JULY 10

A Cure for Single Control Troubles

15 CENTS

RADIO WORLD

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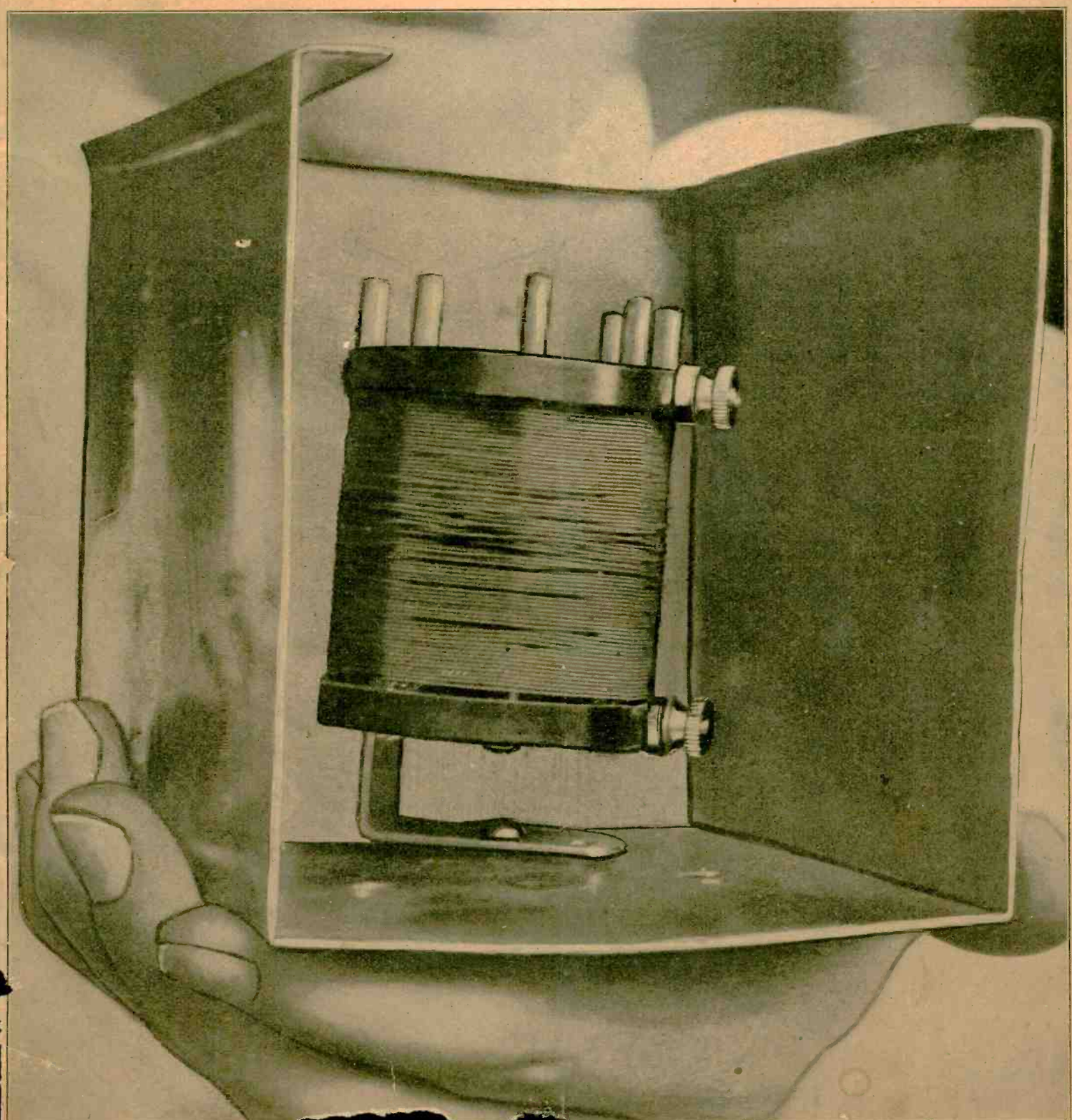

HOW ee page 7. (Radio World Staff Photo)

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LOG OF BST-6

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WBBR, Rossville, N. Y..16
WEBH, Chicago, Ill....49
WHT, Deerfield, Ill.....55
WCCO, St. Paul, Minn..61
WSB, Atlanta, Ga.....66
WGY, Schenectady, N.Y..50
WMAK, Lockport, N.Y..14
WMSG, New York City.11
WOC, Davenport, Ia....85
WFAA, Dallas, Texas...78

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I live within four blocks of WLWL, and since the opening of this station have had great difficulty in choking them off my old set. Even after employing a wave trap I could still hear WLWL around the entire dial and was told by several friends that living so near this powerful station it would be impossible to entirely cut them out with anything less than a super-het. It was a very agreeable surprise, therefore, when I installed my new BST-6, to find that while WLWL came in on 25 I could tune in WRNY on 21 and entirely cut out WLWL. ***This is certainly real selectivity.***—F. S Clark, 350 West 55th Street, New York City

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The Rub in Single Control

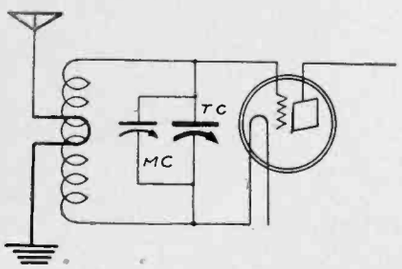


FIG. 1
The test circuit for determining the capacity effect of various locations of the primary in respect to the secondary. A single turn primary was used, located in the middle of the secondary, as shown above, and also at the grid and battery ends, respectively.

Location of the Primary of First Stage Radio Transformer Has Most Important Bearing on Synchronized Tuning — It Should be at the A Battery End of Secondary To Minimize Capacity Effect Between Turns of Respective Windings.

By Herman Bernard

Associate, Institute of Radio Engineers

WHAT is the key to success in the construction of a single control receiver?

Admittedly there are many problems to solve before success is won. Indeed, considerable disaster has overtaken the single control enthusiasts, although there are a few commercial sets of that sort on the market that are highly efficient.

Whether a set be constructed in a factory or at home, the problems are the same, with the exception that manufacturing entails quantity production problems, and simplification and standardization of work are necessary precautions less the venture prove financially unproductive.

The fan at his kitchen workbench, however, is concerned only with the success of the particular single control set that he is making. He knows that considerable labor will have to be expended on balancing, so that all action governed by the solitary dial will represent the same wavelength for all tuned circuits at the same dial setting. He will flounder about a great deal unless he realizes the underlying considerations that make for success.

The Two Big Problems

Taking for granted that cond[illegible] tuned circuits are to be used, an[illegible] 3-section gang condenser is to b[illegible] porated, we are faced at once with the following major problems:

(1)—The construction of the condenser so as to afford accuracy within a working limit.

(2)—The synchronization of tuning, despite other complications in the tuned circuits.

As for the condenser itself, assuming that it has three sections, each of the same capacity, say .00035 mfd., the spacing between plates must be uniform, otherwise variations in capacity will exist at points where there should be identity. The plates should be held rigidly in place, or, if they are adjustable, the setting should remain firm after adjustment. The plates should not be warped. It rests with the manufacturer to take care of all the construction problems regarding the condenser.

The only incurable defect is warped plates, and this nuisance may be attributed to a whim of nature or a devlish trait in metals. The manufacturer should reject condensers with warped plates, or the plates themselves before the condenser is made.

Lower Waves Indicative

With individual control for each tuned circuit, the warping of plates is of little or no consequence, as it is taken care of automatically in the tuning, but where all three circuits are actuated by only one tuning dial, then warping may become serious, especially at the lower wavelengths. The effect of capacity change, however small, is noticeable at the lower wavelengths, although at the higher wavelengths there may be no difference in dial setting, due to the very small percentage this capacity bears to the total capacity in the tuned circuit. In other words, for a high wavelength the tuning condenser plates are almost entirely nested, and, say, .0003 mfd. of a total of .00035 mfd. is used, whereas at a low wavelength only .00008 may be used, or about one-quarter the total capacity, instead of nearly all of the total.

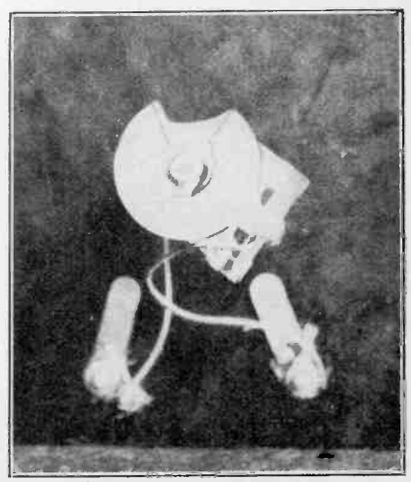


FIG. 2
The midget variable condenser used in the tests. It has nine plates.

Therefore it is absolutely necessary to buy condensers of highly reputable manufacture.

The second problem, that of synchronizing tuning, when using an accurately made condenser, has its chief difficulty in the first stage of radio frequency amplification. This is due to the use of an antenna-ground system, which has a capacity all its own (often about .00025 mfd.), and to the effect of the capacity coupling between the primary, L1, and the secondary, L2. (Figs. 4 and 5)

Search For Remedy

Most of the trouble centers about making the first-stage condenser tune in step with the others. An examination of conditions that cause variations between the tuning of this stage and subsequent circuits is highly advisable.

The location of the primary in respect

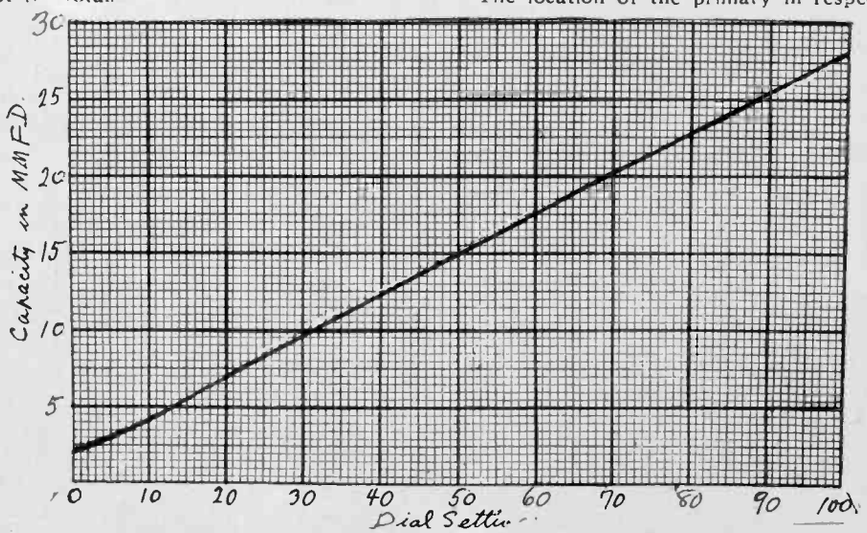


FIG. 3
[illegible] midget condenser in micro-microfarads. The capacity is [illegible] corresponding dial settings are shown [illegible] tally.

A Study of Capacity Effects

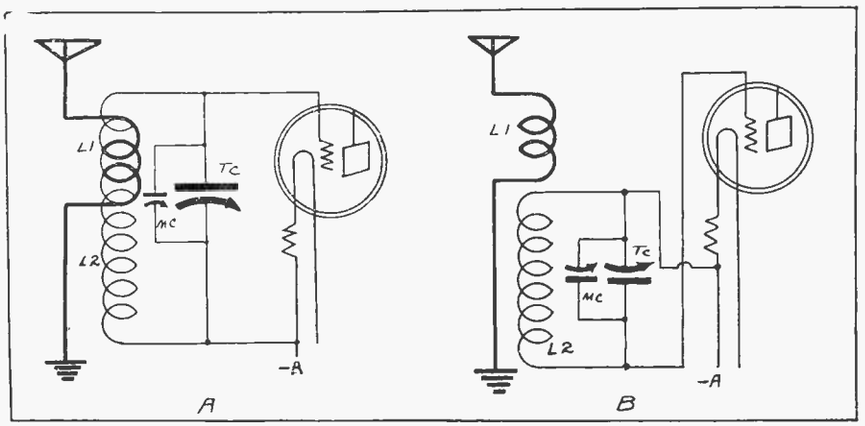


FIG. 4

The primary L1 is shown at the grid end of the secondary in A and at the battery end of the secondary in B.

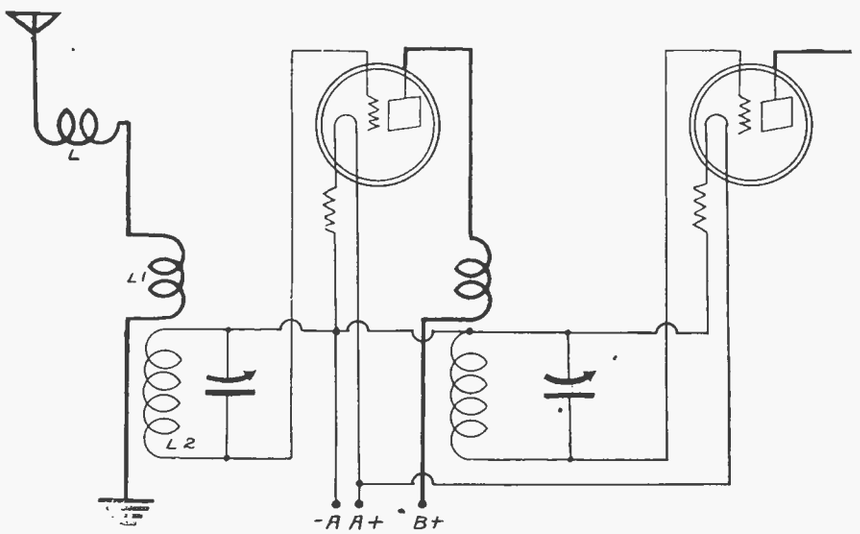


FIG. 5

Primary at Grid End Renders Synchronized Tuning Virtually Impossible, Due to Humps in the Tuning Curve—Gang Condenser Must Be of Excellent Workmanship.

to the secondary is a most important consideration. The capacity effect of the coupling of primary to secondary is mar ed if the primary is wrongly located and this is enough to upset the whole scheme.

Just for experimental purposes a single turn of wire was used for the primary in the circuit shown in Fig. 1, and was located at the middle of the secondary winding, and on top thereof. Across the tuning condenser TC was connected a midget variable condenser, MC, of the type commonly used for neutralizing. The Hammarlund midget was employed. It has nine plates. Fig. 2 shows this midget condenser, while Fig. 3 is a graph of the calibration in micro-microfarads. Thus the scale is from 2 to 28 mmfd., shown at the perpend'cular column at left in Fig. 3, while the dial settings correspond'ng to given capacities are shown on the horizontal level (0 to 100).

A Single Turn Used

With the 1-turn primary centered on the secondary, TCL2 was tuned to a given frequency and a certain dial reading obtained. Then the primary was shifted from the center to the negative A terminal of the secondary, and to tune in the same frequency as previously it was necessary to turn the midget condenser so as to add 8 mmfd. This showed that the midpoint location of the primary on the secondary was the equivalent of adding 8 mmfd. By placing the primary at the grid end the capacity coupling was increased much more, even in comparison with the midway location, and besides the energy input was less.

These tests were made with a 1-turn primary simply to determine whether any noticeable change existed even under the relatively feeble effects of a single turn in the untuned primary.

Those desiring to use this method of determining capacity effects, as in Fig. 1, should bear in mind that if you must add capacity by turning MC, so that the rotor plates are engaged to a fuller extent, it proves that the capacity coupling under the new circumstances is less, since it is necessary to add capacity to reach the same wavelength under the new condition as was tuned in under the old one. If the test is to be made by tuning in a broadcast station it is well to select one on a comparatively low wavelength.

Reference may be had to the curve, Fig. 3, if the Hammarlund midget condenser is used. For instance a setting of 30 on the dial would represent 10 mmfd., while 70 would represent 20 mmfd. One may start by setting MC at 50, i.e., 15 mmfd., and that will give you almost a 15 mmfd. range up or down. As you know in advance what the effect will be, but not the extent of the effect, the midget condenser may be set originally at a

(*Continued on page 28*)

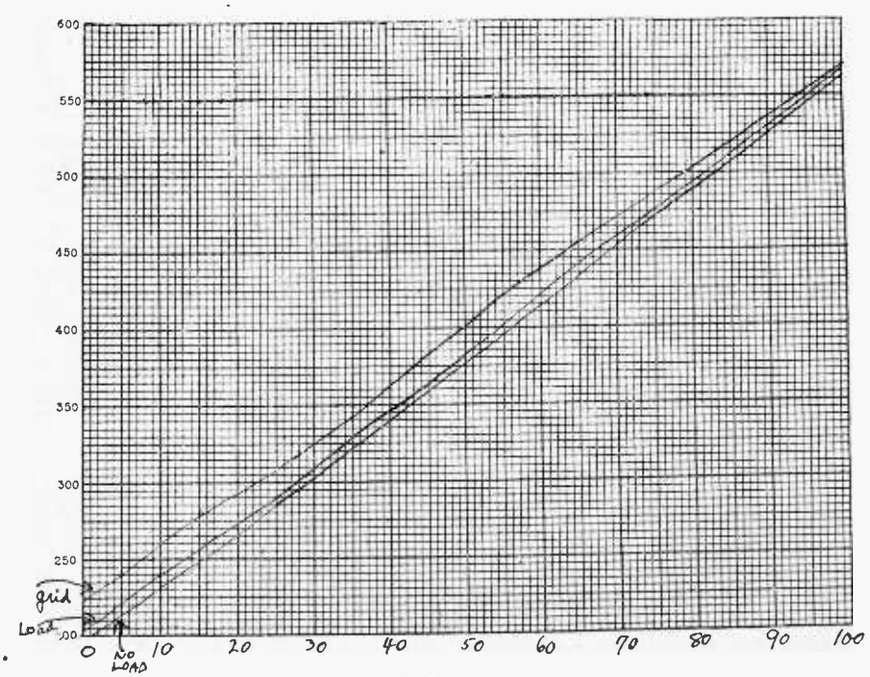


FIG. 6

Difference in capacities told relatively in dial readings, showing the curve of the tuning condenser TC (without midget condenser), with the primary at the battery end ("no load"), a loading [illegible] included ("load"), and with the primary coil located [illegible]id").

A DX Double Regenerator

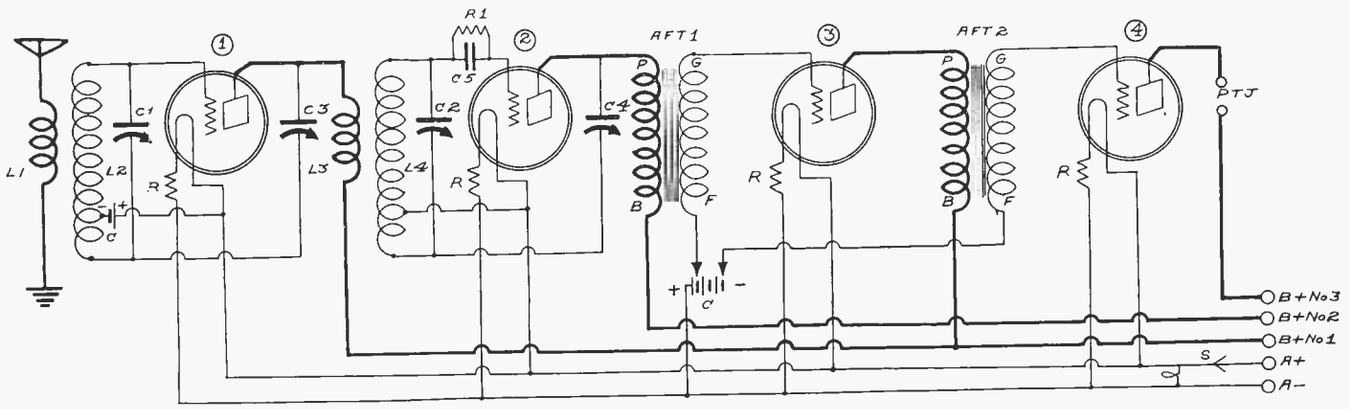


FIG. 1
The double regenerative receiver shown in electrical wiring diagram.

Capacity Feedback Used in Both Stages—How to Get Excellent Results From This Receiver—Not a Set For Novices.

By Capt. P. V. O'Rourke

THE heightening effect of regeneration upon selectivity and sensitivity is so great that this method of increased amplification is very popular. It is used in one stage only, as a rule, for instance, as in the Diamond of the Air, in the detector circuit. Its use in two stages has been the subject of considerable experimenting. It is probably safe to say that success has not attended these ventures to a degree where the run of radio fans might be invited to construct a receiver embodying such a hookup.

The difficulty lies in having a receiver that is controllable. While regeneration in a radio frequency stage, in addition to regeneration in a detector stage, will afford remarkable DX-getting powers in a set, the hookup and construction must be such that the receiver does not "plop" into a condition of paralysis.

Capacity Feedback Used

The inclusion of two tickler coils of the rotary type, one in the RF stage, the other in the detector plate, if the regulation windings are used, would result in a receiver that would go beyond the bounds of simplicity of operation, indeed in many ways would be almost unworkable.

A good way around the difficulty thus encountered is to use the capacity method of feedback in both stages. This is accomplished by dividing the plate output. The plate, therefore, is connected to the B battery positive through the primary of a transformer (L3 for the radio side and PB for the detector output in Fig. 1). By having the condenser variable the effect gained is in the nature of a variable bypass, and the point just under oscillation may be found by turning the condensers, C3 and C4.

DX Is the Main Goal

The use of regeneration in the radio frequency tube of course increases volume considerably, due to the square law applicable to the detector input. The reason why, when only one regenerative tube is used, it is customary to make it the detector, rather than the RF bulb, is that radiation thereby is reduced and there is slightly better stability.

Even with the set as shown in Fig. 1 working well, with regeneration used in both stages, the important advantage will be in selectivity and sensitivity, rather than in volume, because volume always can be taken care of in the audio stages, while the radio amplification is effective principally upon distant reception. In other words, the reason for using double regeneration is not volume increase, although this necessarily results to a marked degree, but to attempt to gain with only two tubes the radio amplification obtainable, without regeneration, only by using five or six tubes for this end alone.

As for the vital consideration of keeping the set within control limits, the B plus voltage on the radio frequency tube is important. This is shown as B plus No. 1 and may be hooked up to first AF tube plate. The voltage usually will be somewhere around 67½, although more may be tried. The receiver functioned well with 67½ volts here, and a negative grid bias of 1 volt. As there was no ready way of obtaining 1 volt from the 4½-volt C battery used, which has taps at 3 and 4½ volts only, the usual procedure of connecting C plus to minus A was not employed, but C plus was connected instead to A plus. The C battery arrangement consisted of two 4½-volt batteries, used only to the 3-volt posts, and series connected, making 6 volts negative in respect to the A battery positive, or, counting from the negative filament, actually 1-volt negative (6 minus 5). This was the most convenient way to get the required odd negative voltage, although other systems may be used to the same effect.

The Different C Connections

Most experimenters no doubt will prefer to join C minus to A minus, and thus make the negative bias cumulative, instead of starting 5 volts behind, so to speak, due to connection to A positive, and then building up, as explained. The customary method is used in the C battery wiring in the audio circuit.

The set, to operate best, should be so constructed that when the plates of C3 are entirely out of mesh there is no over-oscillation on even the lowest receivable wavelength in the RF tube. This is accomplished by using the proper B battery voltage on the RF tube, determined by experiment, and conjunctively using a "safe" primary for L3. Too many turns here mean trouble.

If straight line frequency condensers are used it would be well to mount them at different positions in respect to one another, so that they may turn through their angle of rotation, in the tuning process, to avoid plates of one condenser touching plates of a neighboring condenser.

If L1L2 is made on a 3" diameter tubing, using No. 20 double cotton covered wire, L1 would consist of 8 turns. A separation of ¼" is left and the secondary then is wound, consisting of 47 turns, tapped at the 9th turn. The method of connecting this coil is: antenna to outside terminal of the primary L1; ground to inside terminal; terminal of secondary, that adjoins ground terminal of prim-

(*Concluded on page 6*)

LIST OF PARTS

Two radio frequency transformers, L1L2, L3L4.
Two .0005 mfd. variable condensers, C1 and C2, a 4" vernier dial for each.
Two .00025 mfd. variable condensers, C3 and C4, with a knob for each.
Four No. 1A Amperites, R (for —01A tubes throughout).
Four sockets.
One 7x24" panel with 8x23" baseboard.
One switch S (pilot light optional).
Two audio frequency transformers, PBGF.
One pair of phone tip jacks, PTJ.
One .00025 mfd. grid condenser, C5, with grid leak, R1, 2 to 9 meg.

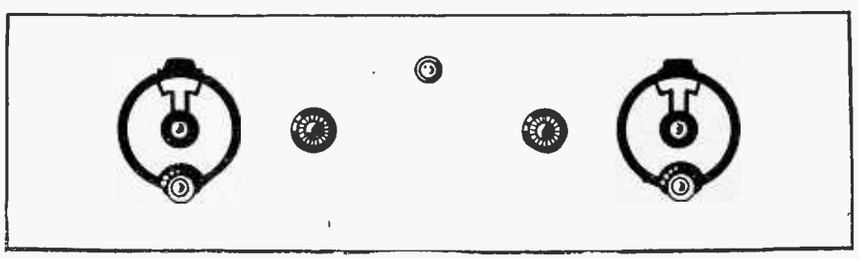


FIG. 2
panel vie[illegible]he double regenerator.

A 2-Tube Dry Cell Receiver

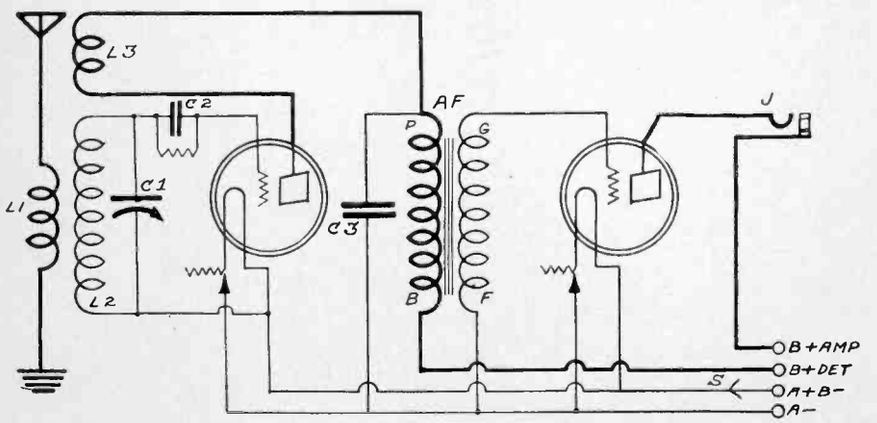


FIG. 1

Circuit diagram of a 2-tube set, consisting of a regenerative detector and a transformer audio stage.

Circuit Affords Great Earphone Volume — Built on a 7x10" Panel, It Is Adaptale to Either Home or Portable Use—Wiring Precautions Concern Method of Connecting Coils.

By Samuel Schmalz

THE 3-circuit tuner, with a stage of transformer coupled audio frequency after it, makes a very fine general utility set. It may be used as a portable, it is just as good, indeed better, in the home, and it gives one about as great a range as the run of receivers. Only earphone use may be obtained, unless one lives very close to a strong local, when speaker operation is possible.

The diagram of this receiver is shown in Fig. 1, while the front panel and the rear are revealed in Figs. 2 and 3. The set is easy and inexpensive to build. Indeed, most experimenters will have about the house nearly all the parts necessary to construct it.

How to Make the Coil

The tuning coil is a regulation 3-circuit tuner. Nearly all of those commercially made have secondaries wound for tuning with a .0005 mfd. variable condenser. One may use any type of variable condenser of that capacity. These days the straight line frequency condenser is in high favor, because, although somewhat crowding the higher wavelength stations, it generously distributes the otherwise greatly overcrowded low wavelength stations.

To wind your own coil, use a form 3" in diameter and 4" high as the stationary one, and on this wind 10 turns for L1, the untuned primary. Leave ¼ to ½" space and then begin winding the secondary, L2. which is an entirely separate winding, and which has 47 turns. The wire used in both instances is No. 22 double cotton covered. The rotary coil, L3, should be on a form that will turn inside the secondary. The inside diameter of the stator will be about 2¾", due to the thickness of the form. The movable coil form, or tickler, should be about 2" in diameter. The wire used here may be finer, such as No. 24 single silk, 30 turns being put on. These turns are placed 15 on each side of a space left in the middle for the rotor shaft. It is necessary to turn the tickler from the panel, hence a shaft ¼" is attached to the tickler, goes through the stator form and thus reaches the panel, since the tuning coil itself is panel mounted.

Tubes on the Set

The tubes for this receiver may be any of general manufacture for detection and amplification, with the filament and plate voltages as recommended by the tube manufacturer. These are given on circulars placed inside the box that contains the tube, and often these data also are printed on the cardboard box, too. Generally 45 for detector plate and 67½ for the last tube will work best.

For a set such as this dry-cell tubes seem to be most popular. Best results will be obtained from the —99 tubes in this class, but excellent results also are obtainable if the —11 or —12 type tubes is used. The rheostats for the 99 tubes would be 30 ohms each, the A battery consisting of two parallel-connected 4½-volt C batteries. For the —11 or —12 tubes use two parallel-connected 1½-volt No. 6 dry cells. The rheostats then would be 6 ohms each, but if you have rheostats of any higher resistance you may use them.

The switch S is handy, but not necessary. If it is omitted the set may be turned on or off by manipulating the two rheostats. With the switch included, the rheostats need be adjusted very seldom. The switch turns the set on or off.

The set may be constructed on a 7x10" panel. To this is affixed a 7x9" baseboard.

Wiring Advice

Connect aerial to the beginning of L1, the terminal near one end of the tubing. Connect ground to the other terminal of L1. The terminal of the secondary which adjoins the ground lead of the primary is connected to A plus and to the rotor plates of the tuning condenser C1. The other terminal of the secondary is connected to one side of the grid condenser and to the stator plates of C1. Therefore, the grid end of the secondary is near the other end of the tubing. To restate this situation differently, the respective coil terminals nearer the ends of the tubing go to aerial and grid respectively. These are connections to two different coils, of course. As for the tickler, if it does not cause generous regeneration when connected in a given manner, reverse the connections, so that the lead that went to plate will go instead to B plus, and the erstwhile B plus lead will go to plate.

LIST OF PARTS

One 3-circuit tuning coil, L1L2L3.
One .0005 mfd. variable condenser, C1.
One 7x10" panel.
One 7x9" baseboard.
One .00025 mfd. fixed grid condenser, C2, with one grid leak, 2 to 9 meg.
Two 30-ohm rheostats.
Two sockets.
One audio frequency transformer.
One switch.
One single circuit jack.
One dial.

DOUBLE REGENERATION

(*Concluded from page* 5)

ary, to rotor plates of C3 and of C1; tap to C minus, and outside terminal of secondary to grid of tube No. 1 and to stator plates of C1.

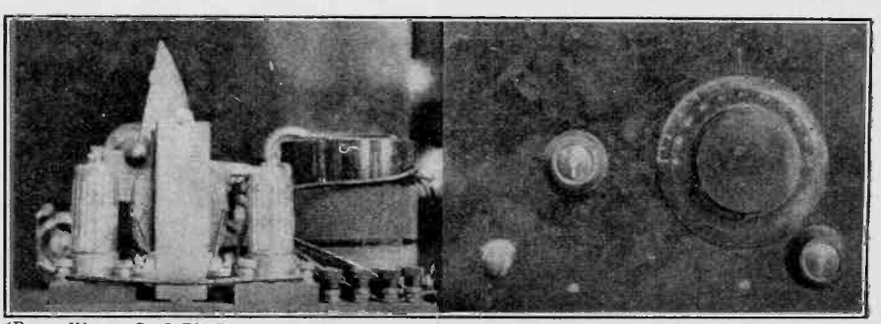
L3L4 consists of a 5-turn primary and a 47-turn secondary, otherwise wound and tapped like L1L2, the connections being: outside terminal of primary L3 to plate of RF tube, next primary terminal to B plus; terminal of secondary, that adjoins B plus terminal of primary, to rotor plates of C4, and of C2; tap to A plus and remaining secondary terminal to one side of the grid condenser C5.

No fixed bypass condenser should be placed on the primary of the first audio transformer, or from detector plate to A minus or otherwise.

The audio C voltages are to be determined by experiment, as these depend on the plate voltages used and on personal taste in hearing. The switch S turns the set on or off as a unit, while the looped line near it in Fig. 1 represents an optional pilot light.

The coils should be placed at right angles to each other, so that the axis of one, on an imaginary line, passes through the center of the other. This is to prevent stray inductive coupling.

This is a set for only experienced radio fans.



(RADIO WORLD *Staff Photo*)

D 3

panel layout.

How to Make a Box Shield

(RADIO WORLD *Staff Photos*)

FIGS. 1, 2 AND 3

The photographs show the shield construction. A pencil points to poorly placed and awkwardly made holes. Never drill a large hole, as that is a leakage point. The A minus leads of the coils may be soldered to the can anywhere, while a soldered connection is made on the outside of the can to A minus. This makes the shield a part of the wiring in sets that have a grounded A battery lead.

Isolation of Fields an Important Precaution in Most Receivers Using More Than Two Stages of Tuned RF.

Dimensions of the Sheet Copper Box Are Determined by the Physical Size of the Coil it Contains.

By Patrick J. Gallagher

THE present trend in radio design is toward the inclusion of more and more radio frequency amplification. The 5-tube set still is exceedingly popular and consists of two stages of tuned RF, tube detector and two transformer coupled audio stages. This type of receiver may be constructed by introducing various types of balancing agencies to avoid over-oscillation. But if a third stage of RF is to be used, either tuned or untuned, then shielding usually becomes necessary, in addition to other precautions. Indeed, all the coils should be shielded.

By incorporating the box type of shielding, and applying it to the four coils in the set, naturally more room must be taken. Hence it is next to impossible to develop a compact receiver where there is shielding of this sort.

Conservation of Space

On the other hand, the space requirements need not be excessive, for one may use coils of smaller than the usual diameter. The coil is the pivot of the shield dimensions, for there should be at least 1" free space between the coil winding and any part of the shield. This is to reduce to a minimum the losses due to eddy currents.

The coil for which the shield was made in the present instance had a diameter of 2", about 2" high, on which the primary and the secondary were wound. For the secondary 70 turns of No. 24 single silk covered wire were used. The primary was wound over the secondary and consisted of seven turns, put on near one end of the secondary winding (to be used as A battery end of secondary). However, the entire primary was wound over a part of the secondary. This kept the axial length of the completed coil down to the total length of the secondary winding alone, another concession to space requirements, but made without sacrifice.

The bottom of the "can" is cut to a size of 4½x5". The 5" length is folded over ½" on each side, leaving 4". The 4½" dimension is folded at the ½" line, also leaving 4". Standard sheet copper is used. The folding is easily accomplished by placing the copper between two boards, using them as a vice, and bending up the larger stretch of copper. The folding referred to brings the small flap at right angles to the main piece.

Three Out of One

Three of the sides are made of one large piece, the copper being cut to 4x12⅛". The 12⅛" stretch is twice bent at opposite right angles. The extra ⅛" is allowed as tolerance for "shrinkage" due to the rounded nature of these particular bends.

The top is 5x5". A slot toward the center is cut at each corner, ½" deep, and then is made to conform to a V-shape, so that the excess ½" may be bent all around to form a lid. Where the overlap meets, the joint is soldered. This refers to the four corners of the lid.

The front piece is 4½x5", the ½" being bent, hence only one flap on this, and the extra 1" on the 5" dimension being converted into two flaps of ½" each.

The plane used for the bottom is drilled so that a 1½" right angle may be mounted. This may be a metal angle. By drilling a hole in the coil form, the other arm of the angle bracket is secured thereto by small bolt and nut, the same device used to hold the form to the shield.

Bringing Out the Leads

Four round holes are drilled in the bottom of the shield so that the coil terminals may be connected by insulated wire through these holes to the parts of the receiver. Two holes may be close together, and these would be used for ground and A minus, if these are the destinations of the leads, or B plus and A minus, or B plus and A plus, in other instances. Near the left-hand side of the bottom another hole is drilled and near the right-hand side still another, these being for high potential leads. e.g., aerial and grid, plate and grid. Do not drill large holes.

After the coil is mounted and the leads brought out, the three-sided piece is soldered to the bottom. Next the lid is soldered to the top of the shell. Finally the front piece is soldered on. Then the shield is completed. It may be soldered to angle brackets screwed on a baseboard. If other means of support are to be used, such as angle brackets for panel or subpanel attachment, of course these should be put on before the constituent pieces are soldered together to form the box.

The shield must be grounded to be effective. Receivers in which the negative A battery is grounded may be built so that only three leads are taken through holes in the shield, the fourth lead being soldered directly to the shield and used as A minus. In other words, the shield becomes part of the A battery minus lead.

Use of a shield causes higher dial readings due to absorption. However, the danger of interstage stray coupling is avoided, great stability is obtained, and a very selective receiver may be the result. Where two stages of tuned RF are used with regeneration, shielding proves very helpful. Also, any coil in a set that is now causing trouble due to interaction may be shielded individually, although the rest of the inductances are not shielded.

(Other Photo on Front Cover)

R. C. A. Buys Its Way Into Philippine Control

MANILA.

The Radio Corporation of America purchased the Radio Corporation of the Philippines, thereby removing the last obstacle to building a powerful station in the islands.

It is understood the purchase gives the American concern wide ramifications in the Orient, including connections with Saigon, French Indo-China and other important points.

The sale, negotiated by Col. C. H. Nance, gives the Radio Corporation of America a monopoly on broadcasting in the Philippines. It previously held a franchise to build a large station near Manila.

Transmuting Noise to Joy

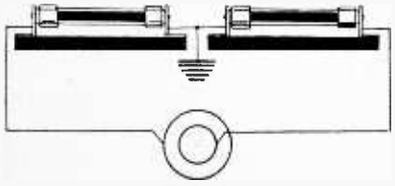


FIG. 1.

Mid-tapped resistors to kill off noise produced by sparking at commutator or collector rings.

Rule of Any Type of Tube Must Be Abandoned—Power or Semi-Power Tube in Last Audio Stage Is Important — Plate Voltages Should Be Juggled, Especially on Detector.

[The author of the following article is well-known to radio experimenters and the trade. He gained fame first as an enterprising amateur, later as a brilliant editor. For several years he was editor of "Radio Broadcast." As an author of technical radio articles that any layman can understand he has won an enviable reputation for his accuracy and lucidity.]

By Arthur H. Lynch

THERE is a great tendency on the part of the public to demand from a radio receiver better tone quality. Manufacturers, realizing this demand, are making every effort to comply with it. In the meantime the public itself is going to no inconsiderable length to procure better tone quality from the receivers now in its possession.

One of the greatest causes for impure tone quality in the ordinary radio receiver of a year ago was the fact that the vacuum tubes were used in almost every instance without regard to their characteristics. For instance, no matter what type loud speaker one were to employ, he would use a 201-A tube and in most instances a 201-A tube would be used as a radio frequency amplifier and detector.

The connections from the receiver usually allowed for the use of 45 volts for the detector and 90 volts for the plate of both the radio frequency amplifier and the audio frequency amplifier. In very few instances was any attention whatever paid to the application of a grid bias to the tubes to be sure that they were working on the proper part of their characteristic curve. Modern receivers, however, are being brought out with this detail given very material attention.

Then, too, it was found that any type of loud speaker usually was connected to a 3-, 4- or 5-tube receiver, the set itself employed a 201-A tube, and in many instances the loud speaker did not in any way match up with the tube feeding it. This has been greatly remedied by the use of the power and semi-power tubes now on the market.

It is true that increasing the plate voltage on either a radio frequency or an audio frequency tube will as a rule result in greater signal strength. However, improving the signal strength has in many cases resulted also in greatly reducing the quality of the reproduction. Quality reproduction of course depends upon a number of factors.

If, for instance, one uses a receiver in which transformers couple the tubes of the audio frequency amplifier, it has been found advisable, according to some of the recognized experts in that line, to use rather high plate voltage on the last tube, voltages in the neighborhood of from 350 to 500. Of course, plate voltages of this magnitude are almost impossible where dry batteries are used to furnish the B supply.

To provide this B supply in a satisfactory manner, many of the manufacturers of high grade transformers have devoted themselves to the problem of producing a battery supply unit which will deliver high voltages and at the same time smooth out the alternating current ripple which one would expect in a supply system of this kind. Great success has been achieved along this line and we will undoubtedly find on the market, beginning with the Fall, a great many battery supply systems of this kind coupled with power amplifiers.

Milliammeter Helps

But our problem at the present minute is more satisfactory operation of the receiver now on hand, and it will be found that by following a few simple rules the tone quality of the receiver now in existence can be improved greatly.

In addition to improving the tone quality those who will follow these simple rules will also find by placing a milliammeter in series with the negative side of their plate batteries (B batteries), that the current drain on these batteries is materially reduced. For instance, where a radio frequency receiver, that is one of the popular 3-dial receivers employing five tubes is used, the first two tubes are used as radio frequency amplifiers, the third as the detector and the fourth and fifth tubes as the audio amplifier system. Most receivers of this kind have been designed for use with 90 volts on the two radio frequency tubes as well as the two audio frequency tubes. By including in series with the grid of the radio frequency tubes 3 to 4.5 volts supplied from a dry battery, usually called a C battery, the proper negative bias is provided for the two radio frequency tubes and though it does not reduce the possibility of the receiver getting distance, it does reduce very materially the amount of current drawn from the B battery. Then, too, similarly including 4.5 volts negative on the first audio frequency tube will provide better tone quality in the audio frequency amplifier. The last tube instead of being 201-A as has been the custom heretofore, should be one of the new 112 tubes or their equivalent, such as the CeCo type F, which the present writer has found very satisfactory. To use this tube satisfactorily, 135 volts should be put on the plate, and the grid bias should be in the neighborhood of 9 to 11 volts.

Juggling Plate Voltages

Many purchasers of radio receivers have been of the opinion that because the given binding posts bear a certain mark it is necessary to use the specific voltage indicated on the binding post and none other. For instance, on many of the receivers now in use it will be found that 45 volts is recommended as the proper plate voltage for use with the detector. A great many detector tubes vary, that is, one is not exactly the same as another. For this reason, detector plate voltages may well be varied from 16.5 to 67.5 volts, and the connection giving the best tone quality and best over[illegible]on should

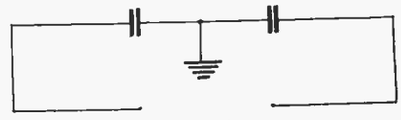


FIG. 2.

Bridging of the house line to get rid of noise.

be used continually. For instance, there is the new CeCo super-sensitive detector tube which has the effect of adding about the same efficiency to a receiver as an additional stage of radio frequency amplification. This tube works best with a plate voltage of about 67.5.

Another interesting point in connection with the detector is the use of the proper fixed resistor as the grid leak. Sometimes resistors may be marked one thing when actual measurement indicates that the marking is all wrong. It should be borne in mind that for detector use the value for a grid leak resistor is not a fixed quantity. It varies with the tube and the voltage applied to the tube.

For this reason it would be well to have on hand several fixed resistors which may be placed in or removed from the grid circuit without trouble, the one producing the most satisfactory results being left in the receiver.

Leak Must Suit Tube

When the detector tube is changed, however, another series of experiments with the grid leak resistor should be made. Some resistors for use in this connection have been found by experiment to be noisy in themselves and they produce noise in the loud speaker. It is a comparatively simple matter to tell whether or not noise is coming from the grid leak resistor by taking it to your dealer and having him connect it in an audio frequency amplifier system with which most dealers are now familiar and which is now commonly used for this purpose.

Juggling the plate voltage of the radio frequency amplifier in receivers by about 22.5 volts at a time and doing the same thing in connection with the audio frequency amplifier is a worth-while procedure. To carry this procedure out most satisfactorily, however, it should be borne in mind that direct connection should be provided for varying the C battery. This may well be done by adding a few binding posts to existing receivers and running wires from these binding posts to the necessary terminals on the C battery.

Resistance Coupled AF

In the foregoing we have assumed that the audio frequency transformers are of good quality and properly used will result in producing at the loud speaker music of real character. However, in a great many of the receivers sold during the past few years this is not true and to rearrange the audio amplifier system would incur a rather heavy expense. In order to take advantage of the best tone quality, at the same time keeping the cost of making the necessary changes in an existing receiver low, resistance coupling or impedance coupling offers a very easy and satisfactory solution.

The application of resistance coupling does not as a rule give the satisfactory performance of which it is capable unless some few precautions are employed. For instance, if the audio frequency system is to operate at its best, 135 volts should be supplied to all three of the audio frequency tubes. This voltage though, it is directly applied to the contact for the tubes, does not actually get to the plate

Kinks for Improving Sets

Interference from Power Line May Be Eliminated By Large Condensers in Shunt With the Supply, the Joint of the Two Condensers Being Grounded — Loose Connections a Frequent Cause of Noise.

of the first two tubes of the audio frequency system because in series with the plates we have the fixed resistors which form part of the coupling system. The resistance of these units in the plate circuit causes a voltage drop and the voltage actually applied to the plate is materially lower than 135, somewhere in the neighborhood of 45. Approximately 135 is directly appied to the plate of the last tube, although the loud speaker winding is in series with it. That is, it is 135, or slightly less due to resistance of the winding, which is nothing as compared with the resistance of the plate resistors. To employ resistance coupling audio at its best we should apply the following voltages: 135 to the plate of all tubes, and a negative bias of minus 5 to 12 to the grid of the third tube. The tubes themselves should be two high mu tubes and one semi-power output tube.

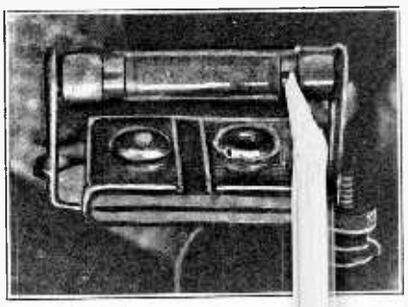
The tone quality produced by a revamped receiver of this type is surprisingly good. And when the receiver is used in conjunction with a good cone type loud speaker it is extremely satisfactory.

Tight Connections Vital

In wiring radio receivers the use of lugs has become very popular, and rightly so. Where lugs are used by the home builder or by the manufacturer great care should be taken that the connections between the lugs themselves and the parts to which they are to contact are very tight. This can usually be made possible by securing the lugs to the necessary unit with the assistance of a machine screw and a lock washer and nut. The use of the lock washer prevents the nut from coming loose.

Where lock washers of this kind are not used there is always a likelihood of a loose contact and the accompanying noise. The ideal arrangement is to have the lug and the metal unit to which the lug is attached in one piece. For instance, a socket having its four contactor units made in a single punching extending beyond the socket long enough to act as a lug works very satisfactorily. A similar arrangement is found on some of the mountings used for holding resistors in place. With devices of this kind, even though the screw holding them in place comes loose, there is no electrical looseness, because the wire connecting the unit to some other part of the receiver is one piece or practically one piece.

Another source of noise in radio receivers is found in the resistance elements themselves. For instance in an ordinary resistor used as a grid leak the resistor element itself when improperly manufactured, due either to poor material used throughout or because of a poor contact between the resistance element itself and



(Radio World Staff Photo)

FIG. 3.

The grid leak should suit th... tube in conjunction with ... used. If you change tube... have to change le...

the tips of the resistor unit, ...ctuation of current flowing in the rec... results. This current flowing through... receiver introduces noise.

If you have a good audio ...equency amplifier, such as the Wester... Electric, it would be well to connect o... of your resistors or a resistor mountin... series with about 22.5 volts and also ... series with the input terminals of y... amplifier. The output of the amplifi... is then connected to a pair of telephon... and the switch on the amplifier used ... control the volume is placed about ha... way up. If you place a resistor in the ...unting and there is a very loud and ...tinuous noise in the telephones you c... be sure that this same noise takes pla... in your receiver when that resistor is ...ed in it. There will, of course, be a very loud click in the telephones when the resistor is placed in the mounting or taken out of it. That does not indicate that the resistor is noisy. The noise to which I refer is a continuous crackling noise and it is very easy to determine by listening to several resistors connected in this way, which of them are producing noise in your loud speaker.

Exists in B Units

Corrosion in any part of a radio receiver is likely to introduce very serious noises. For instance, the terminals of your storage battery, or at least one of them, when used in connection with spring clips actually corrode quite heavily unless some precaution is taken, such as coating with vaseline the terminal itself and the connector or clip used with it. Light corrosion is likely to take place in connection with any of the nickel-plated parts of your receiver. A thin layer sometimes forms on these parts which prevents the current flowing easily from one part of the circuit to another. Then, too, because the corrosion is there, the fluctuation in the current results and this fluctuation causes noise. Where this corrosion is found on the A battery usually it may be remedied by scraping the terminals well and applying vaseline. If this corrosion is not very heavy it may be necessary merely to rub the spring contactor against the terminals of the battery three or four times thereby producing a shiny surface and a good contact.

Corrosion of this kind also exists in some of the B battery supply devices now on the market. This is particularly true in connection with those B battery supply units which use some sort of chemical solution for rectifiers.

Devices of this kind are usually made in such a way that there is but a single voltage supplied from the unit itself and in order to ge... the proper voltage for the operation of the detector tube, the use of a fixed resistor or in some instances a variable resistor is resorted to. Sometimes because the rectifier system gasses, the tips of the resistor unit as well as the spring mountings in which it is placed corrode. To repair this condition, it is necessary only to scrape the tips of the resistor with a knife or fine sand paper and do the same thing with the clip. If the corrosion is not heavy revolve the resistor within its clip two or three times or just rotate it back and forth a little.

A simple remedy for noises from outside sources of this kind, unless it is particularly strong, is to place a large sized high-voltage condenser across the current line entering the residence; better still, two condensers of the same character connected in series across the line with their mid-tap grounded. That is, the wire connecting the two condensers together connected to ground makes an ideal arrangement.

Another system commonly used in remedying a condition of this kind on shipboard which may very well be applied to the home is to connect across the incoming current line two high resistors in series, grounding the mid-tap of the resistors in the same fashion as described above for condensers.

Resistors for use of this kind can be of almost any resistance value, but experience has shown that 2 or 3 megohms connected in series will work out quite satisfactorily.

AC Hum Cut Out

Another form of interference which sometimes is noticed where alternating current is used in the home is a continuous hum in the loud speaker. Sometimes a hum of this kind comes from having the receiver itself too close to an alternating current line running through one of the walls. The hum is then transmitted from the line directly to the coils of the receiver by induction. The remedy for a condition of this kind is found in moving the receiver to some other part of the room. Occasionally a similar condition is found to exist when the antenna or the lead-in from the antenna is run parallel through the house in proximity to the alternating current line. Of course if we are in a house built by someone else before we occupied it we may not know where the lines run. In this instance it will be necessary to do a little experimenting.

Sometimes radio receivers are influenced by noise originating from generators or other electrical devices close by the receiver. Noises of this kind are extremely troublesome, but in many instances their elimination is a comparatively simple matter. As a rule noises of this kind result from poor contact between the generator brushes and the commutator segments. As the armature of the motor or generator revolves, sparks take place between the moving and the stationary electrical members. These sparks actually act as electrical disturbances and are carried along the wire. To eliminate this sparking, connect two rather large sized condensers in series directly across the line feeding the motor or generator and ground the mid-tap. Condensers for this use, where the line voltage is 110, should be able to withstand from 750 to 1,000 volts, and should be purchased accordingly. They should be not less than 2 mfd. each and should be of very high quality.

The manufactured product for the elimination of such interference is the Tobe-Interference Reducer.

Data for the Construction of a Simple Coil Winder

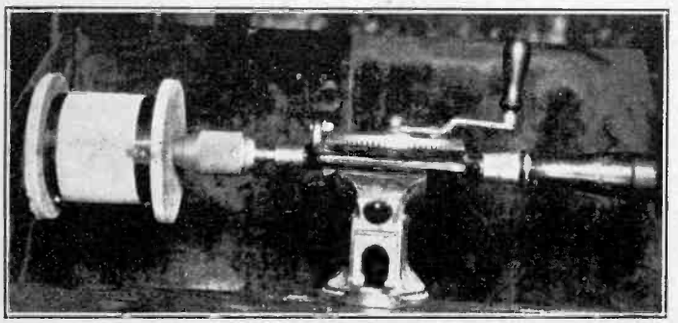


FIG. 1

THE parts for the coil winder and the completed instrument.

By J. E. Anderson

Consulting Engineer

Winding coils by hand is rather a tedious process, and the finished products are not always good to look at. It is very difficult to prevent kinks and bends in the wire, and these will always result in uneven winding. And it is also difficult to keep the wire clean, and dirt on the coil neither enhances its efficiency nor its appearance. A much neater job may be done with a simple coil winder, and the time required for winding a coil is only a fraction of that required to wind the same coil by hand.

A simple winder may be easily made as shown in the accompanying photograph Fig. 1. Cut two discs 4" in diameter out of ply wood, hard rubber or Bakelite. On one side of these discs draw circles corresponding to the more usual sizes of coil tubing, to be used as aids in the center of the form. Then drill ⅜" holes in the centers of the two discs. An iron bolt of suitable length and diameter, a couple of washers and nuts, and a hand drill complete the material for the coil winder.

Insert the unthreaded end of the bolt into the chuck of the drill as far as it will go and draw up the chuck firmly. Then slip one of the discs over the bolt until it rests on the end of the chuck. Now put the tubing to be wound over the bolt and against the disc already in place, centering the tubing by means of the circles on the disc. Then put the second disc in place, again centering. Finally put a washer and a nut or two over the threaded end of the bolt and tighten up. Then put the entire assembly into a bench vise and proceed with the winding.

The end of the wire may be anchored to tacks driven into the discs, or small holes may be drilled in the ends of the tubing at suitable points and the wire fastened to these. It requires only a little figuring to determine where these holes should be drilled so that they may be used for the terminals. The coil shown in the winder was wound and finished before taking it out of the winder. It is a 3" oscillating coil, the secondary being wound with No. 24 double cotton covered wire and the plate coil with No. 36 double cotton covered.

It is not necessary to mount the stock wire spool on a reel, although it is better to do so. If the spool is placed on the floor at some distance away from the winder there will be no difficulty in unreeling the wire even when the winding speed is quite great. Wire sizes up to No. 20 may be easily wound with this winder but heavier sizes present some difficulty due to the lack of rigidity of the assembly.

Resistance of Body Varies With Individuals

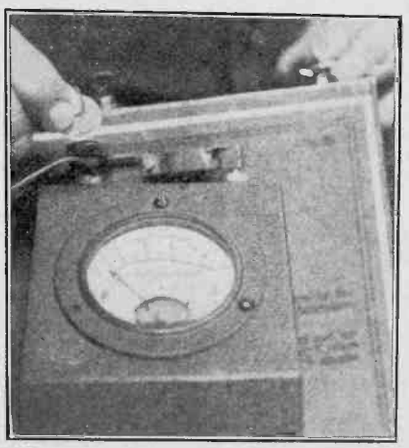
Tests show that different persons have different bodily resistance. The larger the human body, the greater the resistance, generally speaking. The young man in Fig. 1 registered 30,000 ohms at 45 volts, while the more robust man had a 42,000 ohm resistance.

It must be remembered that the resistance depends partly on the condition of moisture on the skin and the strength of pressure at the contact points. Hence dry the hands thoroughly and press very firmly to make contact.

(RADIO WORLD *Staff Photos*)

FIG. 1.

THE resistance of the human body may be measured. The test circuit consists of a 45-volt B battery, a milliameter in the negative leg, and the hands holding respectively B minus and the free end of the meter. The larger the body the greater the resistance, usually, as demonstrated by the two types shown above.



IF a coin is held in each hand the resistance goes down and one feels a shock on making contact.

OLD TYPE TUBE IS MADE INTO AN X MODEL

Phone Tips May be Filed Down to Suit the Purpose—Modernizing Old-Style Tubes Prevents Blowouts.

As is well known, the old UV type of tube will fit the new UX type; that is, it will fit in a fashion. Owing to the fact that the two filament prongs on the new type sockets are larger than on the old, the contact made when a UV type of tube is inserted into a UX type socket is somewhat precarious, and the tube is not held firmly in place. Also since the UV type of tube may be inserted in any manner into a UX socket there is always present the danger of getting the plate voltage across the filament prongs, which of course would be disastrous to the tube.

Both of the above disadvantages may be removed by a very simple device, which is illustrated in the accompanying photograph. This picture shows that the two filament prongs of an old type tube are about twice as long and considerably thicker than the grid and plate prongs. This has been brought about by putting sleeves over the original small prongs. These sleeves may be made out of small caliber brass or copper tubing, the outside diameter of which is 3/16" and the inside ⅛". The proper length is ½".

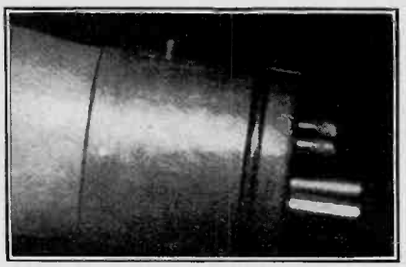
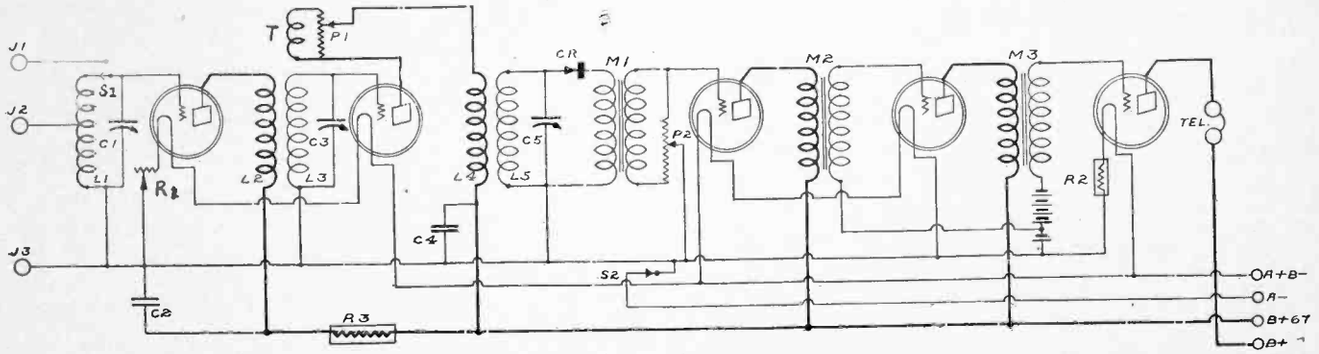


FIG. 1

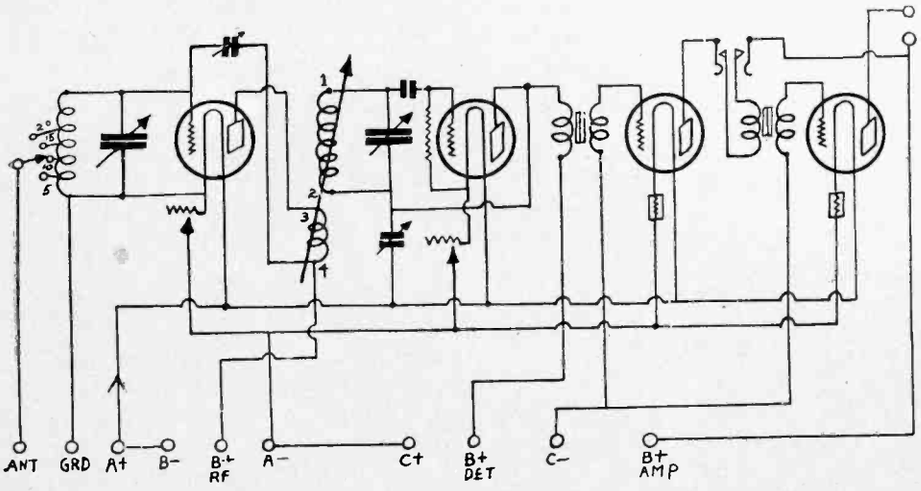
HOW the filament terminals of the tube are "collared" with bushings.

But a simpler way of making them is to take two phone terminals and file off the narrow projection. These will usually have the proper length when the tip has been filed off down to the thick part, and the outside and inside diameters will also be of the proper size. To make them slip over the ends of the small prongs it will be necessary to scrape off the excess solder from the small prongs. Some of it should be left on, however, so that the sleeves will fit close, requiring some force to drive them in place. It will then be unnecessary to solder them on and the sleeves may be removed in case it is desired to use the tube in a UV type socket again. For permanent use in a UX socket, however, the sleeves should be soldered on.

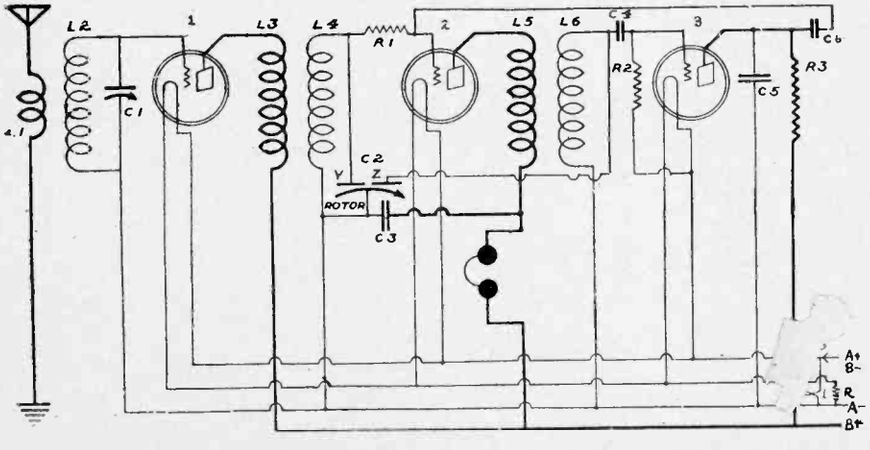
Five Fetching Favorites



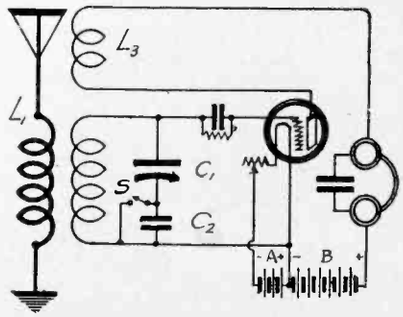
THE ELECTRICAL diagram of the 5-Tube Compact Receiver, described by J. E. Anderson in the June 5 issue of RADIO WORLD. A new scheme is employed to obtain regeneration of the second RF tube, this being through the medium of a resistance in the plate circuit connected in a special manner. The filaments of the two RF tubes are connected in series. The filaments of the two AF tubes are also connected in series. The filament of the last AF tube is controlled by an individual ballast resistor. The —99 type tubes are used throughout this set, with a power tube in the last stage. Each of the —99 tubes requires 3 volts at 60 milliamperes A battery drain. Therefore, the four tubes draw a total of 120 milliamperes, the voltage drop across the series parallel combination being 6 volts. The resistance, inserted in series with the B plus 67½-volt post, is of the 20,000-ohm type, and cuts the initial voltage on the RF tube down.



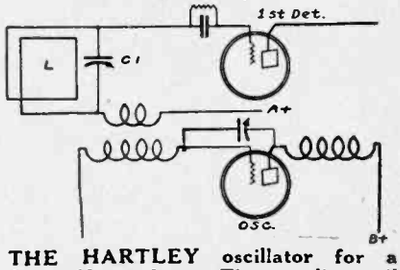
THE CIRCUIT diagram of the 4-Tube Rogers-Schudt Receiver, described in the June 12, 19 and 26 issues of RADIO WORLD. A special antenna coupler and radio frequency transformer are employed. The manner of feedback is also novel. The filaments of the RF and the detector tubes are controlled by rheostats, they being quite critical. The amplifier tube filaments are controlled by ballast resistors. The output is so arranged that either the output of the first AF or the last AF tube may be used. Individual B voltages are applied to the plates of the RF, Det., and the AF tubes. To reduce the B battery drain and also to increase the quality of the signals, a C battery is employed. A movable primary is used in the plate circuit of the first RF tube.



THE ELECTRICAL diagram of a 3-tube resistance reflexed receiver. The detector output (3), with radio frequency currents bypassed by C5, develops a voltage across R3, which is carried by C6 back to the second RF stage (2), in which R1 is the grid leak. Hence tube (2) is reflexed, the audio output being into a pair of phones. A double condenser is used to shunt the secondaries of both RFT. However, single variable condensers may be used. These coils are of the standard make, the capacity of the variable condensers shunting them depending upon the number of turns on these secondaries. R1 and R3 should have a resistance of 100,000 ohms. However, R1 may be va[illegible] .00[illegible] dense[illegible]



MANY FANS have trouble in receiving the lower wavelengths. With the aid of a .00025 mfd. fixed condenser inserted in series and shunted by a switch, S, the stations operating on these waves can be tuned in. Then, if you find that the higher wavelength stations cannot be tuned in, you can short circuit this condenser with the switch S. This scheme can be used in any set. If you have a set using two TRFT, etc., the condenser and switches may be shunted across the secondaries. Of course, the fixed capacity may have to be changed, e.g., anywhere from .0001 to .0005, etc., being employed.



THE HARTLEY oscillator for a Super-Heterodyne. The coupling coil is the one connected to the loop, L. Using a standard loop, that is, one wound on a 2-foot square, with 14 turns, using No. 18 bell wire, C1 should have a capacity of .0005 mfd. The coil in the grid circuit of the first detector consists of 10 turns wound on a tubing 2¾" in diameter, using No. 22 double cotton covered wire. The grid coil in the oscillator circuit, consists of 40 turns, while the plate coil consists of 30 turns. No. 22 double cotton covered wire is used. A ¼" space is left between these two windings. A .0005 mfd. variable condenser shunts the grid and plate terminals of this tube. Complete data as to the operation of this oscillator was given in the May 15, 1926 issue of RADIO WORLD by Herman Bernard.

The Model L-2 Ultradyne

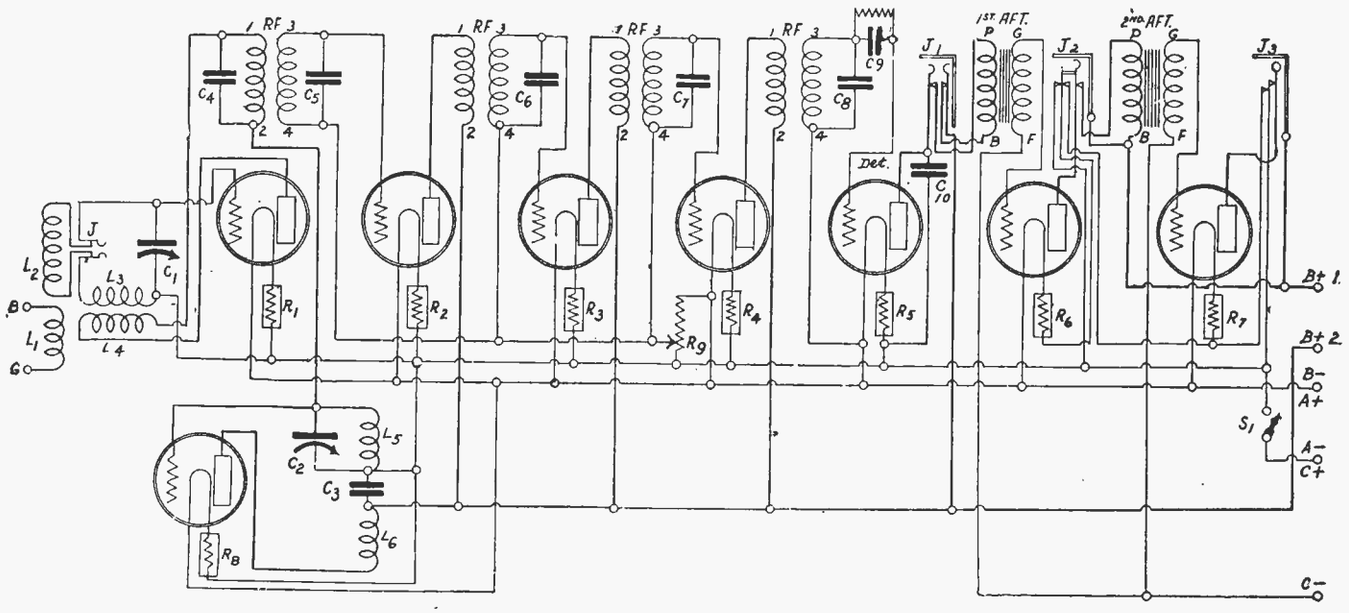


FIG. 362
The electrical wiring diagram of the Model L2 Ultradyne.

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When writing for information give your Radio University subscription number.

I WOULD like to have the electrical wiring diagram, wiring description, and complete data on the Model L2 Ultradyne.—Grant Straturs, Gibson, Ind.

Fig. 362 shows the electrical diagram of this popular Super-Heterodyne. L1 is the primary winding, which consists of 10 turns. L2, the secondary, consists of 45 turns. These are wound on a tubing 3¼" in diameter, using No. 22 double cotton covered wire, with a ¼" separation between the two windings. L4 is the tickler, used to make the first detector or modulator regenerative. L3 is the coupling coil for introducing the fed-back energy into the first tuned circuit. This coil is used only when the loop is to be employed. It is done away with when L2 is used, since L4 is then placed in inductive relation. L3L4 consists of 20 turns of No. 22 double cotton covered wire. This is wound on a tubing 2½" in diameter. For greater flexibility and control, L4, should be wound on a tubing 2" in diameter, so that it may revolve inside the winding of L3. In this case L4 should consist of 25 turns, using the same size wire. L5, the grid coil of the oscillator, consists of 43 turns, while L6 consists of 35 turns, using No. 24 double cotton covered wire. The tuning condensers, C1 and C2, are .0005 mfd. each. The intermediate frequency transformers are of the 30 KC type. Three iron core and one air core IFT should be bought. However, when making them at home, the air core should be made throughout, this being more simple than the iron core. The results in either case are not much different. The primary should consist of 500 turns of No. 28 double silk covered wire, wound in a ¼" slot. The secondary is wound in two sections, one on each side of the primary, in ⅛" slots. This winding consists of 550 turns in each slot, using No. 30 double silk covered wire. This winding is connected in series, e.g., 1,100 turns. The primary winding should be wound on a ¼" diameter. The secondary should be wound on an ⅛" diameter.

C4 is a .001 mfd. fixed condenser. C3 is a .005 mfd. fixed condenser used for by-passing. C9 is the grid condenser, having a capacity of .00025 mfd. C10 is also a by-pass condenser, having a capacity of .002 mfd. J1 and J are double circuit jacks. J2 is a 6-spring filament control jack. J3 is a 4-spring filament control jack. R9 is a 400-ohm potentiometer. Both the AFT are of the low ratio type. The filaments are all controlled by ¼-ampere ballast resistors. The grid leak resistance is 2 meg., although better results may be had if a variable resistance is used. S1 is the filament control switch. The condensers across the secondaries of the four RFT are of the .00025 mfd. fixed type. The primary of the first IFT consists of 300 turns, not 500. The beginning of the primary of the antenna coil is brought to the antenna post on a strip, etc. The end of this winding is brought to the ground post. This is marked G. The beginning of the secondary winding, L2, is brought to the inside terminal of the double circuit jack, this being the lower terminal. The other internal terminal of this jack is brought to the end of the winding, L2. The outer (upper) terminal of the jack is connected to the stationary plates of C1 and to the grid post of the modulator or first detector tube. The only terminal left on the jack, is connected to the beginning of the grid winding of the coupling coil, L3. The end of this winding is brought to the rotary plates of C1 and to one terminal of S1, the other terminal of which is connected to the A minus C plus post. The beginning of the movable coil, L4, is brought to the plate post of the first tube, while the end of this winding is brought to the P post on the first IFT. It also is connected to one terminal of C4. The B plus terminal on this IFT and the other terminal of C4 is connected to the stationary plate connection of C2 and to the beginning of L5, also to the grid post of the oscillator tube socket. The rotary plate connection of C2 is brought to the end of this winding, to the rotary plate connection of C2, to one terminal of C3 and to the open end of S1. The other terminal of C3 is brought to the B plus post on the second IFT and to the B plus 67½ volt post (B plus 2). The end of this winding is connected to the plate post on the oscillator socket. The rest of the circuit is connected in standard fashion, the P, B, G and F posts being brought to their respective posts on the sockets or terminal strip. The ballast resistors are connected in series with the negative legs of all the filaments. The filaments of the last two tubes are controlled by means of filament control jacks. That is, it is possible to listen either to the output of first or second AF tubes. Also a double circuit jack is connected on the second detector output, so that the phones or speaker may be connected here, the phones in case of DX and the speaker for soft local program reception. The plates of the amplifier tubes receive 90 volts. A 4.5 volt C battery is used. The IFT should be mounted at angles, so that magnetic fields do not exist between. It will be noted that the grid returns of the IF tubes are controlled by a potentiometer, R9. The grid leak is in shunt to the grid condenser and is indicated by the zig zag line across C9. The —01A tubes should be used throughout this set for best results, the 6-volt A battery being required to light the filaments. As stated before, an antenna or a ground may be employed, the jack, J, serving as the medium of connecting either, with the aid of a plug. Great care should be taken when the plug is inserted, to see that proper contact is made with the upper and lower prongs, while the two inner contacts are broken. Otherwise no signals will be heard, as the secondary winding will be shorted.

* * *

I WOULD like to see the electrical diagram, baseboard and panel layout, wiring description and data on the "Remarkable Quality Receiver," published in the June issue of "Radio News," in the Radio University columns, as I have lost my copy. This set consisted of three stages of resistance coupled RF amplifica-

Resistance Coupled RF With a Crystal Detector

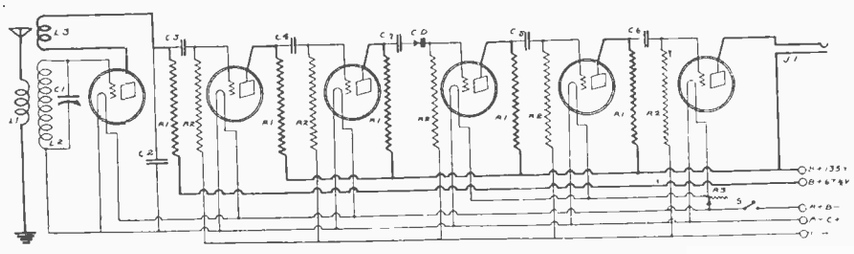
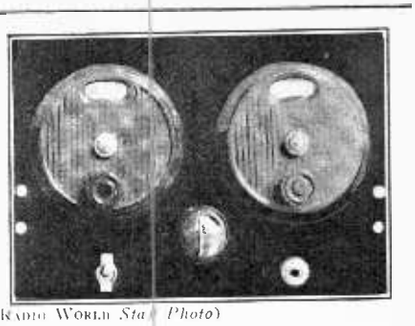


FIG. 363

The electrical diagram of the "Remarkable Quality Receiver."



(RADIO WORLD *Staff Photo*)

FIG. 364

THE PANEL VIEW. The dial on the left controls the tickler, while the dial on the right controls the variable condenser. The center knob is for the rheostat. The switch is to the left and the jack is to the right. Note the mounting screws for the special brackets.

tion, a crystal detector and three stages of resistance coupled AF amplification.—Michael Sansheview, Lewisport, Ky.

Fig. 363, shows the electrical diagram of this receiver. Fig. 364, shows the picture of the front panel layout, while Fig. 365, shows the back view of the set. The primary, L1, consists of 12 turns. The secondary, L2, consist of 54 turns. These are wound on a tubing 2¼" in diameter, using No. 26 double silk covered wire. A ¼" separation exists between the primary and the secondary windings. The length of the tubing is 4". The tickler coil, L3, consists of 40 turns of No. 30 double silk covered wire. The tubing that this is wound up on is 1" in diameter. Twenty turns are wound on each half of the tubing and placed at the top of the larger tubing, in inductive relation to the secondary winding. C1, which shunts this secondary winding, is of the .0005 mfd. variable capacity type C2 is a .002 condenser, used for by-pass action. R1 in the other two stages of RF, Det. and two stages of AF is of the .1 megohm type, while R2 is of the .5 megohm type. C3 and C4 are of the .0005 mfd. fixed type. C5 and C6 are of the three RF tubes are lit right off the 6-volt storage A battery, while the filaments of the detector and the AF tubes are controlled by a single rheostat of the 6-ohm type. A filament switch is inserted in series with the A plus B minus lead, this being the same lead that the rheostat is inserted. The beginning of the primary, L1, s brought to the antenna post. The end of this winding is brought to the ground post. The beginning of the secondary winding, L2, is brought to the rotary plate connection of C1 and to the F minus post on the first socket. The end of this winding is brought to the grid post on the first socket and to the stationary plate connection of C1. The beginning of the tickler coil, L3, is brought to the plate post of this same socket. The end of this winding is brought to one terminal of C2, to one terminal of R1, to one terminal of C3. It will be noted that one terminal of R1 throughout the set is brought to the plate post of the respective tubes, with other terminals, all going to the B plus 135 volt post. The exception to the latter connection comes with the plate resistor connected in the second AF tube, this being brought to the B plus 67½-volt post. Now, all the plate terminals of R1 also are brought to terminals of the various blocking condensers, except in the detector stage, where it is brought to a terminal of C7, the other terminal of the condenser, being connected to the high potential point of the crystal detector. The other terminal or low potential point of the crystal s brought to the grid post of the detector tube socket and to one terminal of the grid resistance. These grid resistances, R2, are all connected in standard fashion, with no exceptions, e.g.

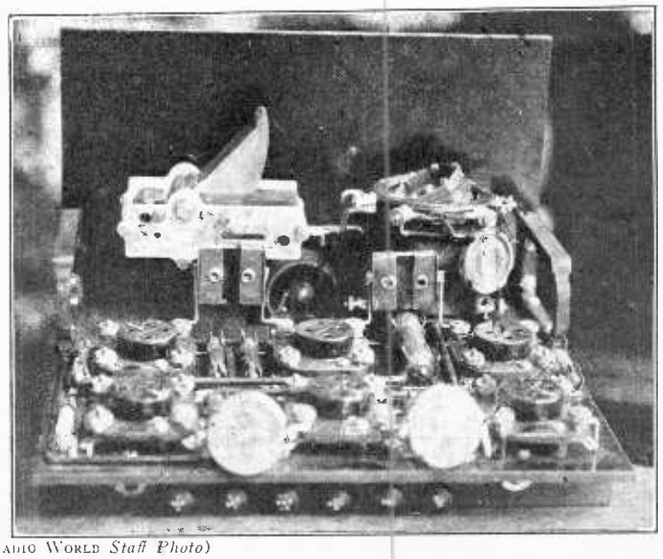


FIG. 365

THE back view of the quality receiver. It is possible to use the Mu-20 tubes in both the radio frequency and the two audio frequency stages, with a Mu-6 in the last stage. When using this combination it is not necessary to use the rheostat at all. Note the neat outlay of the sockets, which are the push type. The special brackets can be seen very clearly. All of the wiring is done underneath the base.

(RADIO WORLD *Staff Photo*)

one terminal to the blocking condenser and grid post, with the other terminal to the C minus post. All the F minus posts are connected together and thence to the A minus post on the strip. A single circuit jack is inserted in series with the plate post of the last tube. The entire set is built on a 7x10" panel, making it very compact. The condenser dial is at the right and the tickler dial is at the left, looking from the front of the panel. The holes for both these instruments are 2½" from the respective edges. The hole for the rheostat is exactly in the center, or 5" from each half and 1⅝" from the bottom. The holes for the shafts of the condenser and tickler are 3" from the top. The holding holes for these instruments are 11/16" from the bottom. If brackets such as were used in the original set are employed, then two holes on each side, 15/16" away from each other and 3/16" from the edges, should be drilled in the panel. No dimensions as to the sizes of the holes will be given, as they vary with the various types of parts. No specific parts are to be used, as long as they correspond with the specification set down in the text. The set is not much on volume.

* * *

I WOULD like to have the circuit diagram as well as the wiring description and coil, condenser, etc., data, on a 4-tube receiver, wherein the first tube is employed as an RF amplifier in a tuned stage, a crystal detector follows and three stages of autotransformer AF coupling

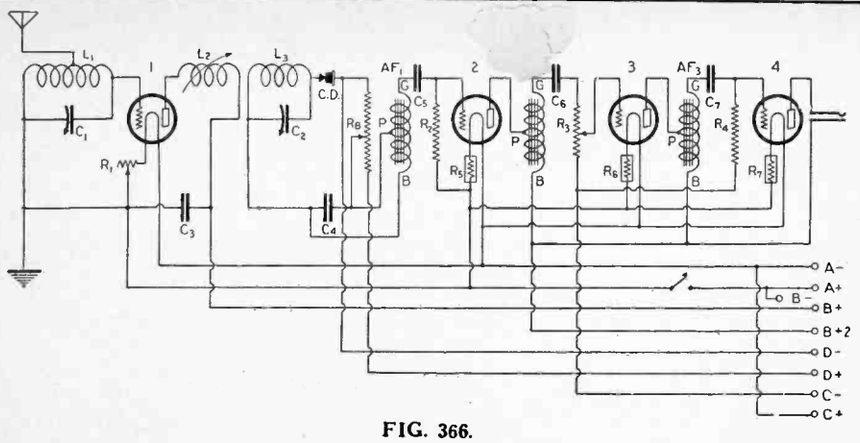


FIG. 366.

Circuit diagram of set requested by Bernard Stone.

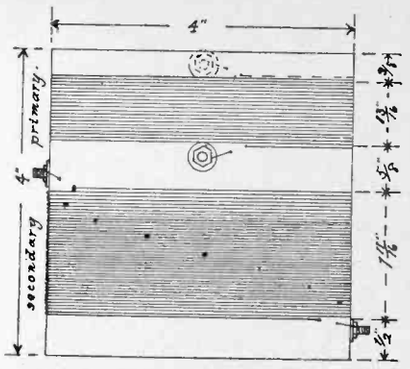


FIG. 367.

Coil dimensions for set shown in Fig. 366.

complete the set.—Bernard Stone, Russellville, O.

Fig. 366 shows the wiring diagram. The antenna coil is of special construction, consisting of 50 turns, tapped at the 8th turn. This is wound on a tubing 3¼" in diameter, using No. 22 double cotton covered wire. The primary of the coupling coil, L2, consists of 10 turns, while the secondary, L3, consists of 40 turns, wound on a tubing 4" in diameter, shown in schematic form in Fig. 367. No. 24 double cotton covered wire is used. A ⅝" space is left between the two windings. The space left at the end of the tubings need not be heeded. C1 and C2 are both .0005 mfd. variable condensers. C3 and C4 are .001 mfd. fixed condensers. R8 is a 400-ohm potentiometer. R1 is a 10-ohm rheostat. R5, R6 and R7 are all ¼ ampere ballast resistors. R2 and R4 are 500,000 ohm fixed resistors. R3, however, is a 500,000 ohm variable resistance. C5, C6 and C7 are 1.0 mfd. fixed condensers. The tapped portion of the antenna coil is brought to the antenna. The end of the 8-turn portion of the winding goes to grid and stator plates of C1. The end of the winding goes to ground, A minus and rotor plates, not to A plus as diagrammed. Be very careful that you connect this coil as specified. Although the primary, L2, is shown as being variable, it is merely adjustable, by sliding it to maximum efficiency in coupling, and leaving it thus, or is fixed from the start. In either case the manner of connecting it will be the same. The beginning of L2 is brought to the plate post of the first socket. The end of this winding is brought to the B plus 45 volt post and to one terminal of C3. The other terminal of this condenser is connected to the arm of R1 and thence to the A plus, through the switch. The beginning of L3 is brought to the rotary plate connection of C2, to one terminal of C4 and to the B connection of AF1. The end of this winding is brought to the stationary plate connection of C2, and to the high potential point of the crystal detector. The low potential point of the detector is brought to the resistance wire terminal of R8 and to the minus terminal of four 1½ volt C batteries connected in series. The other resistance terminal of R8 is brought to the plus post of these batteries. The arm is brought to the other terminal of C4, which also goes to the P post of the AF1. The G post on AF1 is brought to one terminal of C5. The other terminal of C5 is brought to the grid post and one terminal of R2. The other terminal of this resistance is brought to the minus terminal of the filament and not to the plus post, as in the diagram. The plate post on this socket is brought to the P post on AF2. The B post is brought to the B plus 90 volt post. The G post on this AF is brought to one terminal of the fixed condenser, C6. The other terminal of this condenser is brought to the resistance wire terminal of R3. The other resistance terminal is brought to the minus post of the 4.5 volt C battery. One terminal of C7 is also brought here. The other terminal of this resistor is brought to the grid post of the last socket and to one terminal of the fixed condenser, C7. The other terminal of this condenser is brought to the G post on AF3. The P post on AF3 is brought to the P post on the third socket, while the B post is brought to the B plus 90 volt post. The plate post of the last socket is connected to the top terminal of the single circuit jack. The bottom terminal is connected to the B plus 90 volt post, also. This makes a common 90-volt lead for the plates of the three amplifier tubes. This voltage it might be found necessary to raise as high as 135, wherein the C voltage should be increased to 6.

* * *

I NOTED with interest the photograph illustrating a method of placing switches on a small panel or board, for cutting in or out batteries, antenna or ground, on page 17 in the July 3 issue of RADIO WORLD. Please give a full description of the hookup of these switches.—Gilbert Van, North Hackensack, N. J.

Fig. 368 shows the circuit diagram, illustrating the hooking of this small switchboard. The switch employed in the A battery-charger circuit is of the double pole double throw type. The switch employed in the antenna-ground circuit is of the single pole double throw type, while the switch in the filament amplifier circuit is of the single pole, single throw type. If a power amplifier is not used, this SPST switch may be used for cutting out the B battery supply or connecting to the charger if a storage B battery is used. If used for cutting the battery in or out, one terminal is brought to the plus post of the B battery and the other terminal is brought to the B plus post of the set. If used for charging, one terminal is brought to the B plus post of the charger and the other to the B plus post on the battery. As to the antenna-ground switch, this connects aerial and ground, for short circuit in a storm.

* * *

SHOW BY diagram the correct and incorrect methods of connecting an ammeter in the filament circuit.—Gregory Partons, Maury City, Tenn.

Fig. 369 shows the two methods. The

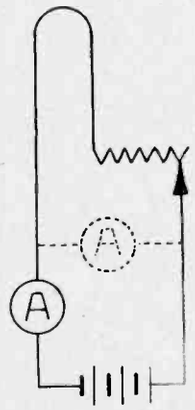


FIG. 369.

Diagram illustrating the correct and incorrect methods of installing an ammeter in the filament circuit.

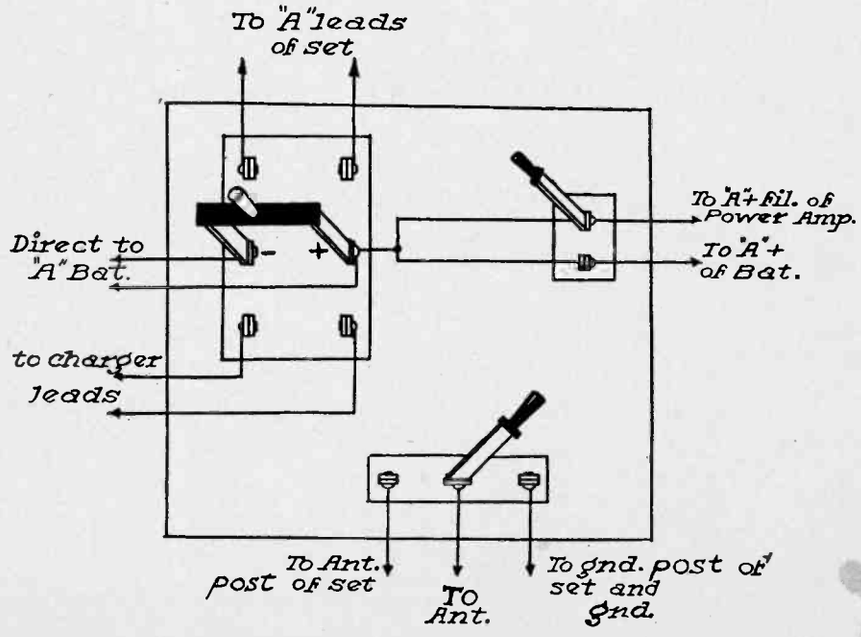


FIG. 368

The schematic diagram of the switchboard.

RADIOTRON AND RECTRON CHARACTERISTICS

GENERAL — DETECTORS AND AMPLIFIERS

MODEL	USE	BASE	MAXIMUM OVERALL DIAMETER	MAXIMUM OVERALL HEIGHT	"A" BATTERY VOLTAGE (SUPPLY)	FILAMENT TERMINAL VOLTAGE	FILAMENT CURRENT (AMPERES)
RADIOTRON UX-201-A	Detector Amplifier	R C A Large Standard UX Base	1 13/16"	4 11/16"	6 Storage	5.0	.25
RADIOTRON UV-199	Detector Amplifier	UV-199 Base	1 1/16"	3 1/2"	Dry Cell 4 1/2 Storage 4	3.0	.06
RADIOTRON UX-199	Detector Amplifier	R C A Small Standard UX Base	1 3/16"	4 1/8"	Dry Cell 4 1/2 Storage 4	3.0	.06
RADIOTRON WD-11	Detector Amplifier	WD-11 Base	1 3/16"	4 1/8"	Dry Cell 1 1/2 Storage 2	1.1	.25
RADIOTRON WX-12	Detector Amplifier	R C A Large Standard UX Base	1 7/16"	4 11/16"	Dry Cell 1 1/2 Storage 2	1.1	.25

DETECTION — DETECTORS AND AMPLIFIERS

MODEL	DETECTOR GRID RETURN LEAD TO	GRID LEAK (MEGOHMS)	GRID CONDENSER (MFD)	DETECTOR "B" BATTERY VOLTAGE	DETECTOR PLATE CURRENT (MILLIAMPERES)
RADIOTRON UX-201-A	+F	2 to 9	.00025	45	1.5
RADIOTRON UV-199	+F	2 to 9	.00025	45	1
RADIOTRON UX-199	+F	2 to 9	.00025	45	1
RADIOTRON WD-11	+F	3 to 5	.00025	22 1/2 to 45	1.5
RADIOTRON WX-12	+F	3 to 5	.00025	22 1/2 to 45	1.5

AMPLIFICATION — DETECTORS AND AMPLIFIERS

MODEL	AMPLIFIER "B" BATTERY VOLTAGE	AMPLIFIER "C" BATTERY VOLTAGE	AMPLIFIER * PLATE CURRENT (MILLIAMPERES)	OUTPUT RESISTANCE* (OHMS)	MUTUAL CONDUCTANCE* (MICROMHOS)	VOLTAGE AMPLIFICATION FACTOR	MAXIMUM UNDISTORTED OUTPUT (MILLIWATTS)
RADIOTRON UX-201-A	135 90	9 4 1/2	2.5 2	11,000 12,000	725 675	8 8	55 15
RADIOTRON UV-199	90	4 1/2	2.5	16,500	380	6.25	7
RADIOTRON UX-199	90	4 1/2	2.5	16,500	380	6.25	7
RADIOTRON WD-11	90	4 1/2	2.5	15,000	400	6	7
RADIOTRON WX-12	90	4 1/2	2.5	15,000	400	6	7

DETECTORS

MODEL	USE	BASE	MAXIMUM OVERALL DIAMETER	MAXIMUM OVERALL HEIGHT	"A" BATTERY VOLTAGE (SUPPLY)	FILAMENT TERMINAL VOLTAGE	FILAMENT CURRENT (AMPERES)	DETECTOR GRID RETURN LEAD TO	GRID LEAK (MEGOHMS)	GRID CONDENSER (MFD)	DETECTOR "B" BATTERY VOLTAGE	DETECTOR PLATE CURRENT (MILLIAMPERES)	AMPLIFIER "B" BATTERY VOLTAGE	AMPLIFIER "C" BATTERY VOLTAGE	AMPLIFIER * PLATE CURRENT (MILLIAMPERES)	OUTPUT RESISTANCE* (OHMS)	MUTUAL CONDUCTANCE* (MICROMHOS)	VOLTAGE AMPLIFICATION FACTOR	MAXIMUM UNDISTORTED OUTPUT (MILLIWATTS)
RADIOTRON UX-200	Detector Only	R C A Large Standard UX Base	1 13/16"	4 11/16"	6 Storage	5.0	1.0	−F	1/2 to 2	.00025	16 1/2 to 22 1/2	1	—	—	—	—	—	—	—
RADIOTRON UX-200-A	Detector Only	R C A Large Standard UX Base	1 13/16"	4 11/16"	6 Storage	5.0	.25	−F	2 to 3	.00025	45	1.5	—	—	—	—	—	—	—

POWER AMPLIFIERS

MODEL	USE	BASE	MAXIMUM OVERALL DIAMETER	MAXIMUM OVERALL HEIGHT	"A" BATTERY VOLTAGE (SUPPLY)	FILAMENT TERMINAL VOLTAGE	FILAMENT CURRENT (AMPERES)	DETECTOR GRID RETURN LEAD TO	GRID LEAK (MEGOHMS)	GRID CONDENSER (MFD)	DETECTOR "B" BATTERY VOLTAGE	DETECTOR PLATE CURRENT (MILLIAMPERES)	AMPLIFIER "B" BATTERY VOLTAGE	AMPLIFIER "C" BATTERY VOLTAGE	AMPLIFIER * PLATE CURRENT (MILLIAMPERES)	OUTPUT RESISTANCE* (OHMS)	MUTUAL CONDUCTANCE* (MICROMHOS)	VOLTAGE AMPLIFICATION FACTOR	MAXIMUM UNDISTORTED OUTPUT (MILLIWATTS)
RADIOTRON UX-120	Power Amplifier Last Audio Stage Only	R C A Small Standard UX Base	1 3/16"	4 1/8"	Dry Cell 4 1/2 Storage 4	3.0	.125	—	—	—	—	—	135	22 1/2	6.5	6,600	500	3.3	110
RADIOTRON UX-112	Power Amplifier	R C A Large Standard UX Base	1 13/16"	4 11/16"	6 Storage	5.0	.5	—	—	—	—	—	157 1/2 135 90	10 1/2 9 6	8 6 2.5	4800 5500 8800	1670 1435 890	8.0 7.9 7.9	195 120 40
RADIOTRON UX-171	Power Amplifier Last Audio Stage Only	R C A Large Standard UX Base	1 13/16"	4 11/16"	6 Storage	5.0	.5	—	—	—	—	—	180† 135† 90	40 1/2 27 16 1/2	20 16 10	2000 2200 2500	1500 1360 1200	3.0 3.0 3.0	700 330 130
RADIOTRON UX-210	Power Amplifier Oscillator	R C A Large Standard UX Base	2 3/16"	5 5/8"	Transformer or Storage 8 8 8 6 6 6	7.5 7.5 7.5 6.0 6.0 6.0	1.25 1.25 1.25 1.1 1.1 1.1	—	—	—	—	—	425† 350† 250† 157 1/2 135 90	35 27 18 10 1/2 9 4 1/2	22 18 12 6 4.5 3	5000 5100 5600 7400 8000 9700	1550 1500 1330 1020 940 775	7.7 7.6 7.5 7.5 7.5 7.5	1540 925 340 90 65 18

RECTIFIERS

MODEL	USE	BASE	MAXIMUM OVERALL DIAMETER	MAXIMUM OVERALL HEIGHT	PURPOSE	
RECTRON UX-213	Full-Wave Rectifier	R C A Large Standard UX Base	2 3/16"	5 5/8"	For use in rectifying systems particularly designed for this Rectron.	Filament Terminal Voltage: 5.0 Volts Filament Current: 2.0 Amperes Max. AC Input Voltage per plate: 220 Volts (RMS) △ Max. Rectified Current (both plates): 65 Milliamperes
RECTRON UX-216-B	Half-Wave Rectifier	R C A Large Standard UX Base	2 3/16"	5 5/8"	For use in rectifying systems particularly designed for this Rectron.	Filament Terminal Voltage: 7.5 Volts Filament Current: 1.25 Amperes Max. AC Input Voltage 550 Volts (RMS) △ Max. Rectified Current 65 Milliamperes

SPECIAL PURPOSE RADIOTRONS

MODEL	USE	BASE	MAXIMUM OVERALL DIAMETER	MAXIMUM OVERALL HEIGHT	PURPOSE		
RADIOTRON UX-874	Voltage Regulator Tube	R C A Large Standard UX Base	2 3/16"	5 5/8"	Constant Voltage Device	Especially designed for use in the following devices operated from alternating current lighting mains:-	R C A Duo-Rectron ("B" Battery Eliminator) R C A Loudspeaker Model 104
RADIOTRON UV-876	Ballast Tube	Standard Mogul Type Screw Base	2 1/16"	8"	Constant Current Device	Especially designed for use in the following devices operated from:- 105-125 Volts 50-75 Cycles	Radiola 30 R C A Loudspeaker Model 104 Brunswick Models: PR-16C, -26C, -36C, -46C, PR-28C, -38C, -48C, P-3. Victor Models: W 15-1, W 9-2, W 12-2.
RADIOTRON UV-886	Ballast Tube	Standard Mogul Type Screw Base	2 1/16"	8"	Constant Current Device	Especially designed for use in the following devices operated from:- 105-125 Volts 40-45 Cycles	Radiola 30 R C A Loudspeaker Model 104 Brunswick Models: PR-16C, -26C, 36C, -46C, PR-28C, -38C, -48C, P-3. Victor Models: W 15-1, W 9-2, W 12-2.
RADIOTRON UV-877	Protective Tube	Double Contact Bayonet Automobile Type △△	1 7/16"	2 1/2"	Current Limiting Device	Used in "B" Battery circuits to prevent excessive current resulting from short-circuit which might damage tubes or wiring.	Voltage Drop Across: Half Filament 2.5 / 45; Entire Filament 5 / 90. At 20 Milliamperes DC; At 90 Milliamperes DC

RADIOTRON UX-874	Voltage Drop: 90 Volts DC Starting Voltage: 125 Volts DC Maximum Current: 50 Milliamperes DC	Positive (+) to Rod Negative (−) to Cylinder
RADIOTRON UV-876	Current Rating: 1.7 Amperes Voltage Drop: 40-60 Volts	
RADIOTRON UV-886	Current Rating: 2.05 Amperes Voltage Drop: 40-60 Volts	

† Loudspeaker coupling recommended at this plate potential due to large plate current.

* At indicated "B" and "C" battery voltages

△ R. M. S. indicates "Root Mean Square" as indicated on an AC voltmeter.

△△ Connection to shell of base for third terminal which is the lead to mid-point of filament.

dotted lines indicate the wrong method. The meter should be placed in series with one leg of the filament or the battery as shown in the heavy lines.

* * *

I WOULD appreciate information as to the normal plate current flow at the usual negative grid bias values of tubes used as amplifiers, so I can check up with a milliammeter; also the voltage amplification factor of the —01A, —99 and —1[illegible] type tubes and the kinds of batteries to use for all tubes. What are the capacity limitations of rectifier tubes for eliminators? How much power (output) will an —01A tube handle in a receiver, as compared with a —99? Please distinguish the tube bases.—Herbert Dresden, Springville, La.

Your questions regarding tube characteristics are best answered in chart form and such a [illegible]rt is published herewith. As for tube bases, all X bases (small standard and large standard) fit all X sockets. The X bases have long terminals and the X sockets are of the push type. All X bases fit the Navy type socket into which, for example, a UV-201A tube fits by pressing down and turning, so that the pin catches in bayonet fashion. The old-type 99 and 11 tubes require special sockets, made to fit them exclusively.

WEAF'S Gifted Family Heard in Home Talent Program

HOME TALENT OF WEAF, New York. Seated (left to right); Harold M. Schaffer, assistant to program director; Mathilde Harding, hostess-accompanist; Kathleen Stewart, hostess accompanist; Betty Lutz, hostess, and G. W. Johnstone, publicity representative. Standing (left to right), Julius Mattfeld, musical librarian; Phillips Carlin, announcer; Graham McNamee, announcer; James Haupt, assistant musical director; Leslie Joy, announcer; Ralph Wentworth, announcer, and Nathaniel Barcus, Artists' Service Bureau Representative.

"Ladies, Be Seated," Studio Invitation

(Herbert Photos, Inc.)

STATION JOAK, at Nagoya, is Japan's biggest and most popular broadcasting organization. It was opened with 6 KW of power and it is heard regularly in California, Peking and throughout Japan. It features both a European and a Japanese studio, where the microphone is adjusted for performers who sit Japanese style. The photo shows Nipponese entertainers performing before the microphone in the studio

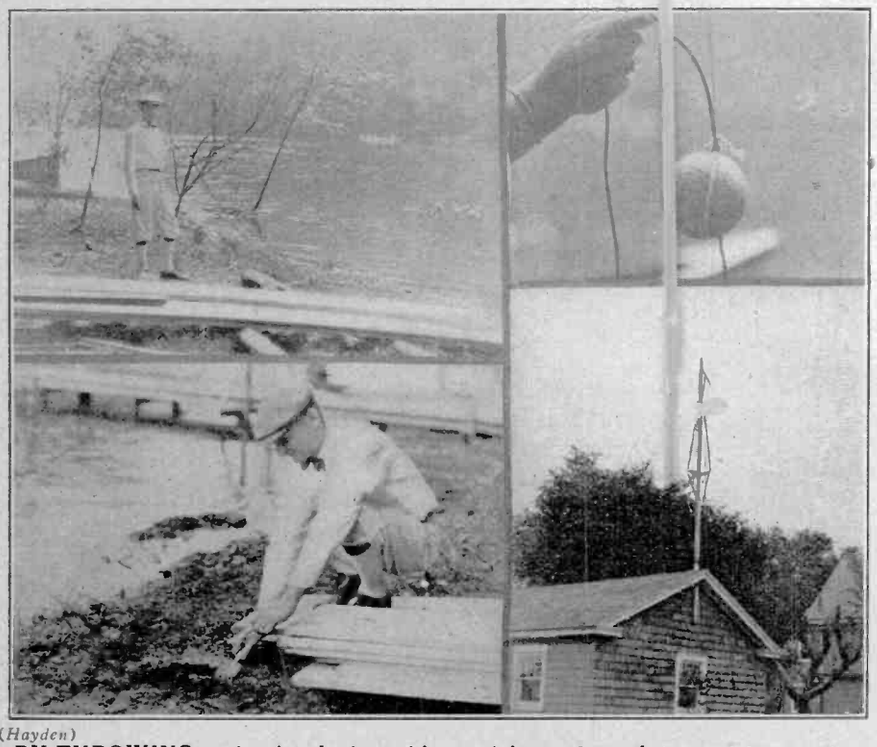
Rosaline Greene Quits WGY Players To Teach School

After playing for two years before the WGY microphone, Rosaline Greene has been graduated from normal college and within the next year will probably be teaching youngsters from five to seventeen how to behave and how to assimilate knowledge.

Miss Greene was leading woman with the WGY players, Schenectady, N. Y. Following her graduation from the New York State College of Teachers with a bachelor's degree, she bade farewell to the radio listeners. She told her friends of the ether that she had found great pleasure in laughing and crying for them, in making love for them, and even, when the play demanded it, in dying for them. Friendly applause letters have been cherished by her and will serve to remind her that she has given pleasure to great numbers of people.

During the two years with the WGY players, Miss Greene has played a great variety of parts, but it is chiefly as the heroine that her always pleasing voice has been identified. She has played Lovey Mary in "Mrs. Wiggs of the Cabbage Patch," Nancy Sykes in "Oliver Twist," Lydia in "The Rivals," Kate in "Taming of the Shrew," Gina Ekdal in "Wild Duck" Ophelia in "Hamlet," and many, many others. Sometimes she lived happily ever after and on other occasions, as in "Ham-

Some Hints on Handy Collectors



(Hayden)

BY THROWING an insulated wire, with a weight at the end, into a lake or other body of water an excellent ground may be obtained. (Upper left). Also, water antennas are popular. However, when used with a set on a boat, it is difficult to keep the antenna near the top of the water. Tie the end of the wire to a large rubber ball (upper right). A good ground may also be obtained by digging up moist earth and burying the wire (lower left). If you own a Super-Heterodyne and pick up interference from neighboring antennas, a modified umbrella type of antenna may be installed (lower right).

An Announcer at 11

(Fotograms)

THE WORLD'S youngest radio announcer is Anne Marie McKinney, 11 years old. She announced the entire program over Station WMSG at Madison Square Garden, New York. In group are: Anne Marie McKinney; James Wolf, Metropolitan basso; and Beatrice Fairfax, writer.

Easily Made Brackets

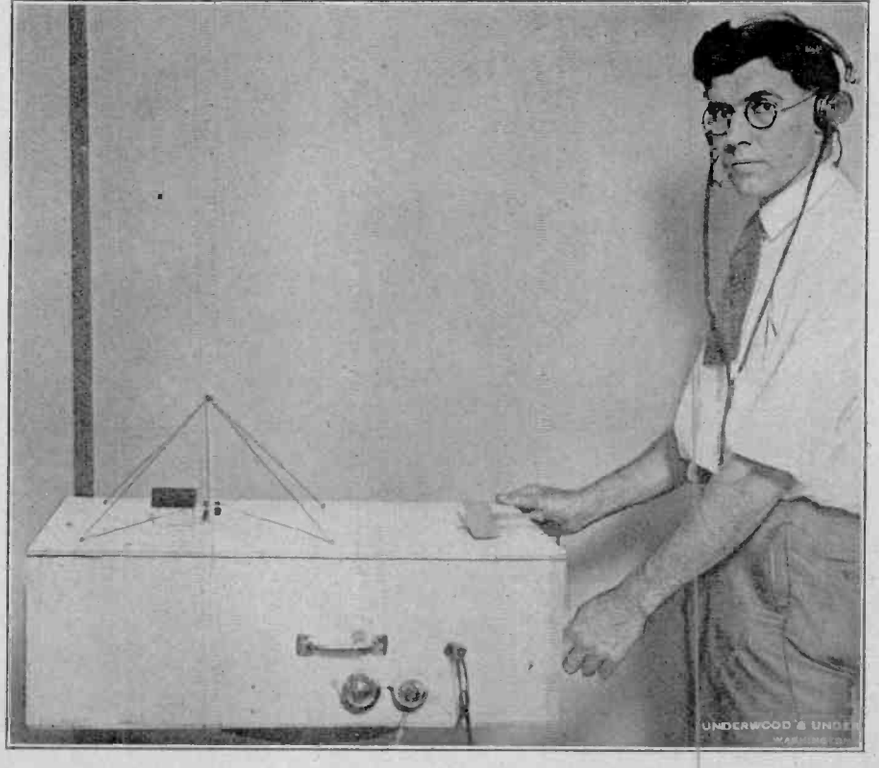
(Radio World *Staff Photo*)

ALUMINUM, which can be purchased in any length or width, may be conviently used for making angle irons to mount coils, condensers, baseboards, panels, etc. It is an easy substance to bend and makes a good support.

let" and "Oliver Twist," she made a tragic exit.

No successor to Miss Greene has been selected by Ten Eyck Clay, director of the WGY Players, and tests will be conducted for two or three weeks, to determine which of a half dozen candidates has the voice most suited for radio reproduction.

New Beacon for 'Planes Designed by Bureau



AIRCRAFT gliding through the ether in the future will not obtain their directions haphazardly, but will be guided by radio through a double coil radio beacon developed by the U. S. Bureau of Standards in Washington. In this photograph D. F. Sutton of the Bureau is shown operating a model of the radio beacon at the Bureau's laboratories.

RADIO WORLD

REG. U.S. PAT. OFF.

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

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General Advertising

1 Page, 7¼"x11"	462 lines	$300.00
½ Page, 7¼"x5⅛"	231 lines	150.00
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¼ Page, 4⅛" D. C.	115 lines	75.00
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Entered as second-class matter March 23, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879.

JULY 10, 1926

A New Charmer

MATHILDE HARDING, the newest addition to WEAF's staff of hostess-accompanists.

DID YOU GET A COPY OF RADIO WORLD'S VACATION NUMBER DATED JUNE 12? This issue is full of information for summer vacationists. Some of the features are: The Light 5-tube Portable, by Herman Bernard, The Freshman Masterpiece, by Albert W. Franklin. The Importance of C Batteries, by John F. Rider, etc. 15c per copy, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

Forced Philanthropy

PERSONS who have some technical knowledge of radio represent a great body in the United States and they are being constantly victimized by acquaintances who think nothing of pressing them into repair service, causing them to furnish radio supplies, even unto tubes, and otherwise taxing the patience and friendship of the victim, without so much as a thought of payment.

When Jim says "Can't get DX," Tom, who knows the ropes, should inquire into the reasons for this sad condition. But Tom is a human being. He has a home and likes to spend a night a week there, anyway, so Jim should not expect Tom to be in constant attendance at the ailing set. Besides, service work is a business, and some radio store in the neighborhood has facilities for rendering this service, although the store proprietor does have the unclubby habit of expecting to be paid.

Nobody has dared to guess to what round numbers the value of B batteries and tubes, supplied by one friend to another, runs in a year. So when we say it is $2,000,000 you must not contradict. Now, how much of this large amount actually is collected by the furnisher from the recipient? In round numbers, $0,000,-000.

One day a dear friend who managed to talk a fellow out of a couple of tubes tried them out to his satisfaction and within a few hours visited the obliging individual and handed him the full price of the bulbs. The zero figure still holds good, however, because the recipient was stunned instantly by this violation of the code, and reeled to the floor. In a few moments he was dead. Thereupon the satisfied customer left, with the money again in his pocket.

The remedial expert had better beware, or he will find himself out several hundred dollars. Persons with large desires for radio sets will solicit his expert opinion, flatter him, ask him to get the set and accessories, and after he had spent his time and his money he stands as good a chance of getting back the one as the other.

Remember the man who runs a radio store for a living. Think of the bread that his children may be denied because volunteers, at great expense to themselves, are taking business away from him. Remember, too, that to be connected in any way with the sale of a set means that for the rest of your life you are the duly authorized service expert, to be wet nurse to the set whenever occasion demands, or even if it merely requests. Remember, too, that this nursing business is professional work, and that the registered radio nurse should be left to the profession that he likes so much and that means so much to him. Otherwise radio store folk will begin to do odd jobs in medicine, editing, carpentry, roofing, sanitary heating and plumbing and book selling. And then how would we doctors, editors, carpenters, roofers, heating sanitation engineers, plumbers and book salesmen like it?

Exhibition Luck

EVER since broadcasting began there has been a natural pride in the breast of every set owner when the receiver did something worthy of notice. Pride will not live a lonely life, however. It prompts an uncontrollable impulse to exhibit. Hence some friend receives the momentous news of what the set accomplished, and, being unprotected, the condition in which modern society leaves all true friends, finds himself invited to attend a demonstration of the prowess of the set.

Ah, fitful night, and fateful one, too! There is no need recounting the happen- Reckoned as potentials, they are negative, every one of them, with no sign of the positive. Before the witness arrived—what wonders the set performed! And how his presence robbed it of every virtue! A true diplomat is needed to explain satisfactorily what remarkable thing happened to bring about the remarkable condition of nothing having happened! The world is full of woes for the set owner. Let the witness depart and the wonders of the set will be restored.

This condition has been going on for so long that, to adopt the cry of the nonplussed, something should be done about it. And what, pray?

Well, all exhibitions in the East should be held after midnight, because if the clear-toned and far-distinct reception that one obtained under most favorable conditions is to be repeated, let it be at a time when the locals have signed off. So much for those east of the Mississippi.

Those west of the Great Divide find time operating against them. Nature, however, was generous with the climate, so may be excused for having caused the relative travel of the sun to be from East to West, whereby "after midnight" on the West Coast means "after 3 A. M." in the East. To try to solve the Western problem after the end of the Eastern night programs would be just as bad, because this might necessitate daylight reception, which is not so favorable on the broadcast band. Besides, some locals out West are going strong about that time.

Hence, to make good your boasts of receiver performance, live in the East and start demonstrations after midnight. If you must live in the West, don't be too proudful. Refrain from anything remarkable, even if true.

Indeed, come to think of it, whether you live in the East, West, South or North, that's the safest course to follow. Boast not at all. Thus will the undemonstrative demonstrations cease to grow their crop of embarrassment.

Limited Renditions

IN the discussion before a Congressional committee on music fees to be paid by broadcasters, the American Society of Composers, Authors and Publishers raised the point that broadcasting, in certain instances, tended to "kill" a new song, because it would be played to death. This was the Society's answer when the broadcasters cited the publicity value attaching to transmitting compositions of members of the Society.

Now an instance arises in the case of the song "Valencia," which radio listeners will agree is a fetching composition. It is said that a certain station has been instructed by the Society to broadcast this piece only at restricted intervals.

There is much to be said in favor of restriction, provided it is sensibly made and enforced. Listeners have suffered the results of repeated broadcasting of the same song by the same station, even on a given night, due to different orchestras putting it on their programs. Surely the song's welcome becomes worn out very fast.

If the Society will aid the stations in providing for the listeners an assorted program, not one that is topheavy with certain few pieces of music, the radio public will be thankful. The public recognizes that, even though neither the Society nor the broadcasting stations deported themselves rationally at the Congressional hearings, both sides have a wide area in which to exercise common sense.

GETTING MAXIMUM RESULTS with Super-Heterodynes by Herman Bernard appeared in RADIO WORLD dated May 15th. 15c per copy, or start your subscription with that issue. RADIO WORLD, 145 West 45th St. N. Y. City.

Freaks of Short Waves Fascinate Experimenters

By Leon L. Adelman

The Chas. Freshman Co., Inc.

FAST strides have been made in radio development during the past few years. When the first successful radio telephony transmission tests were made from KDKA, some six years ago, many could not believe what had happened. Code communication was possible, all knew, but to send the human voice over space without connecting wires was too much to comprehend. Yet it was a comparatively easy task to convince even the most skeptical.

When, in former days, it was possible to cover only relatively short distances, with high power on a high wavelength, many thought that the ultimate had been achieved and sat back to scoff at further attempts towards progress.

But today we have short wave, low power transmission which far excels anything we had previously. Distances are now covered with the expenditure of a mere few watts of power, whereas it formerly required many kilowatts. Progress? Yes, but that is not all.

Amateurs Numerous

The art of radio has advanced more rapidly than any other art or science. This is primarily due to its fascinating appeal to the experimenter. With its irresistive lure, it attracts young and old alike, and there are relatively few who, once having entered the game, drop out for lack of interest.

This class, both young and old, yes, women included, comprises the vast army of amateurs and experimenters in a great measure responsible for the wonderful improvements which almost daily give impetus to radio. They are scattered all over the country and they come from all walks of life. They are united in a common effort—the end that spells better programs, less interference, greater distance range and simplified tuning.

Government figures show that there are approximately 17,000 licensed radio amateurs in the country who are engaged not only in experimental work but in the pastime of sending messages for you or your neighbors to any part of the globe, entirely free of charge. If you are interested, you should get in touch with the nearest radio amateur and he'll gladly give you all the information you request.

Were Kicked About

When the radio law of 1912 was passed, in which the amateur was confined to a wavelength range not to exceed 200 meters, he kicked and howled and thought himself miserable. Leading engineers thought that they had placed the amateur where he rightfully belonged—off the air for good. In other words, transmission on 200 meters was then supposed to have been good for just one thing—nothing.

But, in truth you cannot keep a good man down, and so the amateur set about to explore the unknown and greatly feared territory. Between 176 and 200 meters he worked, at that time on spark, and his slogan became "a mile per watt." Those fellows who were able to send messages 1,000 miles with a one kilowatt spark transmitter were doing excellent work in the eyes of their colleagues, and even made the commercial companies sit up and take notice.

With the advent of continuous wave telegraphy, spark transmitters, in the main, were quickly discarded and 5, 20, 50 [illegible] 100 watt tube transmitters supp[illegible] And with what superior

[illegible] became possible for an amat[illegible] a small 5-watt outfit to com[illegible]e di[illegible]tly with his fellows more than 1,000 mi[illegible]s away. But congestion forced them all to seek lower wavelengths. When Reinartz announced the successful experiments on 100 meters, thousands of amateurs followed him and then with the assignments of 80, 40, 20 and 10 meters and lower, much enthusiasm was aroused and served to stimulate interest.

Only too well do we now know that much greater distances can be covered on the lower wavelengths. And thus the majority of the amateurs can be found on 80 meters or thereabouts. True, there are several on 40, a handful on 20 and a few, if any, on 10 and below.

WGY made history in its transoceanic transmissions on 104 meters. Now WGY is experimenting on 74 meters and KDKA on 69 and these have been heard in practically every corner of the globe.

When I speak of short wave transmission I mean either code or telephone work. To be sure, the development of telegraphic transmission has been faster than telephonic, but the day is not far off when there will be a general migration to the shorter wavelengths.

Work on Expeditions

Take the case of the Bowdoin, explorer MacMillan's ship which was locked in the ice floes of the Arctic on his last expedition. Communication could be effected only by the use of short waves. It was the amateur who kept the valiant explorers in contact with the world.

Again, take the case of the Rice expedition in the jungles of the Orinoco river in South America. Almost every night messages were sent and received through the medium of the short waves and the amateurs.

And then, with the Navy taking an active interest in the amateur and his field of the short waves, a fleet of cruisers was sent into the Pacific to carry on tests. The latest MacMillan expedition carried John L. Reinartz as chief radio operator.

It would be well for us to review the interesting phenomena that occur on the various wavelengths. Beginning with 200 meters, the average 100-watt transmitter can readily cover a range of 2,000 miles with comparative ease. Fading occurs periodically and static discharges are usually of long duration. On 100 meters, the same 100-watt transmitter will generally have a 2,500-miles range. Fading and static characteristics are practically the same as on 200 meters.

Range Up at 80 Meters

As we decrease our wavelength to 80 meters we notice a marked increase in range, coast to coast transmission being effected readily. On 40 meters our range is increased to approximately 4,000 miles. Static and fading occur more regularly, but come in short time intervals. On 40 meters we notice that it is difficult to communicate with stations within a radius of a few hundred miles. In fact, many stations will not hear the signals. Further on the signals are strong and clear.

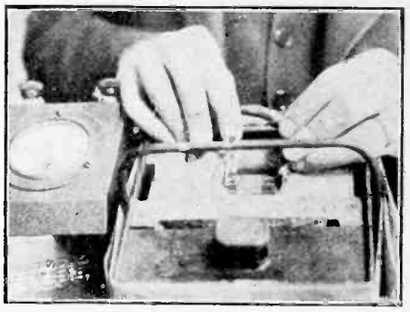
When tuned to 20 meters we get the surprise of our lives. It will be rather venturesome to try communication at night, as on the other wavelengths. But during the daytime and especially at high noon, we will be able to talk to stations 5,000 miles away, without the slightest trouble. This is the first case in which daylight transmission has been found to be superior to night-time transmission. The phenomenon completely overthrows some of the theories.

Freak Below 20 Meters

Below 20 meters conditions seem to be normal again but it is impossible to hold conversation with stations only a few hundred miles away.

It was once prophesied that radio communication would be accomplished by the use or expenditure of very little energy, and would clear around the world. This prophesy has come true, as amateurs are communicating with each other in different corners of the globe with so-called 5-watt tubes. And from the amateurs, the broadcasters have learned a lesson.

Tests Charging Rate



(Radio World *Staff Photo*)

TO DETERMINE the rate at which your charger is charging the A battery, remove the fuse from the charger and connect an ammeter at the fuse clips. If no fuse is on the charger, connect the meter in series with one of the leads to battery (not to lead to the main).

E. A. Graham Dies; Was Acoustic Expert

LONDON.

The death of Edward Alfred Graham, proprietor of Alfred Graham & Co., occurred recently. Mr. Graham was known throughout the world as one of the outstanding acoustic and electrical engineers and as the inventor of the most important naval telephone and loud speaking devices and radio loud speakers.

Thirty-nine years ago Edward Alfred Graham's father, Alfred Graham, invented and put into practical use the first naval telephone. Graham naval telephones and loud speaking devices have been used by the British Admiralty and other nations of the world, both on naval vessels and merchant marine, since then. Edward, after the retirement of his father, became the sole proprietor of the House of Graham and in that capacity developed many loud speaking devices and invented countless features now embodied in the most efficient and best known naval telephone work.

The Amplion Loud Speaker for radio use was the result of Edward Alfred Graham's personal work and the repute of the Amplion Loud Speaker has been due to Mr. Graham's engineering ability and technical experience.

In every country where radio broadcasting exists, the notice of Mr. Graham's death was received with deep regret, as Mr. Graham was recognized in those countries as the leader in the field of radio reproduction by loud speaking devices.

The various Amplion companies throughout the world in association with Alfred Graham & Co., London, England, will continue to carry on Mr. Graham's work.

They passed resolutions of regret.

Single Show for New York; Trade Unites on Garden

The efforts to bring together the promoters of two proposed radio shows in New York City, and unite on one, have proved successful. The show will be held in Madison Square Garden, Sept. 13 to 18 and is known as the Third Annual Radio World's Fair. O. J. Herrmann is managing director and G. Clayton Irwin, Jr., is general manager.

In announcing the plans for one show G. A. Scoville, chairman of the Board of Directors of the Radio Exhibition Corporation, promoter of the exposition at the Grand Central Palace, said: "It has been decided by the Board of Directors of the Radio Exhibition Corporation that the proposed radio exposition to be held in Grand Central Palace Sept. 10 to 17 be cancelled. It is believed that this action will be to the interest of both the public and the entire radio industry.

Double Advantage

"The directors are recommending to all of its exhibitors that they exhibit at the Radio World's Fair to be held in New Madison Square Garden Sept. 13 to 18 under the auspices of the Radio Manufacturer's Association.

"This will be advantageous to both the public and the manufacturers. The public can go to the show and feel that they have seen everything without having to pay two admissions. The manufacturers are satisfied, as it will save them considerable money and time."

Mr. Herrmann said:

"The radio public and the radio industry are to be congratulated on the decision of the radio manufacturers to concentrate their exhibits of new receivers, parts and accessories under a single roof. In addition to this, features of extraordinary interest, not only to the broadcast listeners of the United States and Canada but of the entire world, will be made possible by this concentration of activity. As far as the Radio World's Fair is concerned, we have no hesitancy in predicting that it will not only be the greatest show ever held but one of the finest industrial exhibitions ever conducted.

A World Center

"It is a pleasure to cooperate so fully with all the manufacturers of the country, and we pledge to them and to the public our sincere and earnest efforts to make New York during the week of Sept. 13 the world center of radio activity. The consolidation of the shows means a saving of hundreds of thousands of dollars to the industry and the public, and it eliminates the inconvenience imposed upon the trade and the public in attending two expositions held simultaneously in distant halls.

"I regard the official announcement by the Radio Exhibition Corporation that it is canceling its show in Grand Central Palace as a big step toward the stabilization and progress of the radio industry."

G. Clayton Irwin, Jr., managing director of the Radio World's Fair, announced: "With the cooperation of all the exhibitors, the Radio World's Fair will take care of all the exhibits originally planned for the Grand Central Palace which are not duplications of the exhibits also proposed for the Radio World's Fair.

Need More Space

"We have informed the directors of the Radio Exhibition Corporation that we will be able to house all such exhibits, which means, interpreted from the standpoint of the people interested in new radio developments, the opportunity of seeing in one auditorium at one time the greatest number and variety of exhibits ever brought together and which is a real reflection of the tremendous strides that the radio art and the radio industry have made.

"Additional space will be provided in Madison Square Garden also to accommodate various features of interest to the trade and the public. All of this has given us a vast responsibility and will entail heavy expense, but fortunately Madison Square Garden is big enough to make it possible."

NEW CORPORATIONS

Specialty Service Corp., Brooklyn, N. Y., radio. $10,000; S. F. Usefof, J. T. Conway, M. Loebel. (Attys., Hirsch, Newman & Reass, 100 B'way, N. Y. City).

Franc Eliminator Kit

Franc, Inc., located at 297 Fulton St., Brooklyn, N. Y., submitted to RADIO WORLD Laboratories their B Eliminator Kit and Blueprint. With the aid of the clear prints the kit was assembled with ease. Great satisfaction was obtained when the eliminator was used in conjunction with an 8-tube Super-Heterodyne. The main features of this eliminator are: (1)—01A type tubes are used as rectifiers; (2)—It is compact, audio frequency transformers being employed for stepping up the voltage, thereby decreasing the total weight; (3)—Both sides of the wave are rectified. The kit with which is included the prints, is moderately priced, and guaranteed by the company to give satisfaction. Mr. E. Frank, the Chief Engineer of this company, is the designer of the eliminator.

NAME CHANGES

Marathon Radio Co., N. Y. City, to Banner Radio Products.

Radio Co., N. Y. City, to Vanboura Corp.

Exhibitors At the Only Show New York Will Have

Following is a list of the exhibitors at the Third Annual Radio World's Fair, Madison Square Garden, New York, September 13 to 18:

A-C Electrical Mfg. Company, Dayton, Ohio
Acme Apparatus Company, Cambridge, Mass.
Acme Wire Company, New Haven, Conn.
Aerovox Wireless Corp., New York
All-American Radio Corporation, Chicago
Aluminum Company of America, Pittsburgh, Pa.
American Bosch Magneto Corp., Springfield, Mass.
Amplion Corporation of America, New York City
Amsco Products Co., Inc., New York City
Apco Manufacturing Company, Providence, R. I.
Apex Elec. Mfg. Co., Chicago
Argus Power Radio Company, New York City
Auburn Button Works, New York City
Atwater Kent Mfg. Company, Philadelphia, Pa.
American Electric Company, Chicago

Baldwin, Nathaniel, Inc., Salt Lake City, Utah
Beacon Radio Mfg. Company, Brooklyn, N. Y.
Benjamin Elec. Mfg. Company, Chicago
Best Manufacturing Company, Irvington, N. J.
Blair Radio Laboratories, New York
Bodine Electric Company, Chicago
Bosworth Electric Mfg. Company, Cincinnati, Ohio
L. S. Brach Mfg. Company, Newark, N. J.
Brooklyn Metal Stamping Corp., Brooklyn, N. Y.
Browning-Drake Corporation, Brighton, Mass.
Brunswick-Balke-Collender Co., New York
Bremer-Tully Mfg. Co., Chicago

Allen D. Cardwell Mfg. Corp., Brooklyn, N. Y.
Carter Radio Company, Chicago
C. E. Mfg. Company, Providence, R. I.
Cell-o-kay Mfg. Company, New York City
Central Radio Laboratories, Milwaukee
Corbet Cabinet Mfg. Co., St. Mary's, Pa.
Cornish Wire Company, New York City
Crosley Radio Corporation, Cincinnati, Ohio
E. T. Cunningham, Inc., New York
Colonial Radio Corp., New York

Daven Radio Corporation, Newark, N. J.
Dejur Products Company, Inc., New York
De Veaux Radio Company, Defiance, Ohio
Tobe Deutschmann Company, Boston, Mass.
Diamond State Fibre Company, Bridgeport, Pa.
Dongan Electric Mfg. Company, Detroit, Michigan
Eagle Charger Co., Philadelphia
Electrad, Inc., New York
Electrical Record, New York
Electrical Research Laboratories, Chicago
Electric Storage Battery Co., Philadelphia
English Whitman Products Co., New York

Fansteel Products Co., North Chicago, Ill.
Farrand Manufacturing Company, Long Island City, N. Y.
Federal Radio Corporation, Buffalo, N. Y.
Federal Telegraph Company of California, San Francisco, Cal.
J. B. Ferguson, Inc., New York
Forest Electric Company, Newark, N. J.
Formica Insulating Co., Cincinnati, Ohio
Freed-Eisemann Radio Corp., Brooklyn, N. Y.
Chas. Freshman Company, Inc., New York
Herbert H. Frost, Inc., Chicago
Furnell Mfg. Corp., Newark, N. J.

Garod Corporation, Belleville, N. J.
General Instrument Corp., New York
A. H. Grebe & Co., Inc., New York
Grigsby-Grunow-Hinds Company, Chicago
Golden-Leutz, Inc., Long Island City

Hammarlund Mfg. Company, New York
Hartford Battery Mfg. Co., Hartford, Conn.
The Herald Tribune, New York

Indiana Mfg. & Electric Company, Marion, Indiana

Jewell Electrical Instrument Co., Chicago
Jewett Radio & Phonograph Co., Pontiac, Mich.
Howard B. Jones, Chicago

Karas Electric Co., Chicago
Kay Electric Company, Newark, N. J.
Kellogg Switchboard & Supply Co., Chicago
King-Buffalo, Inc., Buffalo, N. Y.
Kodel Radio Corporation, Cincinnati, Ohio

J. Libarkin & Son, Philadelphia
The Lignole Corporation, Chicago
Arthur H. Lynch, Inc., New York City
Lectrodio Corp., Lynn, Mass.

Martin-Copeland Co., Providence, R. I.
The Magnavox Co., Oakland, Cal.
Mayolian Radio Corporation, New York
Miller Rubber Company, Akron, Ohio
Montrose-Hast, Inc., New York
Leslie F. Minter Co., Chicago

National Company, Boston, Mass.
National Carbon Co., New York
National Lead Battery, St. Paul, Minnesota

The Operadio Corporation, Chicago

Pequot Mfg. Corporation, New York
Perlesz Radio Corporation, Chicago
Permatron Tube Company, Union City, N. J.
Pfanstiehl Radio Company, Chicago
Phenix Radio Corporation, New York
Philmore Manufacturing Co., New York
Popular Radio, Inc., New York
Precise Manufacturing Co., Rochester, N. Y.
Priess Radio Corporation, New York
The Pooley Company, Philadelphia

The Q. R. S. Company, Chicago

The Radio Corporation of America, New York
Radio Digest Pub. Co., Chicago
The Radio Home, Philadelphia
Radio Master Corp., Bay City, Mich.
Raytheon Manufacturing Co., Cambridge, Mass.
R. B. Radio Co., New York
Reichman Company, Chicago

H. G. Saal Company, Chicago
Samson Electric Company, Canton, Mass.
Schickerling Products Corp., Newark, N. J.
Serenada Mfg. Co., New York
Silver-Marshall, Inc., Chicago
M. B. Sleeper, Inc., New York
Sonora Phonograph Company, New York
Spartan Electric Corporation, New York
Splitdorf Electrical Company, Newark, N. J.
The Sterling Mfg. Company, Cleveland, Ohio
Stettner Phonograph Corp., New York
Stevens & Co., Inc., New York
Stewart Warner Speedometer, Chicago, Ill.
The Sun, New York
Steinite Laboratories, Chicago
Shamrock Mfg. Co., Newark, N. J.
Sparks-Wilmington, Jackson, Michigan

Thordarson Elec. Mfg. Company, Chicago
The Times, New York
Timmons Radio Products Company, Philadelphia
Tower Manufacturing Corp, Boston, Mass.
Trimm Radio Mfg. Co., Chicago

University Radio Co., New York
Utah Radio Products Company, Chicago

Walbert Mfg. Company, Chicago
Geo. W. Walker Company, Toledo, Ohio
J. Andrew White, New York
Willard Storage Battery Co., Cleveland, Ohio

Yaxley Mfg. Co., Chicago

Zenith Radio Corporation, Chicago
The Zink Company, Chicago

R. C. A. Sues to Kill Off Makers of TRF Receivers

The announcement of a suit by the Radio Corporation of America, General Electric Company and Westinghouse Electric & Manufacturing Company against the Splitdorf Electrical Company, of Newark, N. J., based upon the use of the principles of the tuned radio frequency patent No. 1,087,892, of Schloemilch-VonBronck, has caused a great deal of discussion by independent radio manufacturers. The plaintiffs state that the invention credited to the two German engineers is covered by the Alexanderson patent, No. 1,173,079, making manufacturers using the TRF principle infringers.

The German patent first was filed in Germany on February 8, 1913, and then in the United States Patent Office on March 14, 1913. Soon after the filing here the World War broke out. Later this patent, among others, was taken over by the Government officials as alien property.

Immediately after the war, the Navy Department announced that the patents would be thrown open to American business in return for specific rights in any radio patents owned by those thus licensed. The Splitdorf Electrical Co. took advantage of this offer, as did many others.

The Alexanderson patent was filed October, 1913, and awarded February 29, 1916, which includes fourteen claims covering the use of multiple tuned circuits, in which disturbing signals are eliminated by the cascading of stages. In suits already tried, wherein these well known patents were the topic of discussion, claims have been made that it is doubtful if either of these sets could be employed for broadcast reception, there being no means whereby oscillations between the RF stages could be controlled.

If this suit is won by the R. C. A. and its associates, every manufacturer making a receiver using any type of tuned radio frequency amplification, which includes the Neutrodyne, Reflex, etc., will be affected. The R. C. A. already controls the regenerative and Super-Heterodyne patents. They also own a license to use the Latour system of reception. With the addition of the TRF patent, they would have complete control of all the three major basic patents used in radio receivers today.

This is worrying independents.

Six Men Arrested In Tube Fraud Case

Six men were arrested in Newark, N. J., on charges of making tubes and selling them under a standard trademark, not their own.

The prisoners are alleged to have had a factory whose daily output of bogus tubes was 3,000 and their sales since last February are reported to have totaled 50,000.

Three of the prisoners are brothers, Joseph, Robert and James Johnson, all of Newark. The others arrested are Joseph Marck of Newark; Albert Miller, owner of the Union Hill Printing Company, Union Hill, N. J., and Albert Smith, who owns the Weehawken Electric and Manufacturing Company of Weehawken, N. J.

The Johnson brothers are alleged to have run the factory at 84 West Kinney Street, Newark, where the bogus tubes were made. Marck is reported to have been the salesman, Miller the man who made the labels and the cartons in which the tubes were packed and Smith to have manufactured the die with which the imprint of a company making standard tubes was placed on the product.

The investigation was begun several months ago by John Harley of the Bureau of Investigation of the E. T. Cunningham Company of San Francisco, makers of radio tubes whose name is alleged to have been stamped on the bootleg tubes. A Cunningham tube retails for about $2, the Newark police said, while the dealers handling the imitation tubes sold them for $1.70, while their actual cost was less than sixty cents apiece.

Temporary Receiver Named For De Forest Co.

Arthur D. Lord of Summit, N. J., was named temporary receiver of the De Forest Radio Co.

The receivership application was made by Dr. Lee De Forest, stockholder and creditor. Edward Maxon, representing Dr. De Forest, said the book value of the assets was about $1,000,000 in excess of liabilities.

The receivership is of a friendly nature and is expected to be only temporary, H. L. Lanphear, Vice President and general manager of the concern, said in a statement. It is expected that a reorganization will be effected in the near future, Mr. Lanphear declared.

"The company's assets greatly exceed its liabilities," he added, "but the depression in the radio business has brought about a temporary financial embarrassment."

Mr. Lord, the receiver, recently was elected President of the company.

Business Opportunities Radio and Electrical

Rates 10c per word; Minimum, $1.00; Cash with order

INVENTIONS WANTED WHICH ARE simple to manufacture and possible of volume distribution through national sales organization; cash or royalty basis; submit full description. United Factories Bureau, 210 Woodward Building, Washington, D. C.

EXPERIENCED ENGINEER DESIGNS, develops, builds small electrical and mechanical devices; reasonable charges. Miller, 120 West 64th St., N. Y. C.

RADIO OUTDOOR AERIAL PATENTED, demountable, fits any roof five minutes; want party to finance same. Box K, Radio World.

COMPLETE LIST OF BROADCASTING STATIONS appeared in RADIO WORLD dated July 3. Sent on receipt of 15c, or start sub. with that number. RADIO WORLD, 145 W. 45th St., N. Y. C.

MANUFACTURER OF ELECTRICAL equipment including complete line of battery eliminators, trickler chargers and power amplifiers is looking for sales organization or executive with facilities for marketing. Box B, Radio World.

THE 5-TUBE SUPER HETERODYNE SET, by Jasper Jellicoe, appeared in RADIO WORLD dated April 17. Sent on receipt of 15c. RADIO WORLD, 145 W. 45th St., N. Y. C.

SWITCHBOARD AND PANEL BUSINESS; opportunity for salesman with a following, thoroughly familiar with electric switchboard business, to become identified with manufacturers of high-grade products, etc.; capital not necessary, but will consider selling an interest to live man; write for interview, giving retails. Box A, Radio World.

RADIO MANUFACTURER, well established, wants responsible party to take over factory and production on contract basis; splendid opportunity for small established concern or energetic individual with small capital; kindly give brief history in letter. Box E, Radio World.

BATTERYLESS RADIO—Competent engineer is open for connection with concern desiring to manufacture radio working from light socket; no trickle charges or liquids; powerful natural reproduction; will demonstrate. Box C, Radio World.

Literature Wanted

THE names of readers of RADIO WORLD who desire literature from radio jobbers and dealers are published in RADIO WORLD on request of the reader. The blank below may be used, or a post card or letter will do instead.

Trade Service Editor,
RADIO WORLD,
145 West 45th St., N. Y. City.

I desire to receive radio literature

Name .....

City or town .....

State .....

Are you a dealer? .....

If not, who is your dealer?

His Name .....

His Address .....

Alvin W. Steverson, Box 44, Ludlow, Ky. (Dealer).
Roe Carlson, S. W. Bell Tel. Co., Duncan, Okla.
Harry A. McArthur, 255 East Longview Ave., Columbus, O.
A. S. Wahl, Scottsdale, Ariz. (Dealer).
Roy Thompson, East Spring St., Cadiz, O.
Emil Mischler, Darmstadt, Germany. (Dealer)
C. W. Hall, 530 West Jackson St., Kokomo, Ind.

The Jaynxon Tone Bridge

The Jaynxon Laboratories are producing a series of radio devices, that make for better radio, under the slogan of "A Jaynxon Product." The first of these and one that has proven highly successful is the Jaynxon Tone Bridge. This device helps to overcome many of the imperfections of tone and volume control incident to modern radio reception. As a perfect volume control it enables the radio user to entertain a number with great volume or to use it as a background of low sweet music. It also protects the loud speaker against the harmful direct current which soon demagnetizes even the most costly unit, allowing distortion to creep in and thus the life of the speaker is prolonged indefinitely. It also acts as a coupling unit between the receiver and the modern cone speaker enabling the listener to get from this type of speaker the tone and quality it should give. The Jaynxon Tone Bridge also eliminates to a great degree incidental noises which mar programs and helps to cut static to a minimum. It requires no installation, a cord being supplied which is plugged into the receiver while the speaker is plugged into the jack of the Tone Bridge. It may be used to improve any make of set or speaker on the market. Full information may be had from the Jaynxon Laboratories, 57 Dey Street, New York City. Mention RADIO WORLD.

TRADIOGRAMS

R. H. McMANN, INC., New York, distributors for many large radio manufacturers, have moved to larger quarters at 12 Warren Street.

THE DICTOGRAPH PRODUCTS CORP. markets a new Piano Unit (Piano Vox Type R70). By attaching this unit to the sounding board of a piano the piano is made into a speaker. The unit is made for grand and upright pianos.

THE ALLEN D. CARDWELL Manufacturing Corporation's manufacturers sales will be handled directly from the main office of the company in Brooklyn; broadcast receiving equipment will be sold through exclusive jobbers and amateur transmitting material will be handled to a small extent through the jobbers, but mainly direct to the amateur from the factory.

SPECIAL SUBSCRIPTION OFFER!

This handsome VALET Auto-Strop Razor FREE—with every five months' subscription to "Radio News" or "Science and Invention" or "Amazing Stories"

Think of it—you can have a beautiful, compact, regulation size AUTO-STROP Razor—FREE. Ideal for your motor trips. Strop to sharpen Blades goes with set.

In order to acquaint the readers of this magazine with these great publications, we are making, for a limited time, a special reduced rate and are also giving FREE one complete VALET Auto-Strop Razor.

For only $1 (Regular Newsstand price $1.25) you can obtain any one of these magazines for five months and also, one FREE Razor—

This shaving outfit consists of a highly polished, nickel-plated, self-stropping Razor; one blade, leather strop especially prepared. The razor case is of metal, finished in maroon, crystallized effect. Lined throughout with velvet, harmonizing with the pleasing color scheme of the entire package.

The only razor in the world that sharpens its own blades.

RADIO NEWS is the largest radio magazine published. It is the outstanding authority in the radio field, carrying more new developments, more hook-ups and more news than any other radio magazine.

RADIO NEWS has been radio's greatest magazine since the very beginning of radio broadcasting.

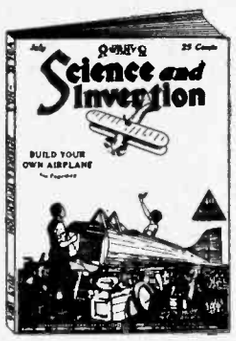
Every day, in all corners of our busy world, Scientists are at work on new Inventions, developing marvelous machines for the progress of the world or compounding strange chemicals for many uses. All these things are shown in the novel magazine "SCIENCE AND INVENTION."

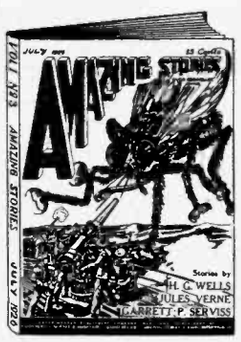
There is also a big Radio Section to "SCIENCE AND INVENTION" for beginners.

Marvelous, Amazing Stories by great men such as Jules Verne, H. G. Wells, etc., appear in this new magazine AMAZING STORIES every issue.

Stories of flying into space at dazzling speed on a comet; Mesmerizing the dead, remarkable situations of all kinds. Tremendously interesting—yet instructive.

Keeps you in touch with the writings of the men with the greatest imaginations in the world.





EXPERIMENTER PUBLISHING CO., Inc.,
53 Park Place, New York, N. Y.

Gentlemen: Enclosed find $1 for 5 Months' Subscription to ☐ RADIO NEWS or ☐ SCIENCE and INVENTION, ☐ AMAZING STORIES and 1 Free Auto-Strop Razor advertised above.

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The coupon on this page is for your convenience, clip it today and pin a $1 bill, money order, or check to it. Fill out the Coupon with your complete name and address NOW.

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53 Park Place New York, N. Y.

WHAT USERS OF THE BRETWOOD Variable Grid Leak *say:*

The Bretwood Grid Leak came with today's mail. It is now exactly 9:00 P.M. and the leak was installed about a half hour ago.
This note is not only an expression of appreciation but also an attestation of the truth of your advertising. During the past half hour I have tuned in stations "ALL OVER THE DIALS" at leisure, and can adjust reception with the leak almost equal to a variable condenser.
I feel constrained to add that while waiting for reply and then receipt of leak from you, there has been on the set a fixed leak and condenser of well known and thoroughly reliable make, and fairly good reception has been enjoyed, but during this half-hour-only test thus far the results are inexpressibly beyond expectation
Have been a radio fan only about four years, but feel I have sufficient knowledge and experience to recognize a good thing upon fair trial. Your promptness and desire to satisfy your trade, in this case has won for you another "BRETWOOD BOOSTER." Thank you.
The Rev. WALTER G. BARLOW,
Bishopville, Ind.

Very many thanks for your kind letter of the 21st ult. and for the grid leak, which works perfectly. I have tried four different makes of grid leaks. The Bretwood "has 'em beat."
M. SAWYER,
Box 238, Los Gatos, Calif.

Received your grid leak and wish to say that none can compare with it when it comes to clearing up reception.
JOHN A. BLACKBURN,
5328 Warren Ave., Norwood, Ohio.

Enclosed find P. O. money-order for $3.00. Please send me two of your Variable Grid Leaks. I am using one and it works fine. Please mail them as soon as possible.
W. H. PERRY,
119 Congress St., Buffalo, N. Y.

Received your grid leak and many thanks. It is the best $1.50 that I have spent for radio equipment.
ED. JENKINS,
703 E. Main St., Louisville, Ky.

Enclosed herewith find check for $1.50 for one Bretwood Grid Leak. I am using your leak and find it far superior to any others. This is my third Bretwood.
J. C. WHITE,
422 W. Wooster St., Bowling Green, Ohio.

Will you please send me by return mail two Bretwood Variable Grid Leaks. I enclose herewith check for $3.25, the 25c. being for a special handling stamp, as these leaks are needed at once.
The leaks are the only satisfactory instrument on the market. I find them absolutely essential in the construction and operation of sensitive experimental receivers.
ED. J. WHITTIER,
The American Appraisal Co.,
Milwaukee, Wis.

I want to thank you for your leak, it makes the set 100% better. I was going to have a Diamond of the Air built, but since I have added your leak to my set I am now down in the dining room of the first floor and the set is on the second floor. I can hear the set just as plainly as if I were up there. I can hear every player in any band or music which is on air. The first night I gave the leak a very good test, and I got four stations in Chicago, one in Detroit, one in Canada, one in Atlanta, Ga., and several others without any noise. All were good and clear. It is going to make me spend more money, as I will have to get a good loud speaker. The horn I have now is a Manhattan Jr., and is good and clear, but as soon as your leak is installed the howling present when using three tubes is immediately stopped.
LEON E. COLE,
5816 Tilbert St., Philadelphia, Pa.

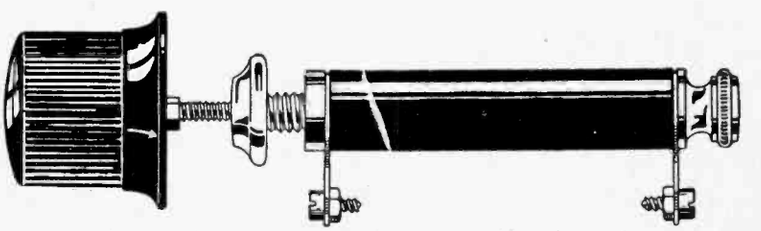
Grid Leak received and tested out, and find it is the only variable leak I ever used that is really variable. Enclosed find $1.50, for which please send me another one.
F. E. STAYTON,
Box 240, Ardmore, Okla.

Thank you for introducing me to the Bretwood Variable Grid Leak! I have installed one in my Three-Circuit Tuner, according to your instructions, and find that it does all you said it would—and more. I am now recommending the Bretwood to all my friends, and those who have used this wonder grid leak have nothing but high praise for it. The fact that it can be adapted for any hookup makes it invaluable to the experimenter.
Although I have only used the Bretwood leak for three weeks I have pulled in several of the weaker stations which were inaudible before, and the microphonic noises which were decidedly pronounced before have entirely disappeared.
Please accept my best wishes for your continued success and also for the Bretwood Grid Leak.
S. R. HUBBS,
180 Quincy St., Brooklyn, N. Y.

Let me say that the Bretwood Grid Leak improves the set 100%.
J. E. McGINNISS,
27 Lenox Rd., Brooklyn, N. Y.

I wish to take this occasion to thank you for your courtesy in furnishing me with your very excellent Grid Leaks. I have installed one with your Condenser on my own personal radio set, and am delighted with the results.
R. W. DeMOTT,
Experimenter Pub. Co.,
53 Park Place, N. Y. C.

I have received the Grid Leak you sent me and it is perfect. It is surely wonderful the way it works. Please send me another by return mail for a friend.
J. F. COOPER,
1029 Courtlandt St.,
Cincinnati, Ohio.



The Bretwood Variable Grid Leak

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Guaranteed Precision Range ¼ to 10 Megohms

Brings in More Distant Stations—Affords Greater Volume—Improves Tone Quality Fits Any Set, Panel or Baseboard.

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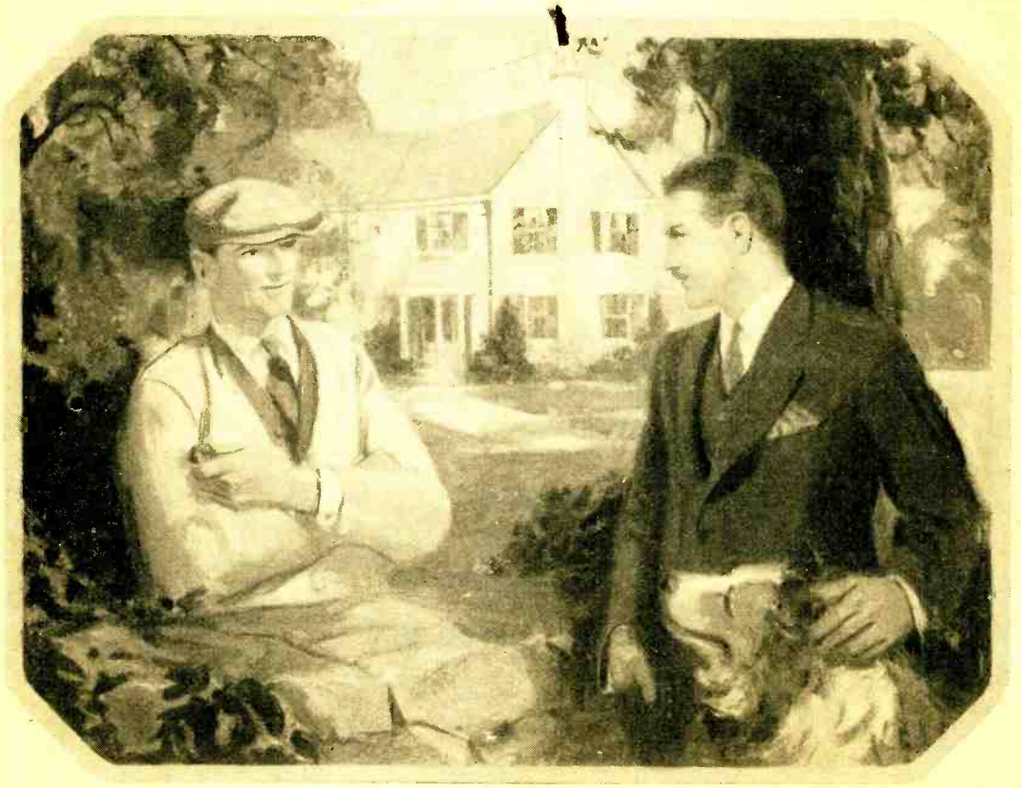
Inquiries Solicited from the Trade



"We give our sets about the same amount of use, but your 'B' batteries always last longer than mine. What's your secret?"

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"Yes, but what do you mean by *right* size?"

"The right size depends on the number of tubes in your set. The more tubes you have, the bigger the 'B' battery you need to give you long, economical service. Just follow the rules laid down by Eveready and you can't make a mistake." These are the rules and the results:

On all but single tube sets—connect a "C" battery. The length of service given below is based on its use.*

On 1 to 3 tubes—use Eveready No. 772. Listening in on the average of 2 hours daily, it will last a year or more.

On 4 or more tubes — use the Heavy-Duty "B" Batteries, either No. 770 or the even longer-lived Eveready Layerbilt No. 486. Used on the average of 2 hours daily, these will last 8 months or longer.

The above rules will give you the maximum of "B" battery life and economy. Of course, if you listen in more than 2 hours a day, which is the universal year-round average, your "B" batteries will not last quite so long, and if you listen less they will last longer. Eveready "B" Batteries give a pure, steady, noiseless current, the kind of current that is absolutely essential if you prize pure tone.

Send for booklet, "Choosing and Using the Right Radio Batteries," sent free on request. There is an Eveready dealer nearby.

Manufactured and guaranteed by

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Toronto, Ontario

*NOTE: A "C" battery greatly increases the life of your "B" batteries and gives a quality of reception unobtainable without it. Radio sets may easily be changed by any competent radio service man to permit the use of a "C" battery.

LEFT - *No. 486, for 4, 5 or more tubes.* $5.50.
RIGHT - *Eveready Dry Cell Radio "A" Battery, 1½ volts.*

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WTAM–*Cleveland*
WWJ–*Detroit*
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WOC–*Davenport*
WCCO { *Minneapolis* / *St. Paul*
KSD–*St. Louis*