Headset Receiver, by J. E. Anderson.

Dec. 5—A Toroid RF Set, Using Crystal, by Lewis Winner. The Diamond of the Air (in Text and Diagram), by Herman Bernard.

Dec. 12—A Self-Contained Receiver, by H. E. Hayden (Part 1). B Battery Eliminator, by Lewis Winner (Holiday Gifts No.).

Dec. 19—The Lemnis Entertainer, by Ed. Spiegler. Feldman 5-Tube Set, by Lewis W. Feldman.

Dec. 26—The Regenerative Wave Trap, by John F. Rider. The 5-Tube Tuned RF Set, by Capt. P. V. O'Rourke.

1926:

Jan. 2—The 2-O Set for Simplicity, by Capt. P. V. O'Rourke.

Jan. 9—The 4-Tube DX Symphony Set, by A. Irving Wilk. A Skillfully Made 1-Dial Set, by Herman Bernard.

Jan. 16—Anderson's 5-Tube Quality Receiver. The Raytheon B. Eliminator, by Lewis Winner.

Jan. 23—The 4-Tube Diamond of the Air, by Herman Bernard. The Antennatrol, by Herbert E. Hayden (Part 1). B Batteries Last Six Months, by S. E. Finkelstein.

Jan. 30—An Individual AF Amplifier, by H. E. Hayden. The Antennatrol, by Herbert Hayden (Part 2). Trapping Out Super-Power in New Jersey, by Capt. P. V. O'Rourke.

Feb. 6—The Fenway (4 or 9 tubes), by Leo Fenway (Part 1). The Great 1-Tube DX Set, by Herman Bernard.

Feb. 13—Anderson's 5-Tube Economical Receiver. Trouble-Shooting for Novices, by M. B. Strock. The Fenway, by Leo Fenway Part 2).

Feb. 20—The 8-Tube Victoreen, by Herbert E. Hayden. The Fenway, by Leo Fenway (Part 3). Quality Stressed in 3-Tube Set, by Brainard Foote.

Feb. 27—The 4-tube DX Dandy, by Herbert E. Hayden. Umbrella Aerial for DX, by Hugo Gernsback. Part 2 of The Victoreen.

Any copy, 15c. Any 7 copies, $1.00. All these 31 copies for $4.30, or start subscription with any issue. RADIO WORLD, 145 W. 45th St., N. Y. C.

Labor Will Erect Own Station In Australia

WASHINGTON.

Organized labor is going to try its hand at broadcasting in Australia, according to a report to the Department of Commerce. The new station, with a call of 2KY, will be of superpower. The Trades Hall authorities are reported as expecting to overcome any causing of interference.

FOR CLEAR, QUIET "B" POWER

RADIO Storage "B" Battery

12 Cells 24 Volts *Lasts Indefinitely—Pays for Itself*

Economy and performance unheard of before. Recharged at a negligible cost. Delivers unfailing power that is clear, pure and quiet. Approved and listed as Standard by leading Radio Authorities, including Pop. Radio Laboratories, Pop. Sci. Inst. Standards, Radio News Lab., Lefax, Inc., and other important institutions. Equipped with *Solid Rubber Case*, an insurance against acid and leakage. Extra heavy glass jars. Heavy rugged plates. Order yours today!

SEND NO MONEY Just state number of batteries wanted and we will ship day order is received. Extra offer: 4 batteries in series (96 volts), $10.50 Pay expressman after examining batteries. 5 per cent discount for cash with order. Mail your order now!

WORLD BATTERY COMPANY
1219 So. Wabash Ave., Dept. 82 Chicago, Ill.
Makers of the Famous World Radio "A" Storage Battery
Prices: 6-volt, 100 Amp. $11.45; 150 Amp. $12.85; 140 Amp. $14.00. All equipped with Solid Rubber Cases.

World STORAGE BATTERIES

Set your Radio Dials at 210 meters for the new 1000 watt World Storage Battery Station, WSBC, Chicago. Watch for announcements.

KDKA WEAF WGN WJS KHJ KGO KFAF WJY KOP

GEM TUBE

A Guaranteed Radio Tube Within Reach of All

Every tube guaranteed. A tube for a dollar of $1 value. A trial order will convince you as it has thousands of others. Send your orders at once.

Orders sent C.O.D. parcel post.

Type..199A
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$1.00 EACH (with standard base)

Dealers, Write for Discounts.

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Dept. W., 260 B'way, N. Y. C.
220 So. State St., Chicago, Ill.
Lafayette Bldg., Detroit, Mich.

HERMAN BERNARD, managing editor of RADIO WORLD, broadcasts every Friday at 7 p. m., from WGBS, Gimbel Bros., N. Y. City, 315.6 meters. He discusses "What's Your Radio Problem?" Listen in!

RESULTS

Readers report on their experiences with sets built from hookups published in RADIO WORLD. *Address Results Editor,* RADIO WORLD, 145 *West 45th Street, New York City, and send photographs of sets, if possible.*

RESULTS EDITOR:

I built the 3-Tube 3-Circuit receiver described by Capt. P. V. O'Rourke in the Oct. 10 issue of RADIO WORLD and received marvelous results as to distance and volume.

JOSEPH S. GORAL,
Rt. 2, Bx. 35,
Latrobe, Pa.

* * *

RESULTS EDITOR:

I built the Diamond of the Air and am getting very good results. I have received stations from all over the country with loudspeaker volume and with wonderful quality. GEORGE FILKAS,
4456 N. 17th St., Philadelphia, Pa.

1926 RADIO CATALOG & LOG BOOK

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Which contains all latest
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AT SLASHED PRICES!!
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IT WILL PAY YOU TO BUY FROM US. We carry one of the largest lines of Radio in the East.

Don't miss the wonderful opportunity to participate in this Great Sale.

Rush your request at once.

To cover the cost of mailing enclose 10c.

ECONOMY RADIO SALES COMPANY
288 6th Ave. Dept. E New York
DEAL DIRECT AND SAVE REAL MONEY
(No Dealers)

ULTRA-LOWLOSS CONDENSER

SPECIAL CUTLASS PLATES DISTRIBUTE THE STATIONS EVENLY OVER THE DIAL SIMPLIFIES TUNING CAPACITY .0005 MFD

$5.00

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SM PARTS

SM Low Loss Inductances

All-bakelite Low Loss Interchangeable Coils for 50-550 meters. These new coils may be used as oscillators, antenna adapters and RF transformers in standard circuits.

Price of all types, Each $2.50

Sockets for any size Coils, Each..... 1.00

SM Type 316 Condensers are furnished, all brass plates, die-cast frame and double adjustable cone bearings. May be ganged by placing one socket behind another, the shafts interlocking in any desired relation. SLF .00035 mfd. capacity for all types of SM Interchangeable coils. Price..$5.75

SM Vernier Dials

The SM Type 801 Vernier Dials are of all bakelite construction. Zero to 100 — clockwise — counter-clockwise or 360 degrees (for Remler Condensers) in a single type. In appearance and operation the SM is the finest vernier dial on the market. Price, each $2.50

SM 210 and 211 Transformers

Designed so that maximum amplification will be obtained at 60 Kilocycles. Available in matched sets of any number. No. 210 is iron-core type while No. 211 is of the air-core type supplied with measured tuning condenser. Each transformer is furnished with individual laboratory curve chart. Price: Both Types.....$6.00 each

See these and other SM Parts at your Dealers or write for circulars.

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CHICAGO, ILLINOIS

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Blueprint and instructions..... $1.00
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VICTOREEN
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Build the Right Set
COAST TO COAST-ON-A-LOOP
No Oscillations, Howls or Squeals
No Matching of Tubes
Range-Clarity-Selectivity-Ease of Operation

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Originators and World's Largest Manufacturers of Self Fluxing Solder
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THE VICTOREEN (from page 12)

fier. The red A plus lead is soldered to the F plus socket post of the third tube from the left. The green B plus detector lead is connected to the plus post of the first audio-transformer.

As to C minus, A minus and B minus, the constructor must choose between locating the C battery on a level with the set, or below with the other batteries.

If the decision is to place it below, the better plan is to use the black cable for A minus, B minus being connected to A minus by a separate lead, not a part of the cable, right at the batteries. This enables you to use the yellow cable lead for C minus, soldering it to the lug on the F post of the first audio transformer, and snipping off the excess bus bar lead. C plus would be joined to both A minus and B minus at the batteries.

The other scheme, with the C battery on a level with the set, would enable you to make the yellow lead B minus and the black one A minus, carrying these down to the batteries along with the other cable leads, while two flexible leads would be used for the C battery. One of these would be soldered to the common joint of A minus and B minus, the first wire we installed, while the other would run from the F posts of the two audio transformers and would be C minus.

Connect antenna and ground to the posts of the antenna coupler so marked, or plug in a loop at the loop jack. Connect the speaker to the final jack, J3, lower right (now that you are facing the panel) and turn on the switch.

Condenser C4, the .006 mfd. safety device, was not included in the wiring directions, as it is not in the list of parts. To include it, simply interrupt the lead from the plate of the oscillator tube on its way to the stator plates, of C2, and place the condenser C4 in between, one side of C4 tube to the plate, the other side of C4 to the stator plates of C2.

C8 has not been included in the wiring directions. It is not necessary, but may be included, if desired, being about 1.0 mfd. C5 and C8 are interchangeable, and as C5 was considered in the wiring directions, C8 was omitted.

FREE BOOKLET FOR INVENTORS
IF YOUR INVENTION is new and useful it is patentable. Send me your sketch.
Z. H. POLACHEK, 70 Wall St., New York
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KNOW where to place your dials for each station in America.
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POSITIVELY GUARANTEED equal to new tubes in every respect. Money will be refunded if tubes prove unsatisfactory for any reason other than burn-outs.

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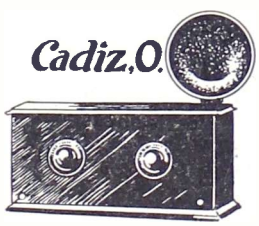

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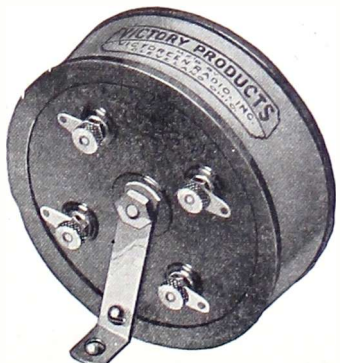
Coast to Coast on a Loop is easy with a

Victoreen "Super"



No. 170 R. F. Transformer

The Heart of the Circuit

4—No. 170 R. F. TRANSFORMERS at $7.00 each and

1—No. 150 Coupling Unit at $5.50

No oscillations, howls or squeals—no matching of tubes.

Complete parts to build the "Victoreen" can be purchased of your dealers at moderate cost.

Ask your dealer for free "Victoreen" folder which contains hook-up and complete information, or write us direct.

THE GEORGE W. WALKER CO.
6515 CARNEGIE AVE. CLEVELAND, OHIO
Branch Offices in Principal Cities

TRADIOGRAMS

Wesley S. Scharp, well-known to the radio fraternity, has become a partner in the firm of Stoner & Heath, manufacturers' agents of 122 Greenwich Street, New York City. They are sole agents in this territory for the Centralab products which are occupying front rank. They also represent Bodine Mfg. Co., Globe Electric Co., Mack Moulded Products and a new Perlesz foundation unit and have just added Cell-O-Meter, a new meter which accurately tells the condition of the storage batery.

The Carter flat plug is an original and efficient plug providing quick and positive means for inserting and removing phone cords without the aid of any other devices. Secure anchorage results, and the plug is highly ornamental, the shape of the handle conforming with that of the dials on the panel. The Carter dialite provides illumination for the front of the panel and at the same time can be used as a combination filament switch. The new Carter 14-inch loop which is highly efficient is also ready. These and the full line of Carter products are handled in New York by the genial P. W. Mack at 1270 Broadway. The well-liked Acme line also handled by Mr. Mack is going strong, orders for the new Acme Cone Speaker coming in faster than they can be filled.

The Ekko Company, 111 W. Monroe St., Chicago, Ill., are putting out a ground clamp also a line of connectives unique for their very simplicity. These connectives are made for Edison phonograph, Columbia, Pathe, Brunswick, etc.

The Lawn Battery Works, 1545 Van Buren St., Chicago, Ill., have designed a cabinet enclosing a 96-volt Lawn B Battery and Lawn Rectifier with switch on inside of cabinet cover, which allows instant use of battery for receiving or charging by simply throwing switch. Full information on this will be sent by just mentioning RADIO WORLD.

This should prove interesting to the real radio fan.

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Polished Nickel or Gilt, ⅝ or ¾" 10¢

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$1.00 brings BLUE PRINT—Working Drawings—Complete Instructions for Erecting. Just send dollar bill (or check). Limited quantity. Send TODAY.
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Price list as before.

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"It gets that last mile"

Electrically and Mechanically it's Perfect.

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Describes fully the complete Crosley line of radio frequency sets, regenerative sets (licensed under Armstrong U. S. Patent No. 1,113,149) and parts.
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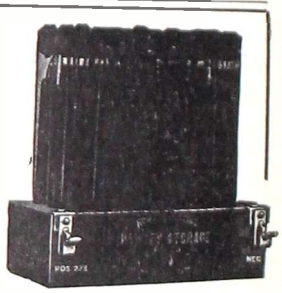
22½ volt rechargeable "B" Storage Battery

$2.95

Includes chemical



45 volts, $5.25; 90 volts, $10.00; 112½ volts, $12.50; 135 volts, $14.75; 157½ volts, $16.80. Truly, the biggest buy today. Easily charged on any current, including 32-volt systems. Any special detector plate voltage had. Tested and approved by leading authorities such as Popular Radio Laboratories. Over 3 years sold on a non-red tape, 30-day trial offer with complete refund if not thoroughly satisfied. Further guaranteed 3 years. Knock-down kits at great savings. Complete "Hawley" "B" battery charger, $2.75. Sample cell, 35c. Order direct—send no money—simply pay the expressman cost on delivery. Or write for my free literature, testimonials and guarantee. Same day shipments. S. Hawley Smith, 318 Washington Ave., Danbury, Conn.

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BEAUTIFUL REGISTERED BULL PUPS, $15. Bulldogs, 501 Rockwood, Dallas, Texas.

EXPERIENCED RADIO MAN WANTS position. Manford Flowers, Clovis, New Mexico.

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EARN $110 to $250 monthly, expenses paid as Railway Traffic Inspector. We secure position for you after completion of 3 months' home study course or money refunded. Excellent opportunities. Write for Free Booklet, G-161 Stand. Business Training Inst., Buffalo, N. Y.

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October Exports Set Record at $1,317,846

Washington.—Radio exports for October, 1925, reached a new high total of $1,317,846, according to figures released by the bureau of Foreign and Domestic Commerce. The principal purchasers of American radio equipment during October were Canada, $808,943; Japan, $151,247; Australia, $87,849; United Kingdom, $71,577; Mexico, $66,118.

New Tube Reviver Works Off the Main

The International Resistance Co., of Philadelphia, Pa., is putting out a clever device, for reviving and restoring to its original efficiency every tube employing a thorium treated filament, where the filament is not actually burned out. It is designed to operate from any 110 or 120 volt line, AC or DC. All that is necessary to restore the tube is to screw the device into the electric socket, press the button for 45 seconds and then allow it to stay in the socket for 10 minutes. This device is known as "The Socket Tube Reviver." Any dissipation of heat, plus a reasonable amount of overload, is well taken care of. These revivers are made for the 201A and the 199 type tubes.

Tested and Approved by RADIO WORLD Laboratories).

LITERATURE

J. H. Fowler, Morstein, Pa. (Dealer).
L. A. Sunde, R.F.D. 2, Box 31, Valley City, N. D.
Hagens and Hageman Radio Co., Teaneck, N. J. (Dealer).
Edward Tlatt, R.F.D. 1, Medina, N. Y.
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Ben Radio Corp., Freeport, N. Y., $50,000; C. H. Nichols, S. Edwards. (Atty., W. P. Bocken, Freeport, N. Y.)
Schneider Horney Radio Research Laboratories, experiments, N. Y. City, 200 common, no par;

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7 x 10	.32
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7 x 24	.75
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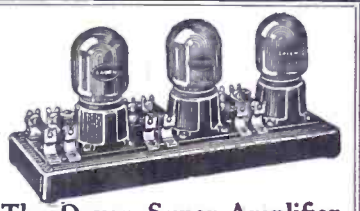

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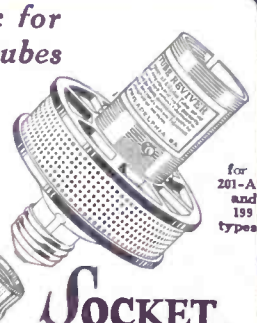

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Two .00025 mfd. Grid Condensers with Mountings
Two 2-megohm Grid Leaks
One .001 mfd. Fixed Condenser
One 1.0 mfd. By-Pass Condenser
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Two Meloformers
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2 .0005 Mfd. Montrose SLF Condensers.
2 Apex Vernier Dials.
2 .00025 Mfd. Grid Condensers with Mountings
2 2-Megohm Grid Leaks
1 .001 Mfd. Fixed Condenser.
1 1.01 Mfd. Tobe By-Pass Condenser.
1 400 Ohm DeJur Potentiometer.
2 30 Ohm DeJur Rheostats.
2 6 Ohm DeJur Rheostats.
2 Precise Audio Transformers.
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2 Double Circuit Jacks.
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