SEPT. 26 15 CENTS

RADIO WORLD

Title Reg. U.S. Pat. Off.

#183

Vol. 8. No. 1 ILLUSTRATED Every Week

USING A SECONDARY AS A LOOP

By J. E. Anderson

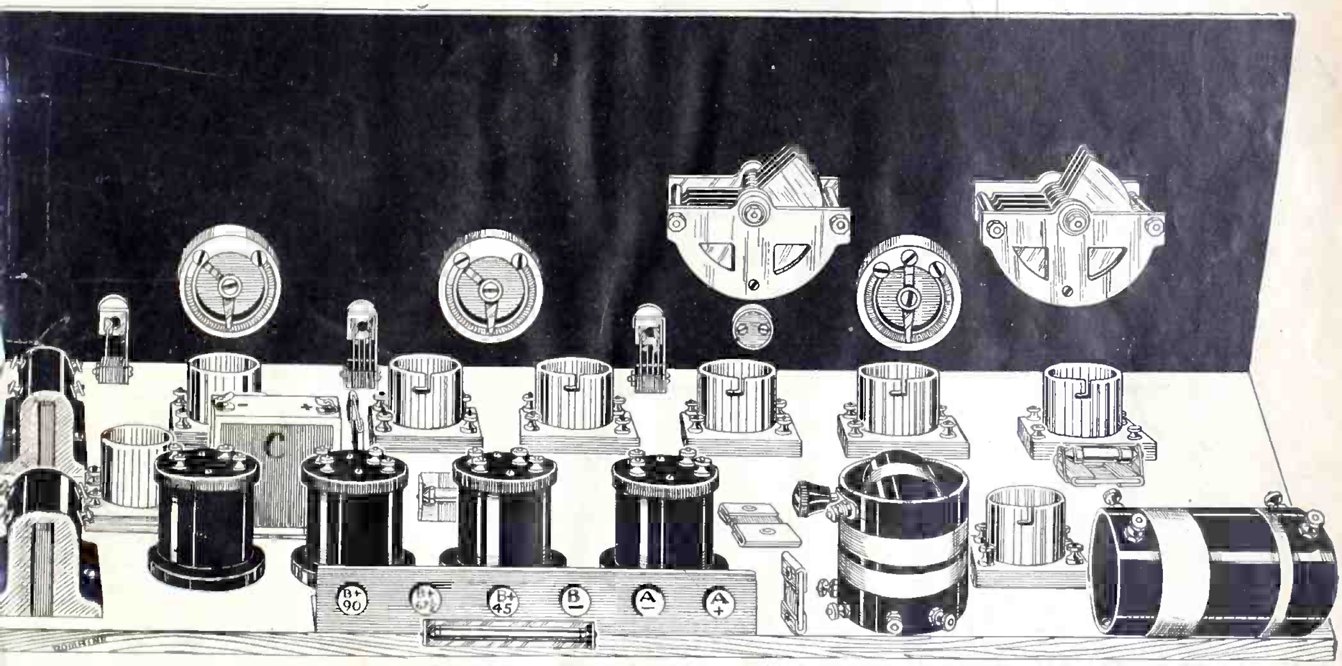
HOW TO WIRE UP THE 1926 DIAMOND

By Herman Bernard

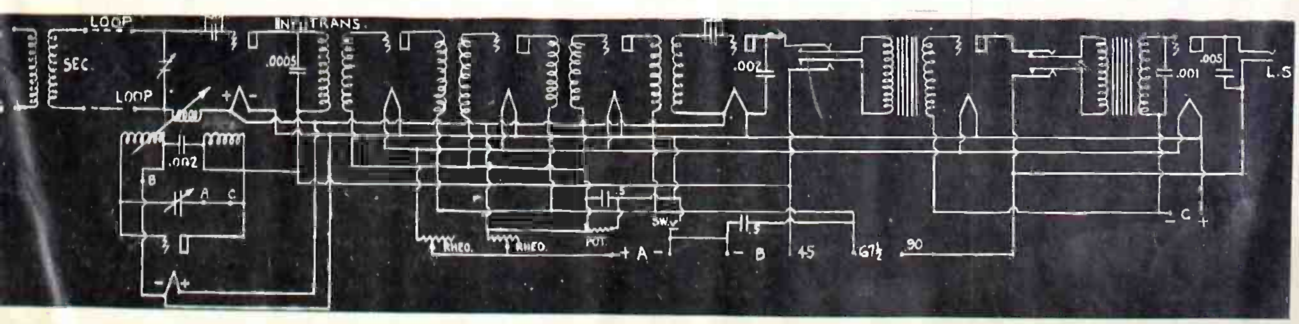
William Bergstrom

THE 8-TUBE SUPER-HETERODYNE

By Sidney E. Finkelstein



REAR VIEW of the 8-Tube Standard Super-Heterodyne showing the placement of the parts. See article on page 8.



THE WIRING of the 8-Tube Super-Heterodyne

RADIO WORLD

[Entered as second-class matter, March, 1922, at the post office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Paper Published by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Phones: Lackawanna 6976 and 2063

Vol. VIII. No. 1. Whole No. 183. **September 26, 1925** **15c per copy, $6.00 a year**

How to Wire the Diamond

Explicit Directions for the 1926 Model

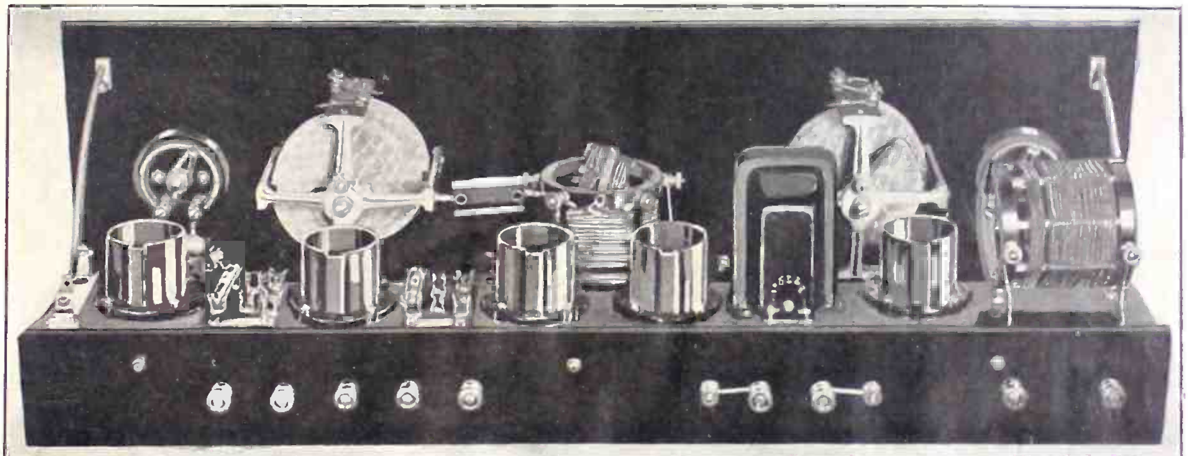


FIG. 7, rear view of the 1926 Model Diamond of the Air. The binding posts, right to left on the supporting strip, are (1) aerial; (2) ground; (3) detector plate; (4) P post of AFT; (5) B post of AFT; (6) B+ No. 1; (7) A minus; (8) A plus; (9) B minus; (10) B+ No. 1, and (11) B+ No. 2. Note (6) and (10) are the same lead. The two are interconnected behind the supporting strip that holds the binding posts, as (10) better accommodates the battery cable lead. Posts (4) and (5) are T and T in Fig. 8.

["How to Build Radio World's 1926 Model Diamond of the Air" is published in three parts, of which the following is the final one. Part I appeared September 12 (Radio Show Number), Part II was in the September 19 issue.

The 1926 model Diamond was exhibited at the two big radio shows held recently in New York City and evoked exclamations of appreciation of its expertness of design and handsome appearance. As for its performance, it is one of the most efficient receivers that the art has yet produced.—EDITOR.]

By Herman Bernard

Associate, Institute of Radio Engineers

PART III

THE panel template, Fig. 2, was published in the September 12 issue. The dimensions were given, and these will guide you or, if the same parts are used as in the original model, will be your unfailing authority. The center shaft holes will apply universally so far as the two variable condensers, the 3-circuit tuning coil, the two rheostats and the Bretwood Variable Grid Leak are concerned. Other points of variation may arise if other parts than those prescribed are employed.

In Fig. 2 at extreme left are two holes, both countersunk, this fact being represented by the double ring effect in the diagram. Corresponding holes are at the right-hand side of the panel. These four holes are for machine screws used in mounting the Bruno brackets to support the socket shelf. If other bracket devices are used, then drill accordingly and to that extent disregard Fig. 2. Note that a No. 29 drill is used. This might not apply to some other make of brackets.

There are five holes along the bottom. These are, left to right, as you look at the front of the panel: loop jack, J1; battery switch, S2; Bretwood Variable Grid Leak, Ro; detector double circuit jack, J2; and the speaker single circuit jack J3. S1 and J2 are interchangeable as to permanent position on the panel. S1TT is not represented on the panel, except only so far as its connections interlink with J2, which already is provided for. Of the five holes, four are drilled with a 7/8" drill, as jacks and switches normally are accommodated by such size of aperture, while the Bretwood Variable Grid Leak, which also is a single panel mount device, has a 1/4" shaft, hence a 5/16" drill should be used to achieve easy clearance.

The Rheostat Mounting

The two rheostat shaft holes are 2½" from left and right ends of the panel, respectively, and are on a central line, 3½" from top and bottom of the panel plane. Use a 5/16" drill for shafts. If other rheostats are used than those in the original model, drill the shaft holes according to Fig. 2 nevertheless, but the countersunk mounting holes may have to be different. These are always to be distinguished from the center shaft holes. By holding a rheostat onto the panel, with the back of the rheostat at front of the panel, the two mounting holes may be conveniently located if other rheostats are used. If you have a template for the rheostats that you will use, by all means follow that. As both rheostats are of the same value, provided the same type of tubes is used, the two shaft holes apply interchangeably to R1 and R2.

Next locate the shaft holes for the two tuning condensers, C1 at left and C3 at right. These are respectively 6½" from left and right ends of the panel, but not on the central line. They are 4" up. For the Bruno condensers follow Fig. 2. For other condensers, drill holes to suit them, using a template, even if you have to make your own template from cardboard. As each condenser is a .0005 mfd. variable (500 micro-mfd.), these two locations interchangeably represent C1 and C3.

There remains only the 3-circuit tuning coil, L2, L3, L4. This is not mounted on the central line either, but is 4 3/16" up. The panel appearance is made more attractive by this method and plenty of room reserved for the grid leak. The hole for the mounting screw is shown on Fig. 2 for the Bruno coil, but if another make of coil is used be sure to drill the proper mounting screw holes. The shaft hole is correct for virtually every type of 3-circuit coil made.

Cabinet Holes

That ends the panel drilling, except that, after the set is completed, and it is to be permanently installed in a cabinet, two small drill holes will be made at the left and right sides of the pane (four in all) and two at top and bottom of the panel (total, eight), so that wood screws may be used to secure the panel to the cabinet. Countersink these holes. If your cabinet has two grooves at the sides so that the panel may be slid in and held taut, then no drilling for cabinet fastening is necessary.

Note that the rheostat R1 and the loop jack are in perpendicular alignment with each other; so are the grid leak and the tickler shaft, likewise the speaker jack and

Panel Drilling Directions

For the 1926 Diamond of the Air

the rheostat R2. Thus the loop jack and the speaker jack, just like the rheostats, are 2½" from the panel sides.

The panel is 7x24" and no smaller size should be considered. The panel may be of hard rubber or, if the extra difficulty in drilling is not objectionable, may be Bakelite.

As previously mentioned, no simplification of the panel layout was attempted that would involve the slightest sacrifice of efficiency, and it is well to have on the panel every item stated.

After the panel is marked, the drilling is done, but the foregoing order will not be followed. Now, because the drill that is in the brace will be used for making all the holes of that size, then another drill inserted and all the holes of the new size made. For checking up purposes the following data are given: there are four holes to be drilled with a ⅞" drill; five holes with a 5/16" drill; eight holes with a No. 29 drill, and five with a No. 26 drill. The rheostat and bracket mounting holes require No. 29, the tickler and condenser holes No. 26. The bracket holes may be located, by the way, by consulting the right-hand side of Fig. 2 and reading the same dimensions into the left-hand side.

Socket Shelf and Terminal Strip

The socket shelf is 3" wide x 23" long. This is mounted horizontally. The binding post strip is 2½" wide x 23" long and is mounted upright. The socket shelf is notched for ½" square at both ends, but on one side only, to allow room for the Bruno brackets. The binding posts in Fig. 7, right to left, are located on a central line (1¼" from top and bottom) as follows, measured from right: (1), 1⅛"; (2), 3¼"; (3), 6"; (4), 7"; (5), 8¼"; (6), 9⅞"; (7), 14"; (8), 15¼"; (9), 16⅝"; (10), 17⅞"; (11), 19⅛". The socket centers, right to left on the shelf are: 5", 10", 12¾", 17", 21". The transformer central point is 7½" from right.

In Fig. 7 the two double mounts for resistors R3R4, R5R6, are centered 14½" and 18½" from right, respectively. The resistor R7 is put on a single mount which runs at right angles to the length of the shelf and is at extreme left. Behind the last socket in Fig. 7 is the ballast resistor R8, also in a single mount, which is next to and at right angles to the R7 mount.

On the bottom of the socket shelf is most of the wiring, excepting the A minus battery lead. Turning the set up 90 degrees from the Fig. 7 position (the same order of reading) the condenser C7 is mounted with connecting lugs at right, while C5 and C6 are mounted with lugs pointing toward the binding posts. At right of C5 is the grid condenser. Socket terminals and various leads are the only other things on the bottom of the shelf.

The panel drilled, mount the parts. If you find that through some misadvertance one or more of the parts do not mount conveniently, for instance, rotor shafts bind, remove that part and drill the shaft hole oversized, if necessary, using an old pair of scissors to enlarge the hole. In that way even if mounting holes (for machine screws) do not coincide with the threaded holes in the instruments, you will likely make them do so by enlarging the shaft hole, thereby enabling you to move the instrument to proper position, which the 5/16" hole prevented. Under no circumstances, because of incorrect drilling, tolerate the use of only one mounting screw where two are called for. Do not trust to chance that things will turn out all right. Particularly must the grid leak, variable condenser, rheostat and tickler shaft enjoy easy motion, otherwise the mounting will be awry, if not at first, then after the misfit instrument is used awhile. The rheostat arm may stick or the condenser plates touch, later on, due to poor mounting on the panel.

Order of Marking Panel for the Set

The marking for drilling the panel for the 1926 Diamond may be done conveniently in the following order: First, tickler; second and third, tuning condensers; fourth and fifth, rheostats; sixth, grid leak; seventh, A battery switch; eighth, double-circuit jack; ninth, loop jack; tenth, speaker jack; eleventh and twelfth, thirteenth and fourteenth, the bracket holes.

The Socket Shelf

Now mount the parts required on the (horizontal) socket shelf, these including the coil LoL1, the five sockets, the audio transformer, the two double mount resistor receptacles and the one single mount. The drill holes for these must be determined by the constructor, unless the commercial type is used, for they will vary considerably, depending on the make of instruments. But this drilling is very simple. Fig. 7 will be a great aid to anybody who meets any trouble at this point.

In mounting the RF coil, shown at right in Fig. 7, be sure to mount it as shown, and not perpendicularly. The reason is that for best efficiency you do not want this coil to function with a loop effect and independently pick up broadcast energy when you are using an outdoor aerial. Perpendicular position of mounting creates the loop effect, because the windings will then be in a direction quite suitable to energy pickup. As the two coils, LoL1 and L2 L3 L4 are mounted at right angles to minimize or prevent inductive feedback from detector to RF stage, the 3-circuit coil is in loop effect position, but at a point where it is ineffective for such, e.g., it is an interstage coupler.

In Fig. 7 the tubes are, right to left: RF, detector, first (transformer) audio and second and third (resistance) audio. The inverse order is due, of course, to the fact this is a rear view. At extreme left is the single mounting for the resistor in the plate circuit of the final tube (R7). Note that the coupling condensers, C5, C6 and C7, are not visible. They are mounted under the socket shelf. See Fig. 5 in last week's issue (September 19). The sub-mounting accounts for the vacant clips in the center of the double mountings.

Note in Fig. 7 where the by-pass condenser is placed, supported only by the busbar joining it with the condenser C3 and the coil L3.

Reconciliation

Before proceeding with wiring directions it is well to reconcile some diagrammatic discrepancies:

(1) The blueprint published September 12 proved such a poor engraving that some of the lines failed to register (e. g., from battery to R8) and also this made the diagram read as if both A leads were closed at F+ on the detector tube. Hence disregard the blueprint and follow the blackprint published this week, Fig. 8. This corresponds in all particulars with Fig. 1, the schematic diagram published in the September 12 issue.

(2) S2 is the A battery switch, as shown in Fig. 1, September 12, and as shown in picture form, Fig. 8, this week. S1 is a special binding post switching device, with double-pole double-throw effect, and a DPDT switch may be used (Fig. 1, September 12) or just the binding posts (Fig. 8), and I think the posts should prevail, as they are cheaper and avoid overcrowding the socket shelf, as all the posts are on the broad, long terminal strip that also acts as a support on the shelf, by the aid of three 1½-inch brass right angles.

(3) The picture diagrams all show the RF coil mounted perpendicularly. Disregard the diagrams to this extent.

(4) The three resistors not in the photograph, Fig. 8, should be there.

Preparatory to wiring, securely mount the brackets in the rear of panel and mount the socket strip on the brackets. Drill for binding post holes on the socket strip, following Fig. 8 approximately. Of course there is leeway here—as elsewhere—but watch your step! J. E. Anderson, the noted radio engineer, was so struck with the 1926 Model Diamond of the Air that when I showed him the diagram in advance of publication he taxied back to his private laboratory and built the very set the photographs portray. In fact, Fig. 9 shows him pointing an approving finger at that part of the audio hookup where novelty exists. This is the set he now uses for broadcast reception.

The binding posts, right to left, as you look at the rear view, Fig. 8, are (1) aerial; (2) ground; (3) detector plate; (4) beginning of primary, P, of AFT; (5) end of primary, B, of AFT; (6) B plus No. 1, normally 45 volts; (7) A minus; (8) A plus; (9) B minus; (10), B plus No. 1 again, the common lead from 6 to 10 being carried under the socket shelf; (11) B plus No. 2, normally 90 to 135 volts, preferably 135.

The Wiring Directions

Begin wiring with the filament circuit. We will assume that the set is to be operated so that the A battery switch, S2, turns the set on or off as a unit (Fig. 1, September 1 issue, Fig. 8, this week's issue).

Connect A battery minus to one side of the switch, the other side of the switch to the post of R1 that makes contact with the movable arm of that rheostat (see special detail diagram, September 12). Carry this lead over to the same position on the other rheostat, R2. R1 is for the RF tube, R2 for the detector. Continue this lead to one side of the ¾-amp. ballast resistor, R8. Now join the remaining open sides of R1, R2 and R8 to the proper binding posts on the sockets. R1 goes to F minus of the RF tube (1); R2 goes to the F minus post of the detector tube (2); R8 goes to the F minus posts of all three audio tubes 3, 4 and 5). A plus is connected directly to the F plus posts of all five sockets.

The Aerial Transformer

All coils are wound in the same direction and only in that event do the following data apply to the polarity question. The aerial is connected to the extreme right-hand binding post in Fig. 7. That is the beginning of the primary, the same relative position as shown in the picture diagrams. Because the post is at right and nearer the end of Lo do not assume that the connection is made to the end of Lo, for the terminals of Lo are brought through the inside of the coil form to posts on the form itself, to secure the winding in place, this being done in the

The Full Wiring, Step by Step

Bernard Gives Directions In Masterly Detail

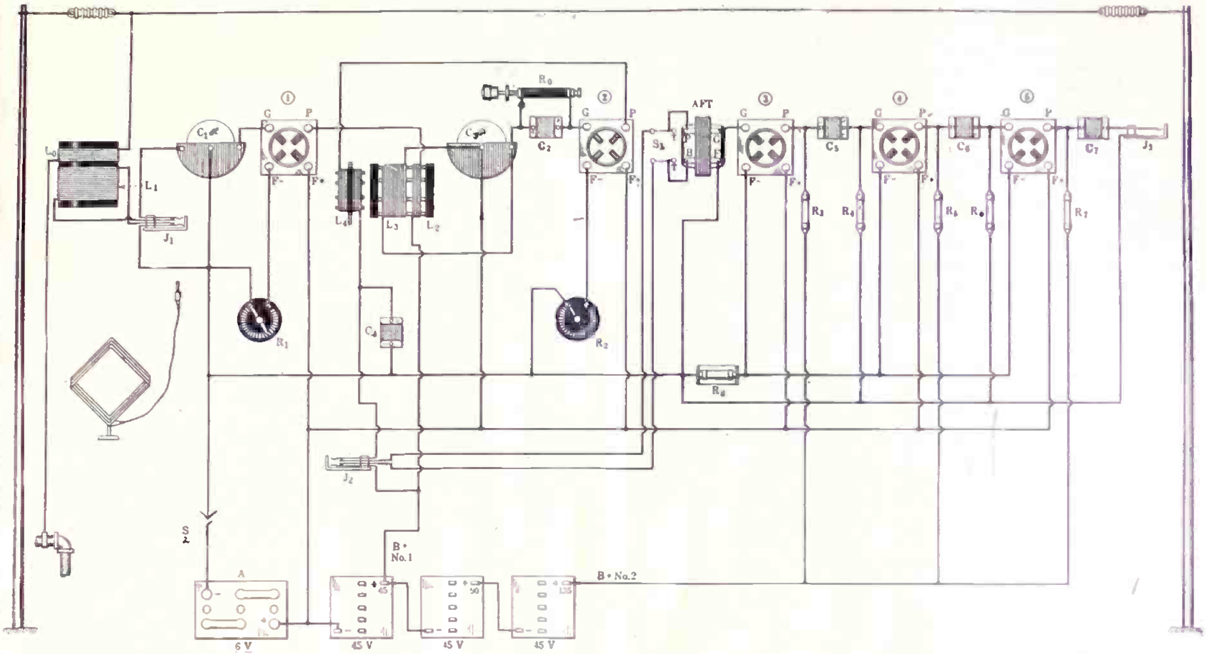


FIG. 8, the circuit diagram of the 1926 Diamond shown in picture form, with the A battery switch S2 used as a master switch, to turn the set on or off as a unit.

manufacture of the coil. Hence the connections actually are just as explained. The end of Lo is joined to the binding post, which will accommodate the ground connection. That completes the wiring of the primary of the aerial circuit transformer, LoL1.

As for the secondary, also be careful to follow the directions precisely. The beginning of the secondary goes to the lower inside prong of the jack, that is, the spring third from top. The jack referred to is the double-circuit one, J1. The right angle of the jack, that is, the lower outside terminal, the one that makes contact with the beginning of L1, goes to A battery minus and to the rotor plates of C1. Do not make this connection to filament minus. The difference between the two is that A minus is the lead as it comes right from the battery, while F minus is the same lead after it has gone through the rheostat R1. If you connect to F minus (i. e., the socket post) instead of to A minus (battery post) you will destroy the bias effect possible from the actuation of the rheostat, and also possibly cause a tuning effect due to the inductance in the wire-wound rheostat being included as a part of the radio circuit. Follow directions and exclude it from the radio circuit. There is no radio in the A battery or filament wiring. Check up and notice whether the end of the primary Lo goes to ground and the beginning of the secondary L1 goes to A minus. The beginning of the secondary adjoins the end of the primary. The remaining terminal of L1, end of secondary, goes to the other inside spring of J1, second from top, while the hooked spring, the uppermost jack leaf and the only remaining unconnected one on J1, goes to the stator plates of C1, and to grid or G post of the RF tube, No. 1.

The stator plates are represented in the picture diagram by posts at the outside of the end plate, while the rotor is represented in the middle, where the condenser shaft would be, for it is this that moves. Both outside posts therefore represent exactly the same lead, since the end plate is only one piece of metal. The rotor is insulated from the stator and hence represents another lead. Do not be confused therefore by the seeming existence of two leads (one to grid end of the secondary, the other to grid), whereas in fact they are one lead and the condenser stator is used for omitting a few unnecessary inches of busbar.

You connected the stator of C1 also to the grid of the RF tube, marked G on the socket. If there are no identifying marks on the sockets, take the position of the bayonet hinge, i. e., slot of the socket, as your guide. Considering the slot as in the center, at rear, of the socket, the post at left front will be A minus, that at right front will be F plus, that at left rear will be grid and that at right rear will be plate. Standard sockets are being considered, not the 99 type, which are different.

The Interstage Coupler

Connect the plate (P post) of the RF tube socket (No. 1) to the beginning of L2, the small winding on the stator form of the 3-circuit tuning coil. The end of this coil goes to the B plus 45 volt binding post. This would be a marked B plus detector, since the same voltage will be used on the detector plate. Also connect this B plus lead to the third spring from top in the double-circuit jack J2, called the detector jack. The beginning of the secondary, L3, that terminal adjoining the end of the primary, goes to the rotor plates of C3 and to A plus. The other terminal of L3 goes to the stator plates of C3, to one side of the grid condenser C2 and to the connection or lug of the grid leak Lo, which is almost against the panel. The remaining open end of the grid condenser goes to the G post of the detector tube socket and to the terminal of the grid leak, which is farther

---

Bernard Audio Circuit an Original Hookup

The double-pole double-throw switch effect from binding posts (S1TT) affords a novel advantage. In Fig. 7 the posts are shown third, fourth, fifth and sixth from right, on the terminal stub. Notice that two pieces of bus bar are used, each one joining the outside post to its neighbor. These pieces are called "straps." They are left just as shown when The Diamond of the Air is used as a unit. But should one desire to hook up some external detector circuit, to get speaker volume through the Diamond audio amplifier, this may be done very readily by pivoting the straps off the large binding posts, letting them hang from the smaller ones, and connecting the experimental detector circuit to the large posts, which represent the audio input (P and B in AFT). Also, with the straps in "off" position, as described, the smaller posts, representing the detector output of The Diamond, may be connected to an external audio-amplifier, to compare the results of The Diamond's audio hookup with those obtainable from some other kind of audio-amplifier. This connection to an external amplifier could be made through a plug inserted in J2. J2 is for earphone use when The Diamond is operated as a unit, to tune in a DX station perhaps. The idea of listening to programs on earphones is getting less popular year by year. But any one desiring to avail himself of this service may hook up the A battery switch according to Fig. 4, September 19 issue, or pull out the ballast resistor R8, of Figs. 1 or 8 is followed, to unlight the three AF tubes, or simply remove those three tubes from the sockets.

The audio hookup is a novelty at the final output, no B current flowing in the speaker, and no C battery being required, neither of these things being true of the so-called standard resistance hookup.

Anderson Is "First Customer"

Noted Radio Engineer Picks 1926 Diamond

LIST OF PARTS

One RF transformer, L0L1.
One 3-circuit tuner, L2L3L4.
Two .0005 mfd. variable condensers, C1, C3.
Two 20-ohm rheostats, R1, R2.
One variable grid leak, R0.
Two double-circuit jacks, J1, J2.
One single-circuit jack, J3.
One audio-frequency transformer.
Fixed condensers: One .00025 mfd. grid condenser, without clips, C2; one .001 mfd., C4; three 0.25 mfd., C5, C6, C7.
One ¾-ampere ballast resistor, R8.
One A battery switch, S2.
Three 0.1 meg. resistors, R3, R5, R7.
Fixed leaks, 1.0 meg., R4; 0.5 meg., R6.
Five sockets.
Three 4" vernier dials.
One 7x24" panel.
One socket shelf, 3x23".
One pair of brackets.
One terminal (binding post) strip, 2½x23".
Eleven binding posts (includes provision for S1).
Three brass angles (½ to 1½" arms).
Accessories: One 24" cabinet, 8" deep inside, as the set is 7" deep; 100 ft. aerial wire; 50 ft. No. 14 insulated leadin wire; One lightning arrestor; one loop for .0005 mfd. condenser tuning; one speaker; two phone plugs, one for loop, one for speaker; six 6 32 nuts and ½" bolts for right angles; one 100-amp. hr. storage battery for 6-volt type tubes; three 45-volt B batteries.
The parts used in the original model: L0L1, 99 RF; L1L2L3, No. 99 3-circuit tuner; C1, C3, No. 21 condensers; R1, R2, 20-ohm rheostats, all these Bruno; J1, J2, Arco; J3, Arco; AFT, General Radio No. 285; C2, C4, C5, C6, C7, Dubilier; R3, R5, R7, R4, R6, R8, Weby resistors; Brooklyn Metal Stamping vernier dials; R0, Bretwood Variable grid leak; Bruno socket shelf, Bakelite sockets, Bruno brackets.

from panel. The P post of the detector tube socket (No. 2) goes to the end of L4, the tickler coil, while the beginning of L4 goes to the top spring (hooked leaf) of the detector jack J2. If confused as to the tickler connections, because the actual connections are hidden, due to pigtail leads, etc., hook up the tickler either way experimentally, determine which way works to your greater satisfaction, and make that gratifying connection permanent. C4, the .001 mfd. bypass condenser, should be connected from B plus 45 volts to A minus.

The Audio Hookup

It will be noticed that the inside springs of the jack J2 are still unconnected. The spring (second from top) that makes contact with the tickler coil L4 (by closing on the top hooked spring) goes to one of the smaller binding posts shown (4) in Fig. 7. The remaining unconnected inside spring, third from top, goes to the other small binding post. Of course all binding posts may be of the same size, but if so, be sure to identify them. Metal markers are purchasable for a few cents. Scratch the figure "1" for plate and "2" for B plus on the binding post stub. Connect the two detector output binding posts to the two larger ones that adjoin them, using bus bar as the straps (Fig. 7). The detector plate lead is connected to the P post of the audio transformer AFT, while the B plus 45 lead

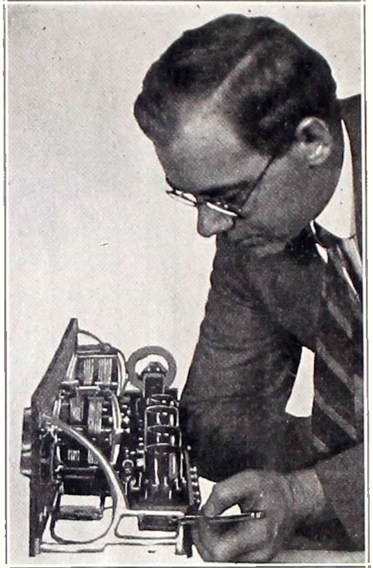


FIG. 9, J. E. Anderson, noted radio engineer, and the 1926 Model Diamond of the Air he built for his personal use.

goes to the B post. G on AFT goes to grid of the first audio tube (No. 3), while F of AFT is connected to A minus (not to F minus).

On some transformers the markings are different than P, B, G and F. The following covers all the systems used: P, P1 or 1, for the beginning of the primary, the connection made to plate; B, P2 or 2 for connection made to B plus; G, S1 or 3, for beginning of secondary, the connection made to grid; F, S2 or 4, the connection made to A minus.

The plate of the first audio tube (No. 3) is connected to one side of the 0.25 mfd. fixed condenser, C5, and also to one side of the 0.1 meg. resistor, R3. The other or remaining free side of that resistor goes to B plus, which may be 90 volts with good effect, but preferably should be 135 volts for greatest volume. This B lead is shown as B plus No. 2, while B plus No. 1 is 45 volts (for detector and RF). The open side of C5 goes to the grid post of the second audio tube (No. 4) and to one side of the resistor R4, which is 1.0 meg. (one megohm). That fixed resistor is a leak, not to be confused, however, with the variable grid leak. The other side of R4 goes to A minue (not to F minus).

The plate of the second audio tube (No. 4) goes to one side of the 0.25 mfd. fixed condenser, C6, and to one side of the resistor R5, which is 0.1 meg., as are all the plate resistors. The other side of R5 goes to B plus No. 2 (high voltage). The open side of C6 goes to one side of the leak R6, which is 0.5 meg. The other side of this leak goes to A minus (not F minus).

And now for the odd part of the audio hookup, which appears in this form in the 1926 Diamond for the first time anywhere, so far as I know.

The same coupling and isolating system is followed as in the resistance stages of audio. The plate of the last tube connects to one side of the 0.25 mfd. fixed condenser C7 and also to one side of the resister, R7, which is 0.1 meg. The other side of R7 goes to B plus No. 2. The remaining unconnected side of C7 goes to the hooked spring of the final jack, J3, while the right angle of the jack, or only other terminal thereon, goes to A minus.

This completes the wiring of the set itself. The external connections remain to be made.

Up to this point connections have not been made to A minus, A plus, aerial, etc., as only the binding posts to which these leads will be joined have received the actual contact. Now physically connect A minus to its post and A plus to its post. Then five tubes in the set at once. See if they light when they should. See that the rheostats actually govern the brilliancy of the two tubes they control. Try the switch. See that it turns the set on and off as a whole. Assuming that all works well so far, or that if trouble is encountered, that it is checked up by the textual or diagrammatic directions and remedied, take all five tubes out of their sockets. Disconnect A minus from its binding post. Connect B minus (of a 45-volt battery) to A plus and connect B plus 45 to its post. Now insert one tube in one socket only. See if the tube lights. If it does, take it out as quickly as possible. There is a short circuit. Find it. Remedy it. Of course use an old tube for this particular test if you have one that at least lights. If a short circuit existed and is assumptively remedied, put the tube in the same socket again. If it does not light repeat the test for the four remaining sockets, with the same tube. Do not try all five tubes at once under this test. All being well, restore the A minus lead to its proper binding post, leave B minus connected to A plus, and connect the one or two remaining 45-volt B batteries, depending on whether you intend to use 90 or 135 volts. You need not be afraid that 90 volts will not work well, nor need you doubt that 135 volts will not give fuller tone. The A and B batteries are connected in series, i. e., A minus is the starting point, A plus connects to B minus, B plus 45 on that the already-connected B battery goes to B minus on the next succeeding B battery of 45 volts, B plus 45 on the second B battery goes to B minus on the third and B plus on the third goes to binding post for B plus No. 2 in the diagrams. As series connection adds the voltages, the highest voltage post on each of the three batteries is, in the order of sequence, 45, 90 and 135.

The actual voltage used is a little more, because the A battery is in series too, hence contributes additional voltage. It is not the full 6 volts, but 6 volts minus the voltage drop in the filament resistors, say 1 volt, hence the actual voltage posts may be taken to be 50, 95 and 140.

Now connect aerial and ground to posts, and speaker to J3 and tune in.

Loop or Outdoor Aerial

If a loop is to be used, attach the loop cords to a phone plug and plug in at the detector loop jack, J1. This lifts the springs connecting to L1 and hence Lo L1, which means the aerial and ground system, is out of the circuit and the loop alone supplies the pickup. Many fans reported receiving great distances on a loop with speaker volume, some of them asserting that they had coast to coast reception on the speaker. I frequently tune in Florida and Chicago stations on a loop from New York City, and I have scarcely been able to receive any station

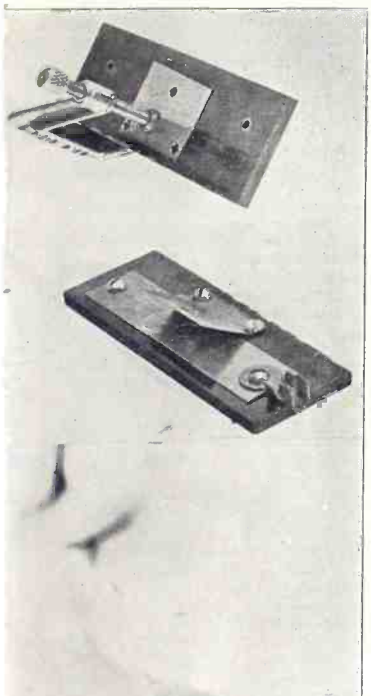
(*Concluded on page 24*)

A HOME-MADE NEUTRALIZING CONDENSER

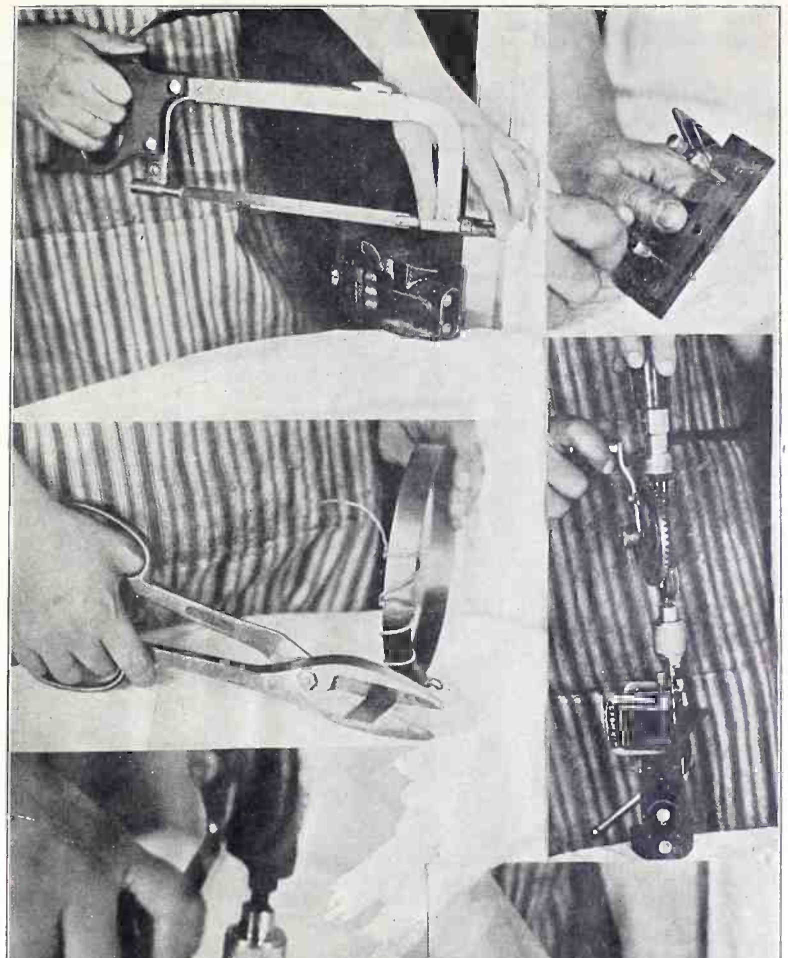
By Herbert E. Hayden

HERE is how to make a precision neutralizing condenser:
Mark off a square of 1" on a piece of

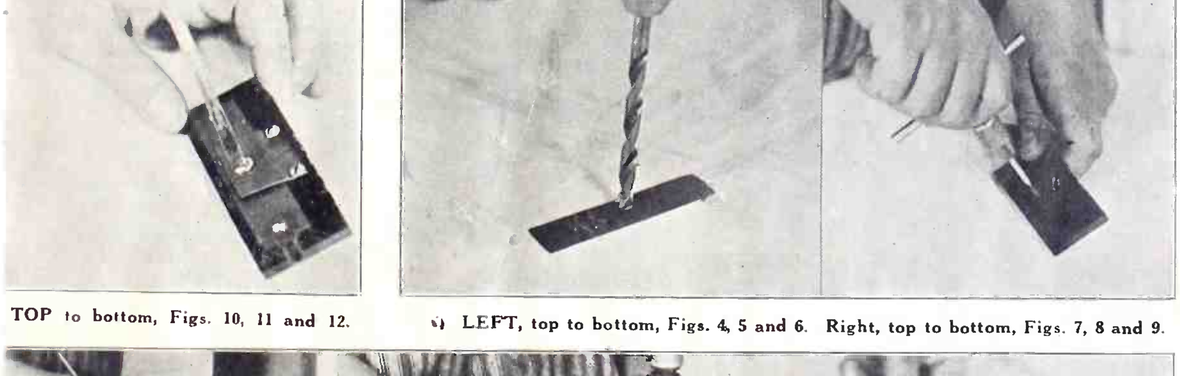
(*Concluded on page* 13)



TOP to bottom, Figs. 10, 11 and 12.



LEFT, top to bottom, Figs. 4, 5 and 6. Right, top to bottom, Figs. 7, 8 and 9.



LEFT to right, Figs. 1, 2 and 3, showing cutting of phosper bronze.

The 8-Tube Super-Hetrodyne

By Sidney E. Finkelstein
Associate, Institute of Radio Engineers

THERE is no receiver, disregarding the number of tubes employed, that can equal the Super-Heterodyne in every respect. The only possible objection to this receiver was that there are eight tubes. This objection is now wiped aside, I believe, due to the low cost of tubes, and the small amount of current that the filaments consume. By properly biasing the grids of these tubes the B battery consumption can be cut in half.

SIDNEY E. FINKELSTEIN

There are only two major controls. One is the tuning condenser and the other the oscillator condenser. Both of these should be of a very good grade, as the most efficient working of this set depends much on these instruments.

The Welty coils are made for this receiver, also the intermediate transformers.

How to Make Coils

Procure a bakelite, hard-rubber or cardboard tubing with an inside diameter of 2". The height of this tubing should be about 3¾". The wire used for the winding of this coil is No. 24 DSC. These data are for the antenna coupler. Stand the form up. One half inch from the top, in any portion of the circumference, make a dot. One and one-half inches from this dot and in the same line as the other dot, make another dot. Now stand the coil on the other circumference. Draw a straight line from one dot to a point on this circumference. Draw another line from the other dot to the same end of the form as the other one was. You will now find that these two lines are parallel to each other and separated 1½" at all points, in other words the lines are equi-distant. On this line drawn, but ½" from the top of the form, make a dot. On the other line and in the same plane make another dot. Drill ⅛" holes at all these dots. On any end, 1⅛" from the hole, start winding the primary. Pull the beginning of the winding through one loop. Wind 11 turns. Punch a small hole here. Run the end of the wire through this hole and thence to the hole opposite the one in which the beginning of this winding was brought. Leave 1½" and punch a small hole. This hole should be in between the two drawn lines.

Leave 1½" and in the same line as the other hole just punched, punch another. Run the wire through this punched hole and pull through the drilled hole that is directly opposite the hole containing the beginning of wire. Wind 68 turns, which constitutes the secondary. Run the end of the wire through the punched hole and thence to the only other drilled hole left. Now insert binding posts in these drilled holes. Mark the post carrying the beginning of the primary winding ant. and the binding post carrying the end of this winding Gnd. The post carrying the beginning of the secondary (68-turn portion) is marked F plus. The post carrying the end of the winding is marked G.

Winding the Oscillator

Lay this coil aside. The next coil to be wound is the oscillator. Procure a form 2⅛" in diameter and 2¼" in length. Stand the coil up on one end. One-half inch from the top and ¾" apart, make four dots. Drill four holes through these dots. Stand the coil on its other circumference. One-half inch from the top and in between the two holes drilled at the other end, make a dot. One-half inch from the top, and also in the center of the other two holes make another dot. Drill two holes where these dots were made. The diameter of these holes are ⅛". Three-quarters of an inch to the left of one of the two holes just drilled, and in the same line, drill another ⅛" hole. Three-quarters of an inch to the right of the other hole drilled, make the final hole, which is also ⅛" in diameter.

One-half inch from the center of the hole of the first binding post start winding the plate coil. Run the beginning of the wire through the first hole and continue winding 35 turns. Punch hole at the end of the winding and run this end to the hole adjacent to the hole carrying the beginning of the plate winding. Leave 1/16" and punch a small hole about 2" away from the hole punched for the end of the plate winding. One-half inch from this hole and in the same line punch another hole. Run the beginning of the wire through this hole and through the third drilled hole adjacent to the last one carrying the end of the plate winding. There are 39 turns wound. This is the grid coil. The end is run through the last hole punched, and to the only remaining drilled hole on that side, or adjacent to the hole carrying the beginning of the grid winding.

Now procure a form 1¼" in diameter and ¾" long. One-half inch from both edges, drill a hole ⅛" in diameter. Take a ruler and lay it over the top of the form (either circumference). Make as straight a line as possible. Make a scratch on the end of the circumferences that have no hole drilled. Now ½" from the top and the bottom of the form, and where the scratch is, drill a hole. A perfectly straight piece of wood or any object should be run through these two holes, without any trouble.

Leave 1/16" from the edge and wind 10 turns. Connect the beginning to a small nut on the shaft of the tubing. Connect the end to the beginning of the other 10-turn winding which is separated ½" from this winding. Connect the ending of this winding to the lock nut of the shaft at the other end. This shaft is not one piece. On each end insert a piece of brass shaft. This should go through the holes of the smaller tubing. The length of these pieces of shaft should be 1⅛". In order to hold the end of the shaft on, a lock nut or a piece of solder is put on the outside of the tubing. At this end, before the shaft enters the small tubing and after it enters the tubing, drop a piece of solder or insert a locknut. On the other end the same is done, except that at the end, there is set on a binding post head. This head should be either screwed or soldered on. Place some solder after the head is placed on the shaft. In order to make contact, there is a piece of copper plate between the lock nuts of both ends of the shaft to the binding posts to be placed.

How to Wire the Set

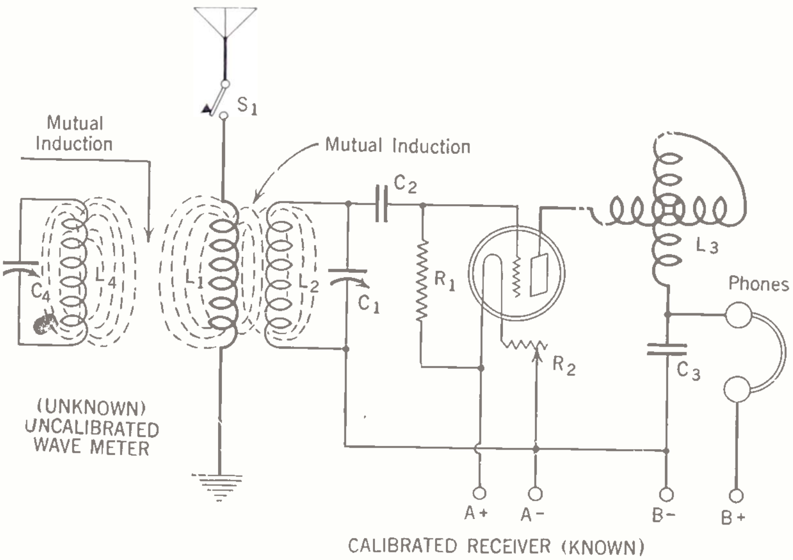
Bring the rotor plates of the variable condenser to a loop binding post and also to one terminal of the tickler coil. The stator plates of this condenser goes to the other terminal of the loop post, and to one terminal of the grid condenser as well as the grid leak. The other terminal of the grid leak goes to the grid post of the first detector tube. The other lead of the tickler coil goes to the F plus lead of this same lead. Connect the beginning of the plate coil to the rotor plates of the variable condenser, and to the plate post of the oscillator tube.

The end of this winding goes to one terminal of the .002 mfd. condenser, to one terminal of the input .0005 mfd. condenser, to the B post of the filter coil, to the 45-volt B plus terminal post, and to the upper terminal contact of the detector jack. The beginning of the grid winding goes to the left-off terminal of the .002 mfd. condenser and to the F minus posts on all the tubes. This F minus connection also goes to one terminal of the A battery switch. The other terminal of the switch goes to the A minus and B minus post on the terminal strip.

The end of the grid winding goes to the stator plates of the oscillator condenser and to the grid post on the oscillator tube. The plate post of the first tube goes to

(*Concluded on page 26*)

Receiver Calibrates Wavemeter



IF you know the dial readings of your regenerative receiver you may calibrate a wavemeter. C4 is a .0005 mfd. variable condenser. L4 is a 50-turn coil, wound on a tubing 3" in diameter with No. 22 DCC wire.

The 5-Tube Browning-Drake

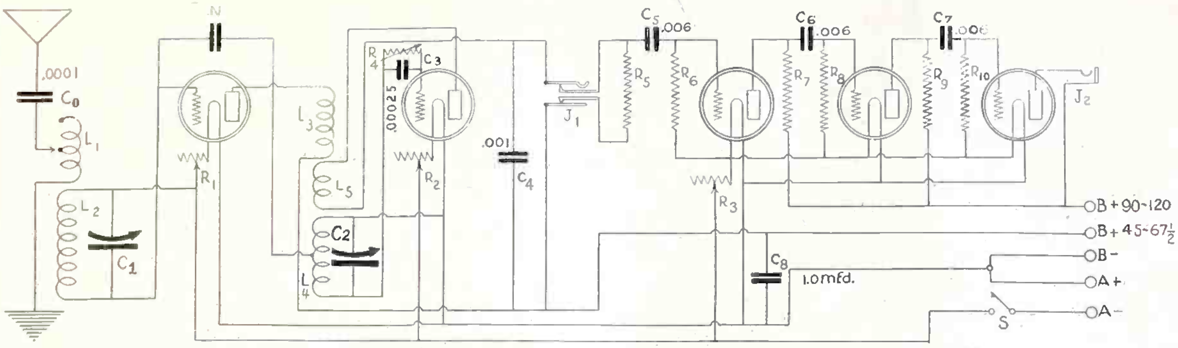


FIG. 1, wiring diagram of the 5-tube Browning-Drake receiver, including 3-stage resistance-coupled audio-amplifier.

By Capt. P. V. O'Rourke

ONE of the receivers that combines regeneration and tuned radio-frequency amplification that are very popular is the Browning-Drake, Fig. 1, shown as a 5-tube set. The circuit comprises one stage of RF, regenerative detector and three stages of resistance-coupled audio-frequency amplification. The RF tube is neutralized.

CAPT. PETER V. O'ROURKE

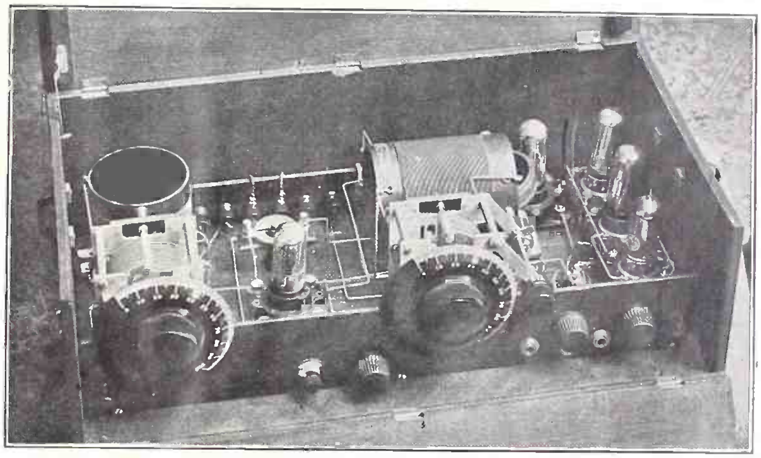
The primary of the aerial circuit transformer, L1, instead of being a plain winding and connected directly to aerial and ground, has an adjustable factor. The coil is not rotated for adjustment but a tap is taken on the primary. Instead of the aerial being connected directly to the primary it is joined to a .0001 mfd. fixed condenser, the other side of this condenser being connected to the movable arm of the tap switch. There should be two points on this tap switch and in addition two end stops.

The only other coil combination used in the tuned circuit is the 3-circuit inductance, L3L4L5. This is connected in standard fashion.

The diagram, Fig. 1, is so drawn that the correct manner of connecting the coil terminals is easily determined. For instance, the movable arm of the tap switch goes to one side of the aerial series condenser which is introduced at beginning of L1 or at the tap thereon. The ground goes to the end of L1 and a minus is connected to the beginning of the secondary and to the rotor plates of C1. This is actually shown in Fig. 1. The end of the secondary goes to the grid, to one side of the neutralizing condenser, N, and to the C1 stator plates.

With the 3-circuit tuning coil the same regard must be paid to polarities, and these are shown in Fig. 1 to be: plate to beginning of L3, B plus to end thereof; A plus to beginning of secondary (that terminal next to end of primary) and to the rotor plates of C2. The other secondary terminal goes to one side of the grid condenser to one side of the variable grid leak, and to the C2 stator plates. The tickler leads are so connected that the current flows in the tickler in the same direction as it does in the secondary, which is opposite to the direction in which current flows in the aperiodic primary, L3. Hence connect beginning of tickler to B plus and end to plate. This position is determined when the tickler and secondary windings are in the same direction.

In the audio circuit the hookup follows that of the Daven unit, the Daven resistors being used. The coils for this set most commonly used are manufactured by the National Company, and this holds good of the variable condensers, too, which are .0005 mfd. each.



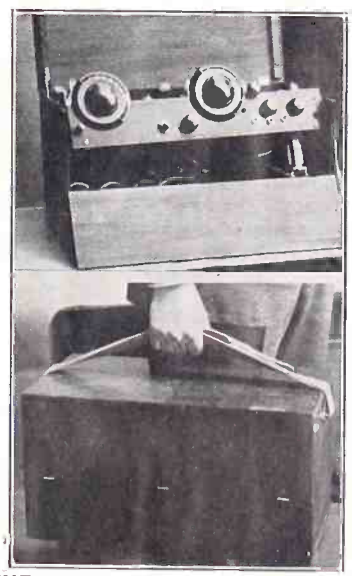
A VIEW of the assembly of the portable set.

Coil Data

Those desiring to make their own coils may procure two 3½" diameter forms, 4" high, and one form 2" diameter, 2" high. L1 may consist of 12 turns of No. 22 double cotton covered wire, tapped at the sixth turn, this tap being connected to the movable arm of the switch. It is a good plan to connect not only the tap to the movable arm of the switch but also to connect the beginning of the primary to the switch arm. This tends to minimize if not entirely prevent dead-end losses. The circuit as shown, however, is the one put forth by the sponsors of the circuit. Leave ¼" space at end of the primary and wind 45 turns for the secondary. This completes L1L2 which are on one form. Next wind 12 turns for L3, leave ¼" space, wind 12 turns of L4, take a tap (by looping the wire at this point and scraping insulation), then wind the additional 33 turns to constitute the full 45 for L4. The wire used in all these cases is the same kind and all windings are in the same direction.

The tickler consists of 38 turns of No. 26 SSC wire on the 2" diameter, room being allowed for the introduction of the rotor shaft of L5 (tickler). This shaft may penetrate the secondary L4 at the ¼" space between L4 and L3. The tap on L4 goes to the open side of N.

The audio hookup has the following constants: R5, R7, R9, each 0.1 meg.; R6, 1.0 meg.; R8, 0.5 meg.; R10, 0.25 meg. The coupling-isolating condensers are .006 mfd. each.

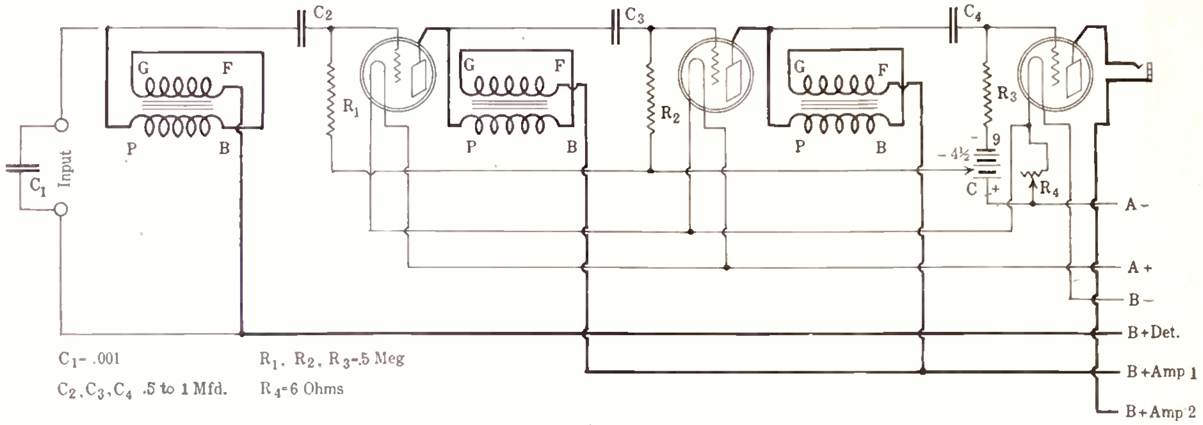


THE movable panel is shown above. The lower photo shows the set being carried in cabinet.

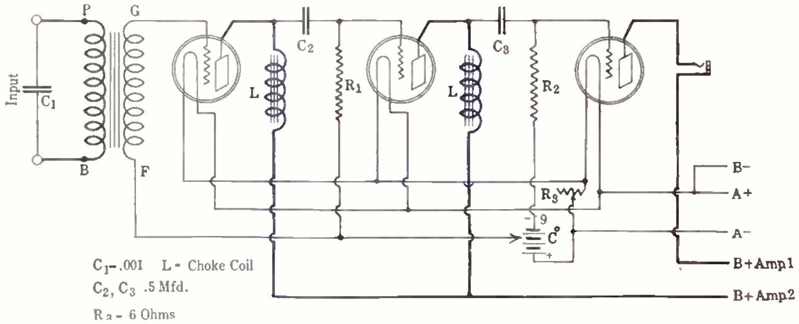
The photographs show the set as built by R. E. Cox, a salesman of the W. L. Douglas Shoe Co., Brockton, Mass. He made it in portable form, so that he might have it with him in his travels, and when

(*Continued on page 30*)

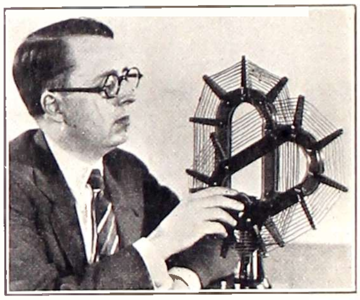
Four Good Audio Hookups



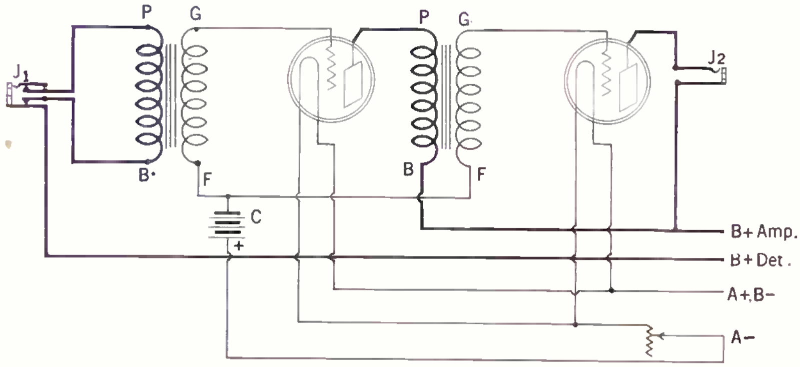
THREE stages of impedance-coupled AF amplification. Transformers are used as the choke coils, the primary and secondary of each being connected series-aiding. The markings are not correct for all types of transformers.



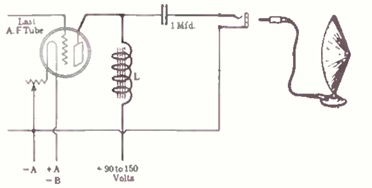
ONE transformer stage and two impedance steps. The choke coils L may be audio-transformers as in the hookup for three impedance-coupled stages. For C2 and C3 one may use .006 mfd., but .5 mfd. or even 1.0 mfd. would be better.



STEWART C. WHITMAN demonstrating his new tuning loop aerial. It is the first loop of its type that tunes the incoming signals to the peak of the wave desired. Tuning is simplified, in that all dial readings may be Calibrated. A great directional effect is obtainable with this loop. (Kadel & Herbert.)



THE MOST POPULAR form of audio-amplification, consisting of two transformer-coupled stages. J1, a double-circuit jack, is connected with outer springs to plate of the detector tube (top leaf in diagram) and B+ detector voltage. The inner spring making contact with the outer plate spring goes to the P post of the first audio transformer, the remaining spring to the B post. A battery, about 4½ volts for 90 on the plate, is used for both stages. One rheostat actuates the filaments of the two tubes. J2 is a single-circui 'ack. No by-pass condensers are shown.



HOW the final audio output may be connected from plate to filament. L is a choke coil.

The Weekly Rebus

Prospective Stations to Plead for a Wave

WASHINGTON.

Several new broadcasting stations in course of erection throughout the country will not be able to get wavelengths unless there is a radical change in the situation. The class B band is already crowded to overflowing while practically all of the class A channels have been assigned.

It is reported that the owners of these new stations are preparing to attend the next national radio conference with the hope of being able to talk Secretary Hoover into giving them a wavelength. He has none.

Present plans are that there will be no reallocation of wavelengths this fall.

Some Recent Numbers

B Battery Eliminator Theory

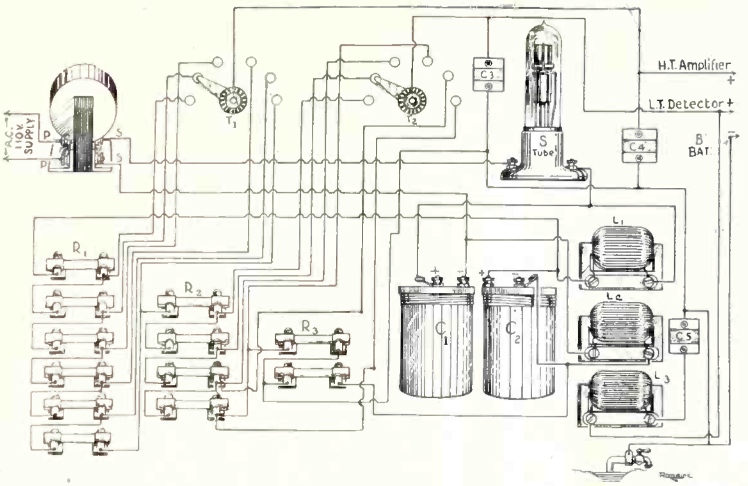


FIG. 1, showing the picture diagram of the tube B battery eliminator. Note that the last two resistances of the 4-125 ohm batch.

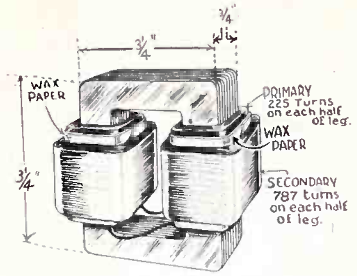


FIG. 2, showing how the AC transformer should be wound. Note the waxed paper separating the primary and the secondary windings. There is also waxed paper underneath the primary windings.

By Lewis Winner

Associate, Institute of Radio Engineers

[*Part I of this article on how to build a B battery eliminator was published last week, issue of September 19. Part II, the conclusion, follows*].

PART II

BY no means is this B battery eliminator perfect. It is, though, a step nearer the ultimate. It is the only one that can be made at home to come within most of the specifications of such an eliminator, which specifications are given later on in the text.

LEWIS WINNER

There is a hum, which cannot be noticed, however, except by the most discerning.

The operation of this eliminator is simple. All that is required for successful operation is to turn on the house juice and regulate the amount of voltage required for the specific tubes in your receiver. The voltage does not fluctuate at all. This can easily be tested with a voltmeter. The needle will not wiggle, that is, when each voltage is tried out, the reading of the voltage on the meter will be constant at all times, regardless of the length of time the meter is connected in series with the line.

No Worry

When working at these low voltages there is nothing to worry about insofar as flash overs or breakdowns are concerned. The instrument should work as soon as completed. Test your output leads and see if you are getting your rated voltage.

This instrument can be placed in a 7x18" cabinet. The cabinet can hide all unsightly wires as the insides of this article is by no means neat, especially if the step-up transformer was made at home. Use No. 12 rubber covered insulated wire for connecting up purposes.

Commercial Receivers With Eliminators

There are many radio receivers now being shown for the first time that incorporate an A and B battery eliminator. Some are wonderful receivers. The designers of these sets are to be congratulated. Some very ingenious engineering designs (so far as the B battery eliminator is concerned) are used. But the eliminators are not perfect. The DC ripple is still present after filtering. It is not noticeable by those who do not actually want to find it, but nevertheless it is present. The vocal, instrumental and oratorical student will have no difficulty in locating the hum, either on the extreme high or low frequencies. On the so-called middle notes (about 3,000 to 5,000 cycles), it is nearly perfect.

The main difficulty lies in compensating the capacity and the inductance of the line for the purpose of making the filter operate perfectly all the time, regardless of what happens to the line. There are a few manufacturers who have introduced such a method in the receiver, but the compensator does not seem to compensate somehow or other.

What Requirements Should Be Fulfilled by a Good B Battery Eliminator

What would then constitute a perfect B battery eliminator?

A perfect B battery eliminator should have the following aspects:

(1) No parts to be replaced.

(2) No chemical cells employed. Chemical cells require attention, in that water and solution have to be added from time to time. They also wear out.

(3) Very few of the present day eliminators, in fact I know of only two such instruments, are passed by the Underwriters' Laboratory. In order that your fire insurance policy shall be covered it is absolutely necessary either to get a certificate from the Underwriters' Laboratory or that there be some mark of their approval on the eliminator. Unless the eliminator is marked, "Approved by the Underwriters' Laboratory," a certificate of inspection should be obtained from the local inspection department of the Underwriters. The fire insurance company places a clause in the policy which covers all radio apparatus, provided a lightning arrestor is installed. Unless the current is generated by the insured, this clause covers all radio apparatus. The eliminator is not covered, according to the Fire Underwriters, unless specially so. I do not think that many users have given this much notice, as I never have heard anyone ask, when purchasing a B battery eliminator, or any electrical device, if its was passed by the Fire Underwriters, or to say, "Wait till I consult my insurance company."

(4) A vacuum tube rectifier shall be incorporated in the eliminator. This tube should have no filament and emit no light or heat. By eliminating the filament a long tube life is obtained, approximately 3,000 hours.

(5) There should be some sort of a compensating device so that the filtering action will be perfect all the time.

(6) This compensating device should be automatic in operation. In last week's article it seemed as if I meant that the device should be controlled by hand, but that is not the case. One that has to be adjusted is almost as bad as none at all. You would have to keep adjusting it unless you own the house you live in and know that nobody is fiddling with the line.

(7) The eliminator if separate should weight no more than five pounds. This allowance is made on account of the large physical windings of the step-up transformer.

(8) The voltage delivered should not fluctuate. If it does, the fluctuation should be within 1/10 of 1% of the rated output.

(9) The eliminator tubes should be properly fused, so that no injury may be done to the vacuum tubes in the set or to the house line.

(10) If the eliminator is placed within the set, it should be properly insulated to prevent accidental contact with the rest of the receiver.

The Hum

R4, the 5,000-ohm resistance unit, is connected in series with R3.

There might be some question in the minds as to the AC hum discussion. We really do not have an AC hum that is heard in the receiver, if the tube is rectifying properly. What we have is a DC ripple. Rectified AC is in reality pulsating DC. If a photograph were taken the pulsating DC would look like the big teeth of a saw. It is because of this irregularity that the filter system is employed. If we rectify AC and properly filter it, then it will be on a par with the DC which is obtained from a storage battery. Therefore when the filter system is destroyed, we hear the pulsating DC in the receiver and not the AC hum. The DC note is as annoying and is on the same basis as the raw AC. The AC hum is often referred to as being the real failure of eliminators, due to this peculiar action which is all right, as the effect is the same in both cases, except that one has a negative and positive alteration (AC) and the other one (DC) only has a steady positive

(*Concluded on next page*)

A 1-Control Regenerative Set

By Percy Warren

WE have had a great many 2-control, 1-tube receivers, but very few 1-tube, 1-control receivers. Fig. 1 shows the electrical wiring diagram of a 1-tube, 1-control regenerative receiver, good for volume on distant signals as well as on local reception. The plate and the grid we coupled by means of the coils L2 and L3. This receiver will squeal like the devil if the coils are not constructed and tuned with care.

PERCY WARREN

The only control is the variable condenser, shunted across the secondary of L2.

The cost of this set is very small. Most folk will have all the apparatus at home. The only expensive article that will have to be purchased will be the condenser.

How to Wind the Coil

The coil is wound on one form, No. 22 DCC wire being used. A form 4" in diameter and 6" long will accommodate the windings. One-half inch from either edge anchor the beginning the wire and wind 10 turns. Anchor the end in the tubing, where a small hole should be punched. Leave ¼" and begin winding the secondary L2. Anchor the beginning of this winding in a small hole in the form. Wind 45 turns. Anchor the end. Leave ¼". Wind 35 turns (L3) and anchor. The primary coil L1 is tapped at the 5th turn from the end. The plate coil L3 is tapped at the 18th turn from the end (B plus side). If you wish to use a 3½" form, the following number of turns should be used. L1 has 12 turns and tapped at the 7th turn. L2 has 49 turns. L3 has 40 turns, tapped at the 21st turn. If you wish to use the 3" form, the following number of turns should be wound: L1 has 15 turns, tapped at the 8th turn. L2 has 56 turns. L3 has 50 turns and is tapped at the 26th turn. Number 24 DCC wire may be used without changing the number of turns.

Don't use any dope on the coils.

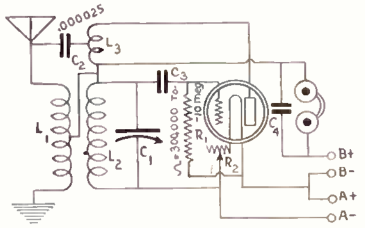


FIG. 1 showing the electrical wiring diagram of the receiver, described in the text.

How to Place the Parts

Use a 7 x 10" panel, with a cabinet to fit. The baseboard should be 6" long and 4" wide. Three and one-half inches from both edges of the panel and 3½" from the top and bottom drill a 3/16" hole. This is for the shaft of the variable condenser. Two inches from the left-hand edge and 2" from the bottom drill a 15/32" hole for the shaft of the rheostat, R2. R1, the variable grid leak, may be put on the outside of the panel or in the set proper. If you desire to place the leak on the panel it should be at the other end of the panel. This is 2" from the right-hand edge and 2" from bottom. The socket should be placed near the variable grid leak, and in case you place this one on the panel, the grid post of the socket should be placed near thereto. This means that the coil will have to be placed in the back of the baseboard, or about 1" from the edge of board. Directly in back of this coil, place the terminal strip. The grid condenser is placed on the grid binding post of the socket. C2, the special antenna capacity coupler should be placed near the antenna post on the terminal strip. C4, the by-pass condenser, should be placed near the B plus post on terminal strip.

How to Wire the Set

The beginning of L1 goes to one terminal of C2 and to the antenna post on the terminal strip. The end of L1 goes to the ground post. The left-off terminal goes to the tapped portion of L3. The beginning of L2 goes to the rotary plates of C1 and to the arm of the rheostat, which is also connected to the A minus post on the terminal strip. The end of L2 goes to the tapped portion of L1. It also goes to the end of L3, to the stator plates of C1 and to one terminal of C3. The other terminal of C3 goes to the grid post of the socket, and to one terminal of the grid leak. The left off terminal of R1 goes to the F plus side of the socket and to the A plus post on the terminal of the strip. This A plus post connects to the B minus post. The end of L3 winding goes to one phone binding post, in which one terminal of the phones is connected to. The other terminal is connected to the B plus post. The beginning of the L3 winding goes to the plate post on the socket. The resistance wire of the rheostat, R2, goes to the F minus post on the socket. The by-pass condenser C4 is connected across the phones.

Tuning the Set

There should be no difficulty in the operation of this receiver. As soon as the set is completely wired up, the phones inserted, the A and B batteries hooked up, the antenna and the ground attached, signals should be heard. If it is found that the signals are broad, reverse the leads of the secondary winding. If the oscillations are beyond control, reduce the number of turns on the plate coil. Also reverse the leads of this coil. If the signals are not loud, reverse the A battery leads. Use a UV201A tube, with 45 volts on the plate. Take out the by-pass condenser. Decrease the amount of resistance in the grid leak. I found that about 6 megohms was just right, but all tubes require different amounts of resistance in the grid circuit for sucessful operation. Try placing the grid leak across the condenser, for obtaining clearer reception. If you find that the set still oscillates too much, disconnect the lead from the end of L2 to the end of L3. Use a very short antenna (about 65 feet for best results). The rheostat will never have to be adjusted at all. Tuning is done with the condenser dial. If body capacity prevails, reverse the leads of the condenser, or ground the shaft of the condenser. Use No. 14 rubber covered wire for connecting up the set.

Various Uses for the "S" Tube

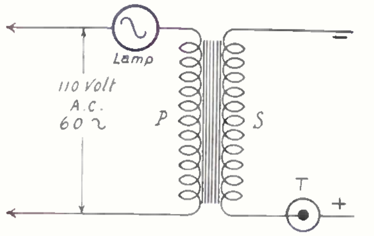


FIG. 3, showing how to hookup the "S" tube for charging purposes. T is the S tube.

(*Concluded from preceding page*)

flow. The other half of the cycle is not rectified with this type.

Other Uses of the S Tube

Those who have a storage B battery may use the S tube to a great advantage for charging purposes. In Fig. 1, we have the electrical diagram of the wiring of such a charger. Nothing in this divice should be attempted to be made at home. The time involved in making the step-up transformer is too great. The operations are tedious. The cost is small, but the above two disadvantages overweigh the cost factor. This transformer should be able to deliver a voltage of from 450 to 11,000 AC. The current-carrying capacity should be about from 1/5 to ½ amperes.

The charging current is regulated by the lamp, which is connected in series with the primary side of the line. A resistance, which is equal in value to that of the lamp, may be used instead of the lamp. The lamp should be of the carbon or the tungsten type. No other should be employed. The rate of charging the B battery is stated on the cover of the battery by the manufacturer. The following table shows how, with different sizes of lamps, the charging rate may be increased or decreased. The results given are within 10% correct:

Watts in Lamp	Charging Rate
100	.046 amperes
150	.068 amperes
200	.89 amperes
250	.995 amperes

In all these cases 550 volts secondary output were used on the S tube. The batteries that were charged had a rated output of from 20 to 100 volts. If you desire to charge a battery with a higher voltage insert a parallel lamp of a greater number of watts rating. For obtaining an intermediate number of amperes also place lamps in parallel, viz., 100-watt lamp in parallel with a 25-watt lamp gives you a charging rate of approximately .056 amperes. If you wish to charge a battery the rated amperage being .026, insert a 100-watt lamp in series with the original 100-watt lamp. It should take about 12 hours to charge a B battery. You cannot use this type of a circuit (in which the S tube is incorporated), to charge an A battery because the S tube delivers too small a current output.

There is a great deal of experimenting to be done in the B battery eliminator field. The road is tough. The telephone companies, who have had some of the greatest telephone and electrical engineers in the world working on this principle have not succeeded in finding a perfect eliminator. They use this current for the same purpose that the radio receiver uses it, that is, to supply the plates of the amplifier tubes. If there is one place where the current has to be constant it is here, as the least fluctuation in the line current will cause an annoying drone at the receiving end. They have eliminators but when they require perfect reception, as for line work, the storage type of battery is used.

Using the Secondary as a Loop

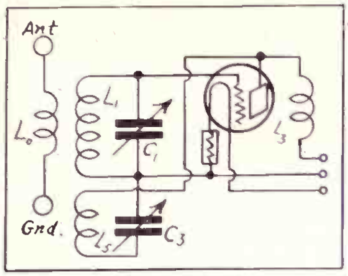


FIG. 1, the wiring diagram of the circuit that uses the secondary as a loop.

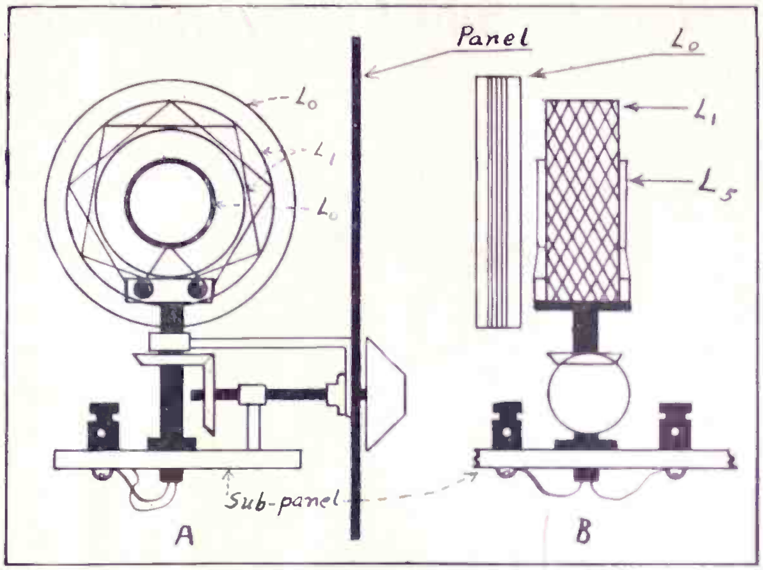


FIG. 2, the side and back views (A and B) of the coil as mounted.

By J. E. Anderson

Consulting Engineer

MANY modern sensitive receivers, such as The Diamond of the Air, multitube radio-frequency sets, Super-Heterodynes, and some reflexes operate satisfactorily on a loop for local and even distant stations. But a loop is often inconvenient to use on account of the large space it requires if it is to be comparable to an outdoor antenna and capable of being turned through 360 degrees. For this reason it may be desirable to use a very small loop, one that may be built into the cabinet of the receiver. But such a small loop is not capable of picking up sufficient energy from distant stations to operate satisfactorily any except the most sensitive receivers. It will, however, work with entire satisfaction for local stations for the types of receivers enumerated above. Such a loop may simply be a low-loss tuning coil having a diameter as small as five inches; but, of course, it should be as large as the amount of available space in the cabinet will permit.

J. E. ANDERSON

If such a small loop is used a time may come when it may be desirable to employ an outside aerial in order that extremely distant stations may be received. The usual plug and jack arrangement for interchanging a loop and antenna is not particularly adaptable to the built-in loop, and it is not very desirable at any time if a simpler means may be found. The difficulty may be solved by a simple arrangement which the writer has designed for use in his 1926 model Super-Heterodyne. A description of this arrangement follows.

Divided Circuit Used

Fig. 1 shows the beginning of this Super-Heterodyne, or of any other radio-frequency circuit having tuned transformers. Regeneration is employed in the first tube, and due to the peculiar requirements of the loop, the Weagant method of obtaining it has been selected.

L1 is the tuning coil which is used as a loop. It is mounted with its axis horizontal in such a manner that it may be turned through an angle of 360 degrees. The fixed tickler L3 is mounted concentrically with the loop with rigid supports so that it turns with the loop. Regeneration is then varied by means of the condenser C3. Thus the regeneration is independent of the orientation of the loop coil.

Now if the coil is to be used as a loop for the reception of local stations nothing is connected to the terminals "Ant" and "Gnd" of the coil L0. But if distant stations are to be received the antenna and ground leads are connected as marked. Now the coil L0 consists of a few turns of wire mounted in a fixed position on the wall of the cabinet or near the secondary coil L1. These turns of course constitute the primary, and any desired coupling between it and the secondary may be obtained by simply turning the loop. If very close coupling is desired the primary turns may be of larger diameter than the loop so that the loop may partly turn inside the primary, in which case the primary should be mounted away from the wall of the cabinet.

Since the loop must be capable of turning it will be necessary to use flexible leads to both L1 and L3, or an arrangement may easily be devised in which stiff phosphor bronze springs complete the connections in wiping contacts. It is preferable, however, to use soldered pigtail connections, at least for the tuned circuit.

The rotation of the loop is controlled with a knob mounted on the panel. A long coupling rod connects the dial with a 45 degree bevelled gear which engages with a similar gear mounted on the loop shaft. The details of the mounting of the coils and the control gear are shown in Fig. 2, A and B. As much as possible of the supports, including the control gear, should be made of hard rubber or other low-loss insulating material.

THE NEUTRALIZER

(*Concluded from page 7*)

28 gauge phosphor bronze. (Fig. 1). Use a scriber for this purpose or a sharp nail. A pencil will not suffice as the lines drawn are very hard to distinguish.

Before cutting this little square from the sheet of metal drill (Fig. 2) three holes in the positions as shown in Fig. 10. That is one near the bottom in the center, and two near the top, in each corner. The drilling should be done with a No. 27 drill.

Now cut the 1" square of bronze from the big piece, using an old pair of shears, or a pair of metal snips if you happen to have them. (Fig. 3).

Saw a piece of Bakelite 1¼x2½x¼". (Fig. 4).

Secure a piece of brass ribbon ½" wide and cut off a strip one and three-quarters wide. (Fig. 5).

In the center of this strip drill a ¼" hole and near the ends drill two more holes with a No. 27 drill. (Fig. 6). This is shown also in Fig. 11.

After this has been done, place the brass strip on the piece of bakelite, and hold it down tight with two little clamps. Now place the whole thing in a vise. With the No. 27 drill make three holes through the ones previously drilled in the brass, and right on through the Bakelite. Do not drill a ¼" hole through the Bakelite, just through the brass strip.

Next take a 6-32 tap and pass it through the holes drilled in the Bakelite (Fig. 9). to receive the machine screws, which will be described later.

Now place the small square of phosphor bronze over the Bakelite with the center top hole over the center one in the Bakelite piece, and which has also been tapped with the 6-32 tap.

The two lower holes in this little square are also drilled through the Bakelite strip, and these two are to be used for holding one side of the bronze fast to the Bakelite. The machine screws are placed right through and cut off flush on the other side.

HERBERT E. HAYDEN

The brass strip is placed as shown in Fig. 11, just under the little square.

Now the large head 6-32 machine screw. If you cannot get a large head machine screw, solder a washer just under the head of the screw.

Set Baby Can Build Brings in Great DX

RESULTS EDITOR:

I have just finished The Set A Baby Can Build, as described by Herbert E. Hayden in the August 29 issue. I added a two-step amplifier (3 tubes in all) and picked up stations WGY, WBZ, WLW and KDKA on the speaker. On the phones I picked up stations WCX, WWJ, KYW, CNRA, WEBH, WOJ, WORD, WOO, WEAF, WTAS and WSAI. I wish to thank Mr. Hayden for this circuit.—Willie Martin, 734 Clay Ave., Norfolk, Va.

By HUGO GERNSBACK:

How to Build the Balanced Interflex Circuit

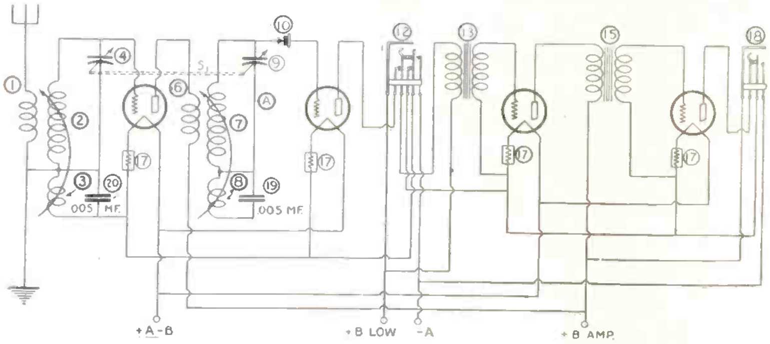


FIG. 1, the wiring diagram of Hugo Gernsback's 1-Control Balanced Interflex

[*Hugo Gernsback, author of the following article, is one of the outstanding personalities in the realm of radio the world over. Editor of "Radio News" and member of the American Physical Society, he has achieved fame both as a practical radio engineer and author and as a deep student in the field of metaphysics. A man of great vision, he is fired with an inspired imagination and communicates this gift to practice with every earmark of genius. Like all intellectual adventurers, he has on occasion attempted scientific feats far beyond the practical accomplishment of the day, for which he has been criticised, but mainly by sluggards and the envious. His Balanced Interflex Circuit, a 4-tube receiver, introduces a new star in the heavens of radio.—Managing Editor.*]

IT has always been my secret ambition to produce a multi-tube circuit which has but one control, not just a single tuning control, and then, stuck away in some obscure corner, some potentiometer or some compensating condenser control, or what-not.

The Interflex Balanced Single-Control Set described here is the result of ideas on single-control sets which I have cherished ever since February, 1923. I believe sooner or later all sets will have to come to real honest-to-goodness single control, by which I mean just one knob and nothing else.

The ideal set should not oscillate; that is, it should not howl and produce shrieks from 200 meters up to 600 meters. Stations should come in without any disturbing noises and all the time there should be only one control or one knob to accomplish this.

The circuit described here does all of these things and quite a good many besides.

Theory of This Set

The Balanced Tuned Interflex Four-A comprises one stage of tuned radio-frequency, crystal detector and three stages of audio-frequency amplification, of which the last two stages are transformer coupled.

In all tuned radio-frequency circuits, if the set howls and squeals, on regeneration, it is necessary to provide losses. There are several methods of obtaining such losses, but the one most customary now is to place the inductances in the magnetic field of the condenser in such a way that there are certain absorption losses. But it is apparent that this is a very crude way of accomplishing these losses. In the first place, moving the coils even 1/64 of an inch closer to or farther from the condensers will make a tremendous difference in signal strength. Furthermore, the losses are not always fully realized, and in spite of some constructors' claims, the majority of the sets thus made squeal and howl most annoyingly.

I have thought of overcoming these defects by using an original method which, to the best of my knowledge, has not been described before.

Granted that we must have certain losses to do away with excessive oscillations, and that a set works best just below oscillations, the following method was adopted: the tickler, in connection with the fixed condenser, is used as an ADJUSTABLE "LOSSER." By means of this arrangement it now becomes possible to adapt the set not only to whatever local conditions there may be, such as aerial and ground, as well as tubes and batteries, but to dozens of others, which we all know vary in every locality and in every set.

"A Most Surprising Thing"

In this particular circuit, if the tickler coils, of which two are used, are correctly adjusted, this set does a most surprising thing. The ticklers can be adjusted at the lowest available wave, say 200 meters, so that the circuit is on the point of oscillation. **If correctly adjusted, impossible as this sounds, the same condition will prevail through the entire broadcast range up to 600 meters.** In other words, stations of 200 meters up to 545 meters will come in with the same intensity, and the stations in between as well.

In Fig. 1, the complete circuit is shown. It will be seen that we have two ticklers, 3 and 8, shunted with .005 fixed condensers.

In order to produce a circuit with but a single control it was necessary to link the two variable condensers.

It might be thought that the tickler 8, with its condenser 19, could be grounded to the filament of the second tube at 17. The connection exists, although it is not immediately apparent. You may trace the connection from condenser 19 through connecting wire A to the rotor of condenser 9, then through the connecting link of the two condensers S1 to the rotor of condenser 4. Thence the circuit goes down through the tickler 3, which you will notice is grounded on the filament 17. Tickler 8 might, therefore, be said to be in series with tickler 3.

The variocouplers shown in Fig. 2 are factory-made, but for the constructor who wishes to build his own may do so at little expense. It should be remembered, as will be seen further down, that once the ticklers are adjusted they are never touched again. Hence, the construction of the ticklers need not be extraordinarily good, because they are used only when the set is first put into operation.

Ordinary well-seasoned cardboard tubing, which has been either shellached or dipped in hot paraffin, should be used. The tickler construction is very simple. Merely use a 1½" piece of tubing, through which passes a threaded 6/32 or 8/32 rod, which is attached to the tubing by means of ordinary hexagon nuts. The bearings can be punched right into the cardboard and no fear need be felt that they will wear out, because the ticklers are not used enough, as has been mentioned. Flexible leads go from the rotor to binding post.

The Double Variable Condenser

We now come to the next important consideration, and that is the double variable condenser. In the Balanced Interflex I found it advisable to use a straight-line frequency condenser, which for many reasons is the most desirable. Two of these were coupled on one shaft, as will be seen by the photographic illustration. Of course, you can use either a straight-line frequency condenser or any other condenser, for that matter, to suit your needs. The two rotor shafts are joined and the only piece which you will need is the connecting sleeve, which any machinest will be glad to make for you at small cost. When buying the condensers it is necessary to be on the alert to see that you select one in which the shaft extends not only on the side which carries the dial, but on the opposite side as well, because if it does not, you cannot make a connection to the second condenser.

Quite a few condensers on the market have a shaft that is extended, and which usually has a slot at the end. If it has not, you can easily provide one with a hack-saw so that it will fit the tennon of the sleeve. The set-screw is quite important, for reasons which will be apparent later.

There are also on the market today condensers in gangs of two that you may buy ready-made, and if you use them, it is, of course, not necessary to provide any connecting sleeve, because such double condensers are usually built upon a single shaft. The adjustable sleeve method is the better, however, as you will see below.

The two condensers shown in the illustrations are supported by means of a bracket between the two. In other types of condensers it would be better to have an end bracket, as some of these condensers are rather heavy and should be supported from the end.

Advice on Panel

The set shown here was made with a panel 7x18" while the baseboard measures 7x17". This was done to save space and make a compact set. I do not, however, recommend these measurements to the average builder, because thr is too much cramping; the panel should be at least 7x21", with a sub-base 7x20", if possible. Or even 7x24" panel with base 7x23" can be used. It will be noticed that the variocouplers are mounted right on the panel. This necessitates drilling holes in the front panel, which have to be filled up afterward. If this feature is not desired, the variocouplers may be placed upon the baseboard, but in that case we must use

Wiring the 1-Control Reflex

Oscillations Are Squelched by Inductances

LIST OF PARTS

Two straight-line frequency condensers, .0005 mfd.
Two variocouplers.
Four Amperites.
Two audio-frequency transformers, 3½-to-1 ratio.
Four sockets.
One fixed crystal detector.
Two .005 fixed condensers.
One vernier dial.
Two automatic filament-control jacks.
One 7x21" panel.
One 7x20" baseboard.
Six binding posts.

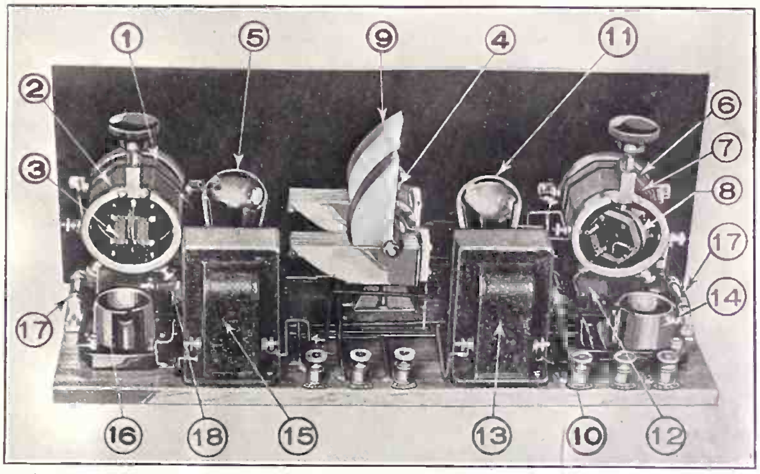


FIG. 2, rear view of the receiver. The numerals identify the parts correspond to those in Fig. 1.

the larger baseboard, because with the smaller size there would be no room left. The set can then be wired as shown in our wiring diagram.

A front view of the set would show only one knob and the turning of this knob will not only bring in the locals, but the DX (distant) stations as well, without any other control whatsoever. The 'phone jack for head-phones is at the left, while the jack for loud speaker is at the right. When through using the set, the listener pulls out the plug, which automatically disconnects all the vacuum tubes. There is no switch on this receiver.

Operation of the Set

This is a world in which you cannot hope to get anything for nothing. By this I mean that when you have reduced the usual six or seven controls in your set to a single one and still expect to get exactly the same results, if not better, than with the old controls, you must of necessity compensate for this. **And it is in the full compensation of this set that its success lies.** I recommend to the builder of this set that he try the carborundum detector as well as several others. As a matter of fact, it becomes necessary to have several fixed detectors, because it will be found that not all of them are suitable for this set. Not every detector will work, and I have found that the detector that is too sensitive will make the set howl and squeal, which is exactly what it is not supposed to do, and does not do if the detector is well chosen.

You will understand, of course, that the B battery minus goes to plus A. This saves one binding post in the set when you connect it.

Not One Rheostat

As will be seen, no rheostats are used in the set. These are supplanted by automatic resistances or Amperites, which work very nicely. If the set is completely wired as per instructions, and if the correct materials have been used, we are now ready to tune the set.

It will be found that on locals the set, if the connections are right, will work immediately, although it may squeal and howl. It now becomes necessary to adjust the tickler controls. **The whole secret of the set lies right in these tickler controls.** As I said before, in a world in which you cannot hope to get anything for nothing, it will be found that a little work must be put in to adjust these two coils in proper relation.

How to Tune In

Proceed as follows:

Tune in the lowest possible station, say around 210 or 220 meters. Adjust your tickler controls in such a way that the station comes in loudly without squealing. By turning both tickler controls **very** slowly you will find a point which is just below the oscillation. That is the correct point. It will be found that, as you turn the condenser tuning control, the stations will snap in with a startling loudness without being accompanied by any squealing or howling throughout the entire range of 200 to 545 meters. If there should be howling or squealing at any of the higher stations, the ticklers are not adjusted correctly. It may be necessary to turn one tickler all the way around and try working it back the other way. Sounds should come in not only loudly, but without distortion of any kind. **If distortion exists, the ticklers are incorrectly adjusted.**

It will take you a little while to become familiar with this adjustment, but once you "get the hang of it," you will be astonished at the power and selectivity of the set.

If, despite everything, the set still howls, then the trouble lies in the coupling between the two condensers. In other words, the condensers do not balance the inductances. In that case the condenser sleeve, as shown in Fig. 5, should be loosened and one of the rotors of one of the condensers advanced or retarded ⅛", more or less. This can best be determined by experiment. In the set which we see illustrated here it was found that for best operation the outside rotor was almost ⅛" out of step with its mate. With a little experimenting you can find the correct point, after which the sleeve may be tightened. This should stop all squealing, and the set may now be said to be perfectly balanced.

There may be other reasons for squealing and before attempting to adjust the condensers, please bear the following important considerations in mind: No two tubes are alike. It will be found necessary in most cases to switch around the four tubes; this often remedies the trouble. Also, as stated before, the fixed crystal detector may be at fault. A detector that is too sensitive causes howls. You will also notice that as you insert a new detector into its holding brackets, you have to retune the set slightly.

The detector may work better if reversed. Try this and you will find that when it is operated in one position, reception is louder.

Of what good is the crystal detector? It gives an amplification factor of about 10 to 20. This may not be so apparent on locals, but if you short-circuit the detector on distant stations, you will find that the signals are in all cases practically killed. Besides, the detector in the grid circuit makes for great clarity of signals.

Trouble Hints

Another important point is the detector voltage. With the set shown here, the particular voltage for best results was 21. This means that you should use a tapped B battery on the detector side. Forty-five volts on this particular set practically killed all signals, except powerful local stations.

Try reversing aerial and ground. Very often this makes a big difference. If your aerial is 100 feet or longer, it is quite necessary to place a .00025 fixed condenser in series with the antenna.

The set may be said to work normally when, by turning the tuning control, the stations snap in with a loud clucking sound at their full power. **There should be no howl or squeal through the entire broadcast range.** When the set is finally adjusted and works at its best, it may be noticed that during the month it develops a squeal. This is a sure sign that the batteries are running down. With a new battery the ticklers may need a slight retuning. If new tubes are used or tubes are switched around, retuning of the ticklers is, of course, necessary.

This particular set, on a 60-foot aerial, brings in KDKA at a dial setting of 50, and the volume is tremendous—stronger than some of the locals. This in midsummer, with lots of static prevailing and transmitting conditions notoriously poor. The locals, of course, come in with tremendous volume over the entire range. Distant stations that have been heard on a single evening are given in the list. This should by no means be considered a record, because receiving conditions in New York are poor. Besides, the log represents that of a sultry August night, with a great deal of static which made it impossible to get the calls of many more stations that otherwise could have been logged.

The receiver should be of particular

(*Concluded on page* 30)

Radio University

A QUESTION and Answer Department conducted by RADIO WORLD for its Readers by its staff of Experts. Address Letters to The Radio University, RADIO WORLD, 1493 Broadway, New York City.

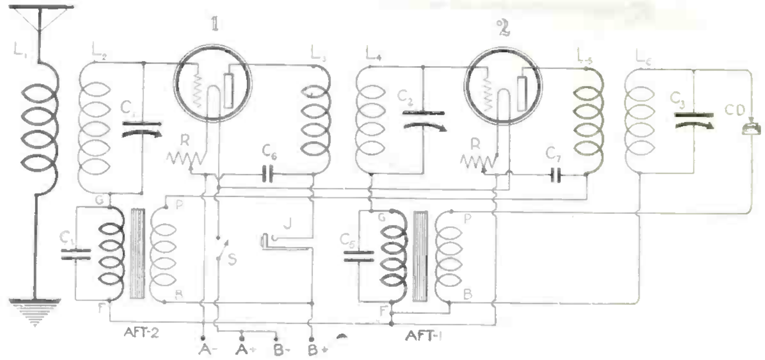


FIG. 202, a 2-tube Inverse Duplex. L1, the primary, has 10 turns wound on a 3½" tubing 4" high, with No. 24 DSC wire. There is ¼" space left and L2, the secondary, has 43 turns. L3 and L5 are the same as L1. L4 and L6 are the same as L2. C1, C2 and C3 are variable condensers having a capacity of .0005 mfd. C6 and C7 are .001 mfd. condensers. C4 and C5 are both .0001 mfd. condensers. The rheostats R have a resistance of 20 ohms. CD is the crystal detector.

A DIAGRAM of 2-tube Grimes Inverse Duplex is requested.—T. Larkins, Swithimpson, N. D.

See Fig. 202.

* * *

CAN I use a 3-circuit tuning coil in The Diamond? The primary is wound with Litz wire and has 10 turns, the secondary is wound with No. 22 SCC wire and has 34 turns. The tickler has 30 turns, and is wound with Litz wire. (2) Is it vital to use Litz wire rather than No. 22 SCC wire? (3) Can the RFT be wound with No. 22 DCC wire? There are 12 turns on the primary and 45 turns on the secondary.—A. F. Scheibeck, 244 Locust St., Chillicothe, O.

(1) Yes. (2) No; No. 22 DCC or SCC wire is usually used on account of the ease encountered in winding and also soldering connections. Litz has a high resistance at high frequencies. (3) Yes.

* * *

I INTEND TO build The Diamond of The Air and would like to use .0003 mfd. condensers in the set. Would they give satisfactory results and range with the proper coils? If so, what would be the proper number of turns for the coils? (2) Can basket-weave coils be used with equal results? (3) Can a tuned plate coil be used with a .0003 or .00035 condenser in place of the regenerative tickler? If so what would be the proper type coil to use?—F. L. Mills, 8121 Korman Ave., Cleveland, O.

(1) Yes. The primary of the RFT coil may be wound on a 3½" diameter tubing and contain 15 turns. The secondary contains 57 turns and is wound on the same tubing, using No. 22 DCC wire. The primary and the secondary intermediate coil is the same as above. The tickler is wound on a 2½" diameter tubing 2" high and contains 40 turns, wound with No. 24 SSC wire. (2) Yes. (3) A 40-turn coil wound on a 3½" tubing, using No. 22 DCC wire.

* * *

I BUILT The Diamond and get very broad tuning. Is there any possible remedy?—J. Uher, 413 East 84th St., N. Y. City.

Reverse the tickler leads. Add more turns to the tickler coil. Reverse the secondary of the RFT. Use a short antenna. Check up your wiring. There is a mistake in it, otherwise the set would be selective.

* * *

WOULD a straight-line frequency .0005 mfd. condenser be better to use in H. E. Wright's Transcontinental 2-tube set that was described in Jan. 31 issue of RADIO WORLD than three of the other types? Could I separate the stations on the low wavelengths with the kind mentioned above?—George Steidle, Jr., 941 Centre St., Mauch Chunk, Pa.

The efficiency depends on the make of condenser, and SLF has to do only with separating low wave stations easily. You may use the SLC condensers with SLF dials, with nearly same results.

* * *

WITH REFERENCE to the Very Loud 1-Tube DX Set published in the Sept. 5 issue of RADIO WORLD. (1) I have one 11-plate condenser on hand and would very much like to use it in building this circuit. Kindly advise the number of turns of wire necessary to enable me to use this condenser. I have number 24 DCC wire on hand. (2) Will a C12 tube be O.K.?—H. Reuss, Philadelphia, Pa.

(1) There should be 75 turns wound on the same sized tubing as prescribed in the text of that issue, for shunting the secondary of L2. There are 65 turns wound for L3. (2) Yes.

* * *

I AM building The Diamond. (1) I would like to know if an Uncle Sam 3-circuit low-loss coil and an Ambassador antennae coil would work well? (2) Will a 6-ohm rheostat run three 201A tubes?—Kenneth Shipton, 3220 Emerald St., Philadelphia, Pa.

(1) Yes. (2) Yes, but the separate rheostats for the RF and detector should be used. The 6-ohm would do for the two or three AF.

* * *

WE HAVE an Autoplex receiver, to which we have added two stages of audio frequency amplification. (1) Would it be feasible to place a step of radio-frequency amplification ahead of this detector?—Donald P. Finch, 58 Firingston St., New Haven, Conn.

It is not advisable to add radio-frequency ahead of a receiver of this particular type, which is a super-regenerative.

* * *

I HAVE built The Diamond with the optional loop, but can get no results when I plug in the loop. The set works excellently otherwise.—W. Nimblett, 22 West 135th St., N. Y. City.

There is an open circuit in your jack or a short circuit in the loop. Look at the two interior jack springs and see if they are making contact with the upper ones. A better way is put a pair of phones in series with a 1½-volt dry cell contacts and test for a complete circuit.

* * *

IN BUILDING The Diamond I would like to use three rheostats, one for the RF tube, one for the detector tube, and one for the two AF tubes. Would it be advisable to use ballast resistances? I am using UV201A tubes.—E. J. Bower, Sioux Lookout, Ontario, Canada.

The rheostats for the radio-frequency and the detector tubes should have a resistance of 6 ohms, while a ¾-amp. ballast resistor will do for three AF tubes, or a ½-amp. type for two AF tubes.

* * *

WHY ARE some coils wound with single, double cotton or silk covered wire? (2) What advantage has the single cotton covered over double cotton covered wire? (3) Is silk better than cotton? (4) Can stranded wire be used with advantage? (5) Is No. 18 stranded rubber covered wire good for loop winding? (6) What is the best type of wire to use in The Diamond, double cotton covered or silk covered wire? (7) I have a Ford Mica 3½ and 5 to 1 AFT. Can they be used in The Diamond?—P. L. Lengthen, Randon, Cal.

(1) So that there will be more or less inductance present in the coil and, in some cases, e.g., DCC wire, less distributed capacity. When using single cotton

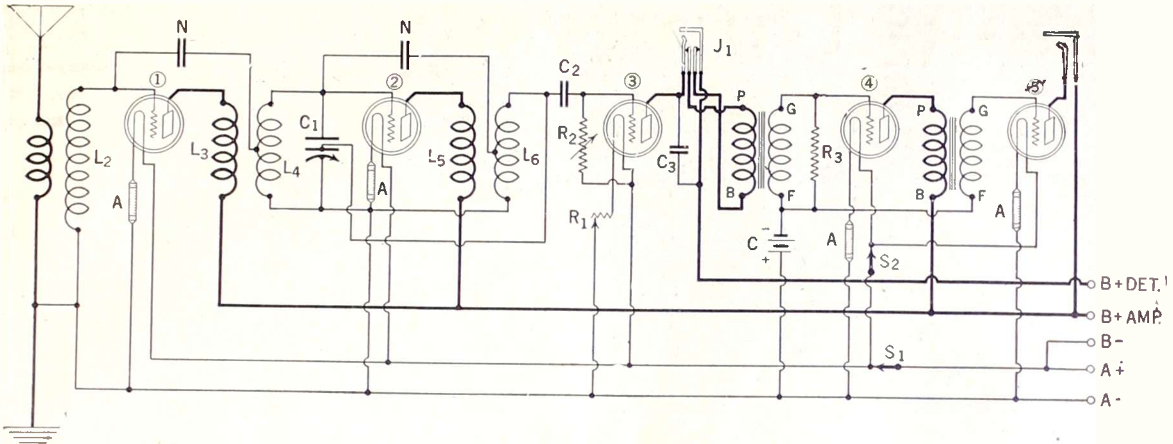


FIG. 203, showing a 5-Tube Neutrodyne, using only one control. The coil constants are: LL2 is a standard commercial (fixed) RFT. L3L4 is wound on a form 3" in diameter and 4" long. There are 12 turns in the primary. Use No. 22 DCC wire, leave 1/8" and wind 12 turns; make a loop and wind 33 more turns, making a total of 45 turns on the secondary. The 12th turn tap is for connecting the neutralization condenser. L5L6 is wound on the same kind of tubing and same number of turns as L3L4. The double condenser (C1) has two separate stators and a common rotor. C2 is a .00025 mfd. grid condenser. R2 is a variable grid leak. N are the neutralizing (variable) condensers. R1 is a 6-ohm rheostat. R3 is a 100,000-ohm resistor. J1 is a double circuit jack. The jack is a single circuit jack. A are the amperites (type to be determined by kind of tubes used).

covered wire, there are fewer turns of wire needed than with DCC. (3) No. (4) Yes. (5) Yes. (6) Double cotton covered wire is considered the best. Usually the kind of wire makes little practical difference. (7) Yes.

* * *

PLEASE INSERT a diagram of a 1-dial 5-tube Neutrodyne receiver. — T. D. Blankins, Longston, Tex.

See Fig. 203.

* * *

I WOULD like to use the UV199 tubes in the RFT and the AFT of The Diamond while a Sodion tube is used in the detector socket. Is this a good combination? (2) Can the loop be successfully used on this set? (3) I cannot make my set tune in step. One dial reads 45 for a certain station while the other one reads 65.—F. D. Love, Williamson County, Tex.

(1) This is a good combination. (2) Yes. (3) If you mean the condenser dials, remove turns from the coil whose condenser gives the higher reading.

* * *

WILL YOU please give me the winding of the RFT to work in connection with the Globe Low Loss Tuner?—Frank Bertoldo, Box 53, Coalgate, Okla.

There are 10 turns on the primary of a 3½" tubing using No. 22 DCC wire. The secondary consists of 45 turns, employing the same wire, and immediately adjoins the primary.

* * *

COULD I use the UV199 tubes in The Diamond? (2) What is the resistance of the rheostat?—C. B. Arendt, 409 9th St., Valley Junction, Ia.

(1) Yes. (2) 50-ohms, when using a 6-volt storage A battery, 20 ohms when using the 4½-volt A battery.

* * *

DOES television apparatus attach directly to the output of your receiver? (2) Will there be any drawbacks such as static and will static bother the pictures and in what way will it manifest itself? (3) How bright should the light in a rectifying bulb used in charging batteries be? Mine gets very hot while operating. Is this a sign that the transformer is not just right?—William R. Haugsted, 606 9th St., Nevada, Ia.

(1) No, a special receiver is required. There are no general data obtainable on this subject. It will be discussed a great deal at radio engineering societies. Keep in touch with these societies, as well as the Bureau of Standards Circulars. Little is generally known on the subject. (2) Static is one of the drawbacks. It distorts the picture. (3) The filament should give a bright light. It matters nothing if the tube gets hot.

* * *

THE DIAGRAM of the 3-tube Marconi Broadcast Receiver is requested.—S. Sanford, Long Island City, N. Y.

See Fig. 204.

* * *

WHAT SIZE tubing, wire and how many turns are required for a 3-circuit tuner, when a .0003 mfd. condenser is shunted across the secondary of this coil? (2) Will this coil tune to the broadcast wavelengths?—C. V. R. Dehart, 348 West Side Ave., Haustown, Md.

There are 15 turns wound on a 3½" tubing, using No. 22 DCC wire for the primary. The secondary is wound separately, next to this coil and contains 57 turns. (2) This coil tunes to all the wavelengths from 200 to 555 meters.

* * *

I BUILT the carborundum crystal set as was described by Lewis Winner in the July 25 issue of RADIO WORLD and find it is a wonder. I get clear reception on the speaker. However, it will not work when I connect the batteries in the circuit.—G. Claybrooke, 616 E 25th St., Los Angeles, Cal.

There must be a short circuit in the potentiometer or you have reversed the polarities of the A batteries.

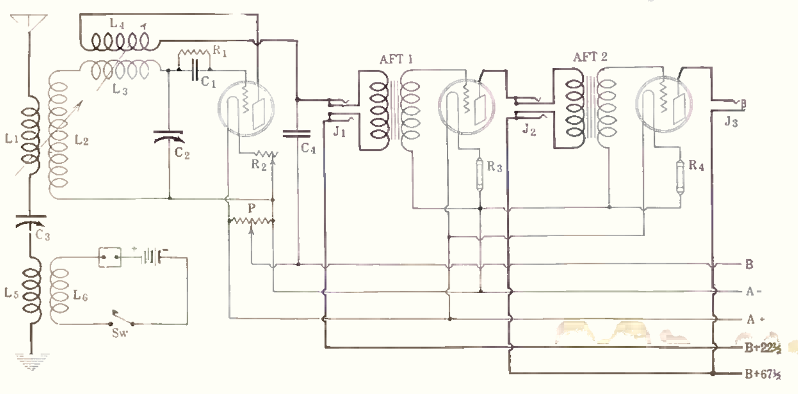


FIG. 204, showing the 3-Tube Marconi Broadcast Receiver. L1 is wound on a 3" diameter tubing, 3" in height and has 9 turns. L2 (the rotor) is wound on a 2" form, 2¼" high, and has 36 turns. Use No. 22 DCC wire. L3 is wound on the same type of form as L1, except that it has 22 turns. L4 is wound on a 2" form, 2¼" in height and has 45 turns. This is the rotor. L1L2 is placed at right angles to L3L4 C3 is a .001 mfd. variable condenser, to be used in tuning in the shorter waves, in case the receiver does not respond so well. C2 is a .0005 mfd. variable condenser. R1 is a 2 megohm grid leak. C1 is a .00025 mfd. grid condenser. R2 is a 6-ohm rheostat. C4 is a .001 mfd. by-pass condenser. J1 and J2 are both double circuit jacks. J1 is a single circuit jack. AFT 1 and 2 are of the low ratio type. R3 and R4 are special ballast resistors, the resistance of which is determined by the tube. P is a 400-ohm potentiometer. The special test buzzer is not required and therefore no data will be given.

THE KEY TO THE AIR

KEY

Abbreviations: EST, Eastern Standard Time; CST, Central Standard Time; MST, Mountain Standard Time; PST, Pacific Standard Time; DST, Daylight Saving Time.

How to tune in a desired distant station at just the right time—Choose your station from the list published herewith. See what time division the staton is under (EST, CST, etc.); then consult the table below. Add to or subtract, as directed from the time as given on the PROGRAM. The result will be the same BY YOUR CLOCK that you should tune in, unless daylight saving time intervenes, as explained below.—The table:

If you are in	*And want a station in*	*Subtract*	*Add*
EST	CST	....	1 hr.
EST	MST	....	2 hrs.
EST	PST	....	3 hrs.
CST	EST	1 hr.	....
CST	MST	....	1 hr.
CST	PST	....	2 hrs.
MST	EST	2 hrs.	....
MST	CST	1 hr.	....
MST	PST	....	1 hr.
PST	EST	3 hrs.	....
PST	CST	2 hrs.	....
PST	DST	1 hr.	....

FRIDAY, SEPTEMBER 25

WAAM, Newark, N. J., 263 (ESTDS)—11 AM to 12; 7 PM to 10:30.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12:30 to 1:05 PM; 7:30 to 11:05 PM.
WAMD, Minneapolis, Minn., 243.8 (CST)—12 to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 to 10 PM.
WBBR, New York City, 272.6 (ESTDS)—8 PM to 10.
WBOQ, Richmond Hill, N. Y., 236 (ESTDS)—7:30 PM to 11:30.
WBZ, Springfield, Mass., 333.1 (ESTDS)—6 PM to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 to 4; 5:30 to 10.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—12:30 to 1:30 PM; 4:30 to 5:30; 6:30 to 11.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 to 7 PM; 8 to 10; 11:45 to 1 AM.
WEAF, New York City, 492 (ESTDS)—6:45 AM to 7:45; 11 to 12; 4 PM to 5; 6 to 12.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 8 to 11.
WEAO, Ohio State University, 293.9 (EST)—8 PM to 10.
WEEI, Boston, Mass., 476 (ESTDS)—6:45 AM to 7:45; 2 PM to 3:15; 5:30 to 10.
WEMC, Berrien Springs, Mich., 286 (CST)—9 PM to 11.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30.
WFBH, New York City, 272.6 (ESTDS)—2 PM to 6.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 PM to 4; 6 to 7:30.
WGCP, New York City, 252 (ESTDS)—2:30 PM to 5:15; 8 to 11.
WGES, Chicago, Ill., 250 (CSTDS)—7 to 9 PM; 11 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (ESTDS)—12 M to 12:45 PM; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (EST)—1 PM to 2; 5:30 to 10:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8:30 to 10.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—12:30 PM to 1; 2:15 to 5; 7 to 11; 12 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—7 PM to 9; 11 to 12; 12:30 to 1:30; 4:30 to 5:30; 6:30 to 9:30.
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 8:45 to 10:05; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—6:45 AM to 7:15; 10 to 11; 1 PM to 2; 3 to 5; 6 to 7.
WJY, New York City, 405 (ESTDS)—7:30 PM to 11:30.
WJZ, New York City, 455 (ESTDS)—10 AM to 11; 1 PM to 2; 4 to 6; 7 to 10:30.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 7:30 to 1 AM.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15; 1:30 PM to 2:30.
WMCA, New York City, 341 (ESTDS)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (ESTDS)—3:45 PM to 4:45; 6:20 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1; 5:45 to 7:10; 9 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 5:45 to 12.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7.
WPAK, Fargo, N. D., 283 (CST)—7:30 PM to 9.
WPG, Atlantic City, N. J., 299.8 (ESTDS)—7 PM to 8:30; 10 to 12.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—9 AM to 10; 12 PM to 1; 5 to 7.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (ESTDS)—11:59 to 2 PM; 7:59 to 9:45.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 10; 12 PM to 1 AM.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30; 3 to 4; 6 to 7; 8 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:20 PM; 1:30 to 3:20; 3:30 to 11.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFDY, Brookings, S. D., 273 (MST)—8 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 10.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 9:30 to 12.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 11.
KGO, Oakland, Cal., 361.2 (PST)—11:10 AM to 1 PM; 1:30 to 3; 4 to 7.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 3:30 PM; 5:30 to 11:30.
KJR, Seattle, Wash., 484.4 (PST)—10:30 AM to 11:30 AM; 1 PM to 6:30; 8:30 to 11.
KNX, Hollywood, Cal., 337 (PST)—11:30 AM to 12:30 PM; 1 to 2; 4 to 5; 6.30 to 12.
KOA, Denver, Col., 322.4 (MST)—11:45 AM to 12:30 PM; 3:30 to 4:15; 6 to 10.
KOB, State College of New Mexico, 348.6 (MST)—11:55 AM to 12:30 PM; 7:30 to 8:30; 9:55 to 10:10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 8:45; 11 to 12 M.
KPO, San Francisco, Cal., 429 (PST)—7:30 AM to 8; 10:30 to 12 M; 1 PM to 2; 4:30 to 11.
KSD, St. Louis, Mo., 545.1 (CST)—4 PM to 5.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:20 to 10.
KYW, Chicago, Ill., 536 (CSTDS)—6:30 AM to 7:30; 10:55 to 1 PM; 2:25 to 3:30; 6:02 to 7:20; 9 to 1:30 AM.
CNRA, Moncton, Canada, 313 (EST)—8:30 PM to 10:30.
CNRE, Edmonton, Canada, 516.9 (MST)—8:30 PM to 10:30.
CNRS, Saskatoon, Canada, 400 (MST)—2:30 PM to 3.
CNRT, Toronto, Canada, 357 (EST)—6:30 PM to 11.

SATURDAY, SEPTEMBER 26

WAAM, Newark, N. J., 263 (EST)—7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12:30 PM to 1:05; 12 to 2 AM.
WAMD, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 1 AM.
WBBR, New York City, 272.6 (ESTDS)—8 PM to 9.
WBOQ, Richmond Hill, N. Y., 236 (ESTDS)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (ESTDS)—11 AM to 12:30 PM; 7 to 9.
WCAE, Pittsburgh, Pa., 461.3 (ESTDS)—10:45 AM to 12 M; 3 PM to 4; 6:30 to 7:30.
WCBD, Zion, Ill., 344.6 (CST)—8 PM to 10.
WCOO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12:30 PM; 2:30 to 5; 6 to 10.
WEAF, New York City, 492 (ESTDS)—6:45 AM to 7:45; 4 PM to 5; 6 to 12.
WEEI, Boston, Mass., 476 (ESTDS)—6:45 AM to 7 AM.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 7 to 8.
WEMC, Berrien Springs, Mich., 286 (CST)—11 AM to 12:30 PM; 8:15 to 11.
WFAA, Dallas, Texas, 475.9 (CST)—12:30 PM to 1; 6 to 7; 8:30 to 9:30; 11 to 12:30 AM.
WFBH, New York City, 272.6 (ESTDS)—2 PM to 7:30; 11:30 to 12:30 AM.
WGBS, New York City, 316 (ESTDS)—10 AM to 11; 1:30 PM to 3; 6 to 11.
WGCP, New York City, 252 (ESTDS)—2:30 PM to 5:15.
WGES, Chicago, Ill., 250 (CSTDS)—7 PM to 9; 11 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 2:30 PM; 3 to 5:57; 6 to 11:30.
WGY, Schenectady, N. Y., 379.5 (EST)—7:30 PM to 10.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:30 PM; 4 to 5; 6 to 7:30.
WHAR, Atlantic City, N. J., 275 (ESTDS)—2 PM to 3; 7:30 to 9.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (ESTDS)—2:15 PM to 5; 7:30 to 10.
WHO, Des Moines, Iowa, 526 (CST)—11 AM to 12:30 PM; 4 to 5:30; 7:30 to 8:30.
WHT, Chicago, Ill., 400 (CSTDS)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (ESTDS)—7 AM to 8; 10:20 to 11; 1 PM to 2; 3 to 4; 6 to 11:30
WJY, New York City, 405 (ESTDS)—2:30 PM to 5; 8 to 10:30.
WJZ, New York City, 455 (ESTDS)—9 AM to 12:30 PM; 2:30 to 4; 7 to 10.
WKRC, Cincinnati, O., 326 (EST)—10 to 12 M.
WLWC, Cincinnati, O., 422.3 (EST)—9:30 AM to 12:30 PM; 7:30 to 10.
WMAK, Lockport, N. Y., 265.5 (EST)—10:25 AM to 12:30 PM.
WMCA, New York City, 341 (ESTDS)—3 to 5 PM; 6:30 to 2.
WNYC, New York City, 526 (ESTDS)—1 to 3 PM; 7 to 11.
WOAW, Omaha, Neb., 526 (CST)—10 AM to 1; 2:15 to 4; 9 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 5:45 to 7:10; 9 to 12.
WOO, Philadelphia, Pa., 508.2 (ESTDS)—11 AM to 1 PM; 4:40 to 5; 10:55 to 11:02.
WOR, Newark, N. J., 405 (ESTDS)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7:30; 8 to 11.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 3 AM.
WPG, Atlantic City, N. J., 299.8 (CST)—7 PM to 12.
WRC, Washington, D. C., 469 (EST)—1 PM to 2; 6:45 to 12.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 12.
WRNY, New York City, 258.5 (ESTDS)—11:59 to 2 PM; 7:59 to 9:30; 12 M to 1 AM.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 3 to 4; 5 to 6; 10:45 to 12.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10; 11:55 to 1:30 PM; 3 to 4.
KDKA, Pittsburgh, Pa., 309 (EST)—10 AM to 12:30 PM; 1:30 to 6:30; 8:45 to 10.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 268 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10:30.
KFOA, Seattle, Wash., 455 (PST)—Silent.
KGO, Oakland, Cal., 361.2 (PST)—11 AM to 12:30 PM; 3:30 to 5:45; 7:30 to 9.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 6 to 7; 10 to 11.
KHJ, Los Angeles, Cal., 405.2 (ESTDS)—7 AM to 7:30; 10 to 1:30 PM; 2:30 to 3:30; 5:30 to 2 AM.
KJR, Seattle, Wash., 484.4 (PST)—1 PM to 2:45; 6 to 6:30; 8:30 to 10.
KNX, Hollywood, Cal., 337 (PST)—1 PM to 2; 6:30 to 2 AM.
KOA, Denver, Colo., 322.4 (MST)—11:30 AM to 1 PM; 7 to 10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9.
KPO, San Francisco, Cal., 429 (PST)—8 AM to 12 M; 2 PM to 3; 6 to 10.
KSD, St. Louis, Mo., 545.1 (CST)—7 PM to 8:30.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10:30.
KYW, Chicago, Ill., 536 (CSTDS)—11 AM to 12:30 PM; 4 to 5; 7 to 8.
CKAC, Montreal, Canada, 411 (EST)—4:30 PM to 5:30.
CNRO, Ottawa, Ontario, Canada, 435 (EST)—7:30 PM to 10
PWX, Havana, Cuba, 400 (EST)—8:30 PM to 11:30.

SUNDAY, SEPTEMBER 27

WBBM, Chicago, Ill., 226 (CST)—4 PM to 6; 8 to 10.
WBBR, New York City, 272.6 (EST)—10 AM to 12 M; 9 PM to 11.
WCCO, St. Paul and Minneapolis, Minn., 416 (CST)—11 AM to 12:30 PM; 4:10 to 5:10; 7:20 to 10.
WDAF, Kansas City, Mo., 365.6 (CST)—4 PM to 5:30.
WEAF, New York City, 492 (EST)—3 PM to 5; 7:20 to 10:15.
WEAR, Cleveland, O., 390 (EST)—3:30 PM to 5; 7 to 8; 9 to 10.
WFBH, New York City, 272.6 (EST)—5 PM to 7.
WGBS, New York City, 316 (EST)—3:30 PM to 4:30; 8 to 10.
WGCP, New York City, 252 (EST)—8 PM to 11.
WGES, Chicago, Ill., 250 (CST)—5 PM to 7; 10:30 to 12 M.
WGN, Chicago, Ill., 370 (CST)—11 AM to 12:45 PM; 2:30 to 5; 9 to 10.
WGR, Buffalo, N. Y., 379.5 (EST)—9:30 AM; 7:15 to 8 PM.
WGY, Schenectady, N. Y., 379.5 (EST)—9:30 AM to 12:30 PM; 2:35 to 3:45; 6:30 to 10:30.
WHAD, Milwaukee, Wis., 275 (CST)—3:15 PM to 4:15.
WHAR, Atlantic City, N. J., 275 (EST)—2:30 PM to 3:45; 7:50 to 10; 11:15 to 12.
WHN, New York City, 360 (EST)—1 PM to 1:30; 3 to 6; 10 to 12.
WHT, Chicago, Ill., 238 (CST)—9:30 AM to 1:15 PM; 5 to 9.
WIP, Philadelphia, Pa., 508.2 (EST)—10:45 AM to 12:30 PM; 4:15 to 5:30.
WJZ, New York City, 455 (EST)—9 AM to 12:30 PM; 2:30 to 4; 7 to 11.
WKRC, Cincinnati, O., 326 (EST)—6:45 PM to 11.
WMCA, New York City, 341 (EST)—11 AM to 12:15 PM; 7 to 7:30.
WNYC, New York City, 526 (EST)—9 PM to 11.
WOCL, Jamestown, N. Y., 275.1 (EST)—9 PM to 11.
WOO, Philadelphia, Pa., 508.2 (EST)—10:45 AM to 12:30 PM; 2:30 to 4.
WPG, Atlantic City, N. J., 209.8 (EST)—3:15 PM to 5; 9 to 11.
WQJ, Chicago, Ill., 448 (CST)—10:30 AM to 12:30 PM; 3 PM to 4; 8 to 10.
WREO, Lansing, Michigan, 285.5 (EST)—10 AM to 11.
WRNY, New York City, 258.5 (EST)—3 PM 5; 7:59 to 10.
WSBF, St. Louis, Mo., 273 (CST)—9 to 11 PM.
WWJ, Detroit, Mich., 352.7 (EST)—11 AM to 12:30 PM; 2 to 4; 6:20 to 9.
KDKA, Pittsburgh, Pa., 309 (EST)—9:45 AM to 10:30; 11:55 to 12 M; 2:30 PM to 5:30; 7 to 11.
KFNF, Shenandoah, Iowa, 266 (CST)—10:45 AM to 12:30 PM; 2:30 to 4:30; 6:30 to 10.
KOA, Denver, Col., 322.4 (MST)—10:55 AM to 1 PM; 4 PM to 5:30; 7:45 to 10.
KOIL, Council Bluffs, Iowa, 278 (CST)—11 AM to 12:30 PM; 7:30 to 9.
KGW, Portland, Oregon, 491.5 (PST)—10:30 AM to 12:30 PM; 6 to 9.
KHJ, Los Angeles, Cal., 405.2 (EST)—10 AM to 12:30 PM; 6 to 9.
KJR, Seattle, Wash., 384.4 (PST)—11 AM to 12:30 PM; 3 to 4:30; 7:15 to 9.
KTHS, Hot Springs, Ark., 374.8 (CST)—11 AM to 12:30 PM; 2:30 to 3:40; 8:40 to 11.

MONDAY, SEPTEMBER 28

WAAM, Newark, N. J., 263 (EST)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (ESTDS)—12:30 M to 1:05 PM; 7:30 to 12.
WAMB, Minneapolis, Minn., 243.8 (CST)—10 PM to 12.
WBBM, Chicago, Ill., 226 (CST)—6 PM to 7.
WBBR, New York City, 272.6 (ESTDS)—8 PM to 9.
WBZ, Springfield, Mass., 333.1 (EST)—6 PM 11:30.
WCAE, Pittsburgh, Pa., 461.3 (EST)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 12.
WCBD, Zion, Ill., 344.6 (CST)—8 PM to 10.
WCCO, St. Paul and Minneapolis, Minn., 416 (CST)—9:30 AM to 12 M; 1:30 PM to 6:15.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 PM to 7; 8 to 10; 11:45 to 1 AM.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 4 PM to 5; 6 to 11:30.
WEAR, Cleveland, O., 300 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 7 to 8.
WEEI, Boston, Mass., 476 (EST)—6:45 AM to 8; 3 PM to 4; 5:30 to 10.
WEMC, Berrien Springs, Mich., 286 (CST)—8:15 PM to 11.
WFAA, Dallas, Texas, 475.9 (EST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30.
WFBH, New York City, 272.6 (EST)—2 PM to 6:30.
WGCP, New York City, 252 (EST)—2:30 PM 11; 1:30 to 3:10; 6 to 7:30.
WGES, Chicago, Ill., 250 (CST)—5 PM to 8.
WGCP, New York City, 252 (EST)—2:30 PM to 5:18; 8 to 10:45.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 3:30 to 5:57.
WGR, Buffalo, N. Y., 319 (EST)—12 M to 12:30 PM; 2:30 to 4:30; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (EST)—1 PM to 2; 5:30 to 8:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10.
WHAR, Atlantic City, N. J., 275 (EST)—2 PM to 3; 7:30 to 9.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 360 (EST)—2:15 PM to 5; 6:30 to 12.
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 7:30 to 9; 11:15 to 12.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (EST)—7 AM to 8; 1 PM to 2; 3 to 8.
WJZ, New York City, 455 (EST)—10 AM to 11; 1 PM to 2; 4 to 5:30; 6 to 6:30; 7 to 11.
WKRC, Cincinnati, O., 326 (EST)—8 PM to 10.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 1; 2 to 3; 4:30 to 6; 7:30 to 11:30.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15 PM; 1:30 to 2:30; 3 to 5; 6 to 10.
WMAK, Lockport, N. Y., 265.5 (EST)—8 PM to 12.
WMCA, New York City, 341 (EST)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (EST)—3:15 PM to 4:15; 6:20 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1:30; 5:45 to 10:30.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 5:45 to 6.
WOO, Philadelphia, Pa., 508.2 (EST)—11 AM to 1 PM; 4:40 to 6; 7:30 to 11.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 to 4; 6:15 to 11:30.
WPAK, Fargo, N. D., 283 (CST)—7:30 PM to 9.
WPG, Atlantic City, N. J., 299.8 (EST)—7 PM to 11.
WOJ, Chicago, Ill., 488 (CST)—11 AM to 12 M; 3 PM to 4.
WRC, Washington, D. C., 469 (EST)—9 AM to 10; 12 M to 2; 6:15 PM to 6:30.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (EST)—11:59 AM to 2 PM; 7:30 to 11.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 10:30; 12 to 1 AM.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 6 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:15 PM; 2:30 to 3:20; 5:30 to 10.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:45 PM to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (PST)—9 AM to 10:30; 11:30 AM to 1 PM; 1:30 to 6; 6:45 to 7; 8 to 1 AM.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30; 5 to 8.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 1:30 PM; 5:30 to 10.
KJR, Seattle, Wash., 384.4 (PST)—1 PM to 2:45; 6 to 6:30; 7 to 11.
KNX, Hollywood, Cal., 337 (PST)—12 M to 1 PM; 4 to 5; 6:30 to 12.
KOB, State College of New Mexico, 348.6 (MST)—11:55 AM to 12:30 PM; 7:30 to 8:30; 9:55 to 10:10.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 10.
KPO, San Francisco, Cal., 429 (PST)—10:30 AM to 12 M; 1 PM to 2; 2:30 to 3:30; 4:30 to 10.
KSD, St. Louis, Mo., 545.1 (CST)—7:30 PM to 10.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10.

KYW, Chicago, Ill., 536 (CSTDS)—6:30 AM to 7:30; 10:55 to 1 PM; 2:15 to 3:30; 6:02 to 7.

TUESDAY, SEPTEMBER 29

WAAM, Newark, N. J., 263 (EST)—11 AM to 12 M; 7 PM to 11.
WAHG, Richmond Hill, N. Y., 316 (EST)—12 PM to 1:05 AM.
WAMB, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 12.
WBOQ, Richmond Hill, N. Y., 236 (EST)—3:30 PM to 6:30.
WBZ, Springfield, Mass., 333.1 (EST)—6 PM to 11.
WCAE, Pittsburgh, Pa., 461.3 (EST)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 PM to 4; 5:30 to 10.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 PM to 7; 11:45 to 1 AM.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 11 to 12 M; 4 PM to 5; 6 to 12.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 7 to 10; 10 to 11.
WEEI, Boston, Mass., 476 (EST)—6:45 AM to 8; 1 PM to 2; 6:30 to 10.
WFAA, Dallas, Texas, 457.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1; 2:30 to 6; 6:45 to 7; 8:30 to 9:30; 11 to 12.
WFBH, New York City, 272.6 (EST)—2 PM to 6:30; 11:30 to 12:30 AM.
WGBS, New York City, 316 (EST)—10 AM to 11; 1:30 PM to 3; 6 to 11:30.
WGCP, New York City, 252 (EST)—2:30 PM to 5:15.
WGES, Chicago, Ill., 250 (CST)—7 PM to 9; 11 to 1 AM.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (EST)—11 AM to 12:45 PM; 7:30 to 11.
WGY, Schenectady, N. Y., 379.5 (EST)—11 PM to 2:30; 5:30 to 7:30; 9:15 to 11:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHAR, Atlantic City, N. J., 275 (EST)—2 PM to 3; 7:30 to 9; 11:15 to 12.
WHN, New York City, 360 (EST)—12:30 PM to 1; 2:15 to 3:15; 4 to 5:30; 7:30 to 10:45; 11:30 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 7:30 to 9; 11:30 to 12.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 508.2 (EST)—7 AM to 8; 1 PM to 2; 3 to 5:30; 6 to 11.
WJY, New York City, 405 (EST)—7:30 PM to 1:30.
WJZ, New York City, 455 (EST)—10 AM to 11; 1 PM to 2; 4 to 6; 7 to 11.
WKRC, Cincinnati, O., 326 (EST)—6 PM to 12.
WLIT, Philadelphia, Pa., 395 (EST)—11 AM to 12:30 PM; 2 to 3; 4:30 to 7.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 1 PM; 1:30 to 2:30; 3 to 5; 6 to 11.
WMCA, New York City, 341 (EST)—11 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (EST)—3:45 PM to 5; 6:50 to 11.
WOAW, Omaha, Neb., 526 (CST)—12:30 PM to 1:30; 5:45 to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 5:45 to 10.
WOO, Philadelphia, Pa., 508.2 (EST)—11 AM to 1 PM; 4:40 to 5; 10:55 to 11:02.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 7:30.
WPG, Atlantic City, N. J., 299.8 (EST)—7 PM to 11.
WQJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to 4; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—9 AM to 10; 12 M to 2; 6:55 PM to 11.
WREO, Lansing, Michigan, 285.5 (EST)—8:15 PM to 11.
WRNY, New York City, 258.2 (EST)—11:59 AM to 2 PM; 4:30 to 5; 8 to 11.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 8 to 9; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 8 to 10; 11:30 to 1 AM.
WWJ, Detroit, Mich., 352.7 (EST)—8 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 6 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—9:45 PM to 12 M; 1:30 PM to 3:20; 5:30 to 10:45.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30.
KFMQ, Fayetteville, Ark., 299.8 (CST)—9 PM to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 11.
KGO, Oakland, Cal., 361.2 (PST)—11:30 AM to 1 PM; 1:30 to 3; 4 to 6:45; 8 to 1 AM.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 11.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 7:15; 12 M to 3:20 PM; 5:30 to 11.
KJR, Seattle, Wash., 384.4 (PST)—9 AM to 6:30 PM; 8:30 to 1 AM.
KNX, Hollywood, Cal., 337 (PST)—9 AM to 10; 1 PM to 2; 4 to 5; 6:30 to 12.

WCAE, Pittsburgh, Pa., 461.3 (EST)—12:30 PM to 1:30; 4:30 to 5:30; 6:30 to 11.
WCCO, St. Paul and Minneapolis, Minn., 416.4 (CST)—9:30 AM to 12 M; 1:30 to 4; 5:30 to 11.
WDAF, Kansas City, Mo., 365.6 (CST)—3:30 PM to 7; 8 to 9:15; 11:45 to 1 AM.
WEAF, New York City, 492 (EST)—6:45 AM to 7:45; 11 to 12 M; 4 PM to 5; 6 to 12.
WEAO, Ohio State University, 293.9 (EST)—8 PM to 10.
WEAR, Cleveland, O., 390 (EST)—11:30 AM to 12:10 PM; 3:30 to 4:10; 6:45 to 7:45.
WEEI, Boston, Mass., 476 (EST)—6:45 AM to 8; 3 PM to 4; 5:30 to 10.
WEMC, Berrien Spring, Mich., 266 (CST)—8:15 PM to 11.
WFAA, Dallas, Texas, 475.9 (CST)—10:30 AM to 11:30; 12:30 PM to 1.
WFBH, New York City, 270.6 (EST)—2 PM to 7:30; 12 M to 1 AM.
WGCP, New York City, 252 (EST)—2:30 PM to 5:18; 8 to 10.
WGES, Chicago, Ill., 250 (CST)—7 PM to 9; 11 to 1 AM.
WGBS, New York City, 316 (EST)—10 AM to 11 PM; 1:30 to 4; 6 to 7.
WGN, Chicago, Ill., 370 (CST)—9:31 AM to 3:30 PM; 5:30 to 11:30.
WGR, Buffalo, N. Y., 319 (EST)—12 M to 12:45 PM; 2:30 to 4:30; 6:30 to 11.
WGY, Schenectady, N. Y., 379.5 (CST)—5:30 PM to 7:30.
WHAD, Milwaukee, Wis., 275 (CST)—11 AM to 12:15 PM; 4 to 5; 6 to 7:30; 8 to 10; 11:30 to 12:30 AM.
WHAS, Louisville, Ky., 399.8 (CST)—4 PM to 5; 7:30 to 9.
WHN, New York City, 368 EST)—2:15 PM to 5:30; 7:30 to 11; 11:30 to 12:30 AM.
WHO, Des Moines, Iowa, 526 (CST)—12:15 PM to 1:30; 6:30 to 12 M.
WHT, Chicago, Ill., 400 (CST)—11 AM to 2 PM; 7 to 8:30; 10:30 to 1 AM.
WIP, Philadelphia, Pa., 568 EST)—7 AM to 8; 10:20 to 11; 1 PM to 2; 3 to 4; 6 to 8.
WJZ, New York City, 455 (EST)—10 AM to 11; 1 PM to 2; 4 to 6; 6 to 11:30.
WKRC, Cincinnati, Ohio, 326 (EST)—8 PM to 10.
WLIT, Philadelphia, Pa., 395 (EST)—12:02 PM to 12:30; 2 to 3; 4:30 to 6; 7:30 to 9.
WLW, Cincinnati, O., 422.3 (EST)—10:45 AM to 12:15 PM; 1:30 to 2:30; 3 to 5; 6 to 11.
WMCA, New York City, 341 (EST)—10:45 AM to 12 M; 6:30 PM to 12.
WNYC, New York City, 526 (EST)—6:30 PM to 11.
WOC, Davenport, Iowa, 484 (CST)—12:57 PM to 2; 3 to 3:30; 4 to 7:05; 9 to 11.
WOR, Newark, N. J., 405 (EST)—6:45 AM to 7:45; 2:30 PM to 4; 6:15 to 12 M.
WPAK, Fargo, N. D., 283 (CST)—7:30 PM to 9.
WOJ, Chicago, Ill., 448 (CST)—11 AM to 12 M; 3 PM to ; 7 to 8; 10 to 2 AM.
WRC, Washington, D. C., 469 (EST)—9 AM to 10; 12 M to 2; 6:25 PM to 7.
WREO, Lansing, Michigan, 285.5 (EST)—10 PM to 11.
WRNY, New York City, 258.5 (EST)—11:59 AM to 2 PM; 7:59 to 9:55.
WSB, Atlanta, Ga., 428.3 (CST)—12 M to 1 PM; 2:30 to 3:30; 5 to 6; 10:45 to 12.
WSBF, St. Louis, Mo., 273 (CST)—12 M to 1 PM; 3 to 4; 7:30 to 9.
WWJ, Detroit, Mich., 352.7 (EST)—6 AM to 8:30; 9:30 to 10:30; 11:55 to 1:30 PM; 3 to 4; 6 to 7; 8 to 10.
KDKA, Pittsburgh, Pa., 309 (EST)—6 AM to 7; 9:45 to 12:15 PM; 2:30 to 3:20; 5:30 to 11.
KFAE, State College of Wash., 348.6 (PST)—7:30 PM to 9.
KFI, Los Angeles, Cal., 467 (PST)—5 PM to 11.
KFKX, Hastings, Neb., 288.3 (CST)—12:30 PM to 1:30; 5:15 to 6:15; 9:30 to 12:30 AM.
KFMQ, Fayetteville, Ark., 299.8 (CST)—7:30 PM to 9.
KFNF, Shenandoah, Iowa, 266 (CST)—12:15 PM to 1:15; 3 to 4; 6:30 to 10.
KFOA, Seattle, Wash., 455 (PST)—12:30 PM to 1:30; 4 to 5:15; 6 to 10.
KGO, Oakland, Cal., 361.2 (PST)—11:30 AM to 1 PM; 1:30 to 2:30; 3 to 6:45.
KGW, Portland, Oregon, 491.5 (PST)—11:30 AM to 1:30 PM; 5 to 10.
KHJ, Los Angeles, Cal., 405.2 (PST)—7 AM to 715; 12 M to 1:30 PM; 5:30 to 12.
KJR, Seattle, Wash., 484.4 (PST)—9 AM to 1 AM.
KNX, Hollywood, Cal., 337 (PST)—1 PM to 2; 7 to 12.
KOIL, Council Bluffs, Iowa, 278 (CST)—7:30 PM to 9; 11 to 12 M.
KPO, San Francisco, Cal., 429 (PST)—7 AM to 7:45; 10 to 12 M; 1 PM to 2; 3:30 to 11.
KSD, St. Louis, Mo., 541.1 (CST)—6 PM to 7.
KTHS, Hot Springs, Ark., 374.8 (CST)—12:30 PM to 1; 8:30 to 10:30.
KYW, Chicago, Ill., 536 (CST)—6:30 AM to 7:30; 10:30 to 1 PM; 2:15 to 4; 6:02 to 11:30.
CNRA, Moncton, New Brunswick, Canada, 313 (EST)—9:30 PM to 11.
CNRR, Regina, Saskatchewan, Canada—8 PM to 11.
CNRO, Ottawa, Ontario, Canada, 435 (EST)—7 PM to 11.

WEDNESDAY, SEPTEMBER 30

WAAM, Newark, N. J., 263 (EST)—12:30 PM to 1:05; 7:30 to 11:05.
WAHG, Richmond Hill, N. Y., 316 (EST)—12 M to 1:05 PM; 8 to 12.
WAMB, Minneapolis, Minn., 243.8 (CST)—12 M to 1 PM; 10 to 12.
WBBM, Chicago, Ill., 226 (CST)—8 PM to 10.
WBZ, Springfield, Mass., 333.1 (EST)—6 PM to 11.

A THOUGHT FOR THE WEEK

The man who said he would physically demonstrate the theory of perpetual motion was. Marconi is!

RADIO WORLD

Trade Mark Reg. U. S. Pat. Off.

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

TELEPHONES: LACKAWANNA 6976 and 2063
PUBLISHED EVERY WEDNESDAY
(Dated Saturday of same week)
FROM PUBLICATION OFFICE
HENNESSY RADIO PUBLICATIONS CORPORATION
ROLAND BURKE HENNESSY, President
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
1493 BROADWAY, NEW YORK, N. Y.
(Putnam Bldg., Times Square and 43rd Street)
European Representatives: The International News Co
Breams Bldgs., Chancery Lane, London, Eng.
Paris, France, Brentano's, 38 Avenue de l'Opera.
San Francisco, Loyd B. Chappell, 656 O'Farrell St.

EDITOR, Roland Burke Hennessy
MANAGING EDITOR, Herman Bernard

SUBSCRIPTION RATES

Fifteen cents a copy. $6.00 a year. $3.00 for six months. $1.50 for three months. Add $1.00 a year extra for foreign postage. Canada, 50 cents.

Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order is automatic acknowledgment of their subscription order. Changes of address should be received at this office two weeks before date of publication. Always give old address also. State whether subscription is new or a renewal.

ADVERTISING RATES

General Advertising

1 Page, 7¼"x11"	462 lines	$300.00
½ Page, 7¼"x5½"	231 lines	150.00
¼ Page, 4½" D. C	115 lines	75.00
1 Column, 2¼"x11"	154 lines	100.00
1 Inch		10.00
Per Agate line		.75

Times Discount

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

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

CLASSIFIED ADVERTISEMENTS

Ten cents per word. Minimum, 10 words. Cash with order. Business Opportunities, 50 cents a line; minimum, $1.00.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the act of March 3, 1879.

SEPTEMBER 26, 1925

Super-Power Blanketing of Small Stations Only A Myth, Experts Find

By Thomas Stevenson

WASHINGTON.

Super-power will never supplant the local station. This is the outstanding conclusion of radio experts at Washington as a result of the recent 50-kilowatt experiments of WGY at Schenectady.

The test proved almost conclusively that regardless of the power used by any station, its service area will be too small to render absolutely dependable reception over wide areas.

Radio engineers estimate that the dependable service area of a 500-watt station does not exceed 25 miles. This does not mean that the station cannot be heard beyond that distance, but that fans more than 25 miles away cannot always depend on being able to get that particular station every time it is on the air with sufficient clarity to fully appreciate its programs. The crystal set service range of a 500-watt station is less than 25 miles.

Distance Results

Some laymen thought that when the power was increased from 500 to 50,000 watts that it would correspondingly increase the service range 100 times, or to 2,500 miles. But this is not true at all. Instead, it can safely be said that the service range of a 50-kilowatt station does not exceed 100 miles. As a matter of fact, fading was experienced on the signals of WGY during the test at much less than 100 miles. Of course, with the strength of the signals, the fading could be partially overcome. Also, the fading probably would not be experienced at all times.

There is no doubt that the subject will receive considerable attention at the next national radio conference. It is believed that the conclusion of the conference will be that there is a definite place for both the higher-power and the local station, and that interconnection should be depended on for the broadcasting of national events rather than super-power stations.

Need 2,000 Stations!

With the present limitation to the service area of a broadcasting station, there has been much speculation as to the number of stations that would be required to give perfect reception to all parts of the country. Estimates now are that probably more than 2,000 stations would be required to give perfect reception to every citizen in the United States.

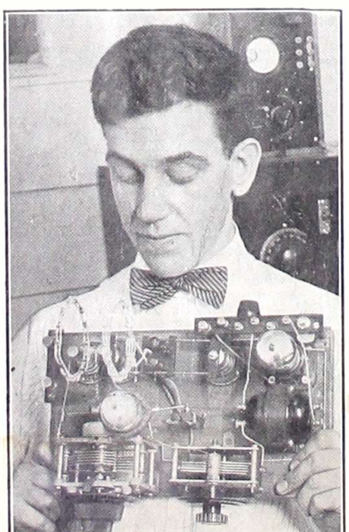
At the present time there are about 560 stations, many of which are 100 watters or less. Until some method is found to put stations closer together in the present broadcasting band, or else enlarge it, it is not believed the total number of stations will exceed 600.

STATIONS ARE PREPARING TO USE HIGHER POWER

Anticipating that the next National Radio conference will approve higher power, several stations throughout the country are now being equipped to go as high as 50 kilowatts, it has been learned.

It is believed that the subject will provoke quite a heated discussion when the conference assembles. Last year the increase to 5,000 watts was bitterly opposed until suggestion was made that the increase be placed on an experimental basis with the understanding that if interference or blanketing resulted, the stations would be forced to decrease their power.

The contention of those who oppose higher power is that it would result in blanketing of the smaller stations and thereby create a monopoly.



HERE IS the amateur's delight, a short wave low-loss receiver. The circuit is the standard regenerative type, with a tickler employed in the plate circuit and will tune from 20 to 110 meters. The base of the tube was taken off so that there would be no extra capacity to raise the wavelength of the set or make it hard to control. The coils are of the air wound type. Note the large porcelain insulators on the baseboard.

New Books

Dynamo Electric Machinery, a technical treatise on the construction and operation of Direct and Alternating Current Machines, by Erich Hausmann, E.E., Sc.D., Thomas Potts Professor of Physics and Electrical Communication at The Polytechnic Institute of Brooklyn, N. Y., published by D. Van Nostrand, N. Y. City.

This volume is intended for extensive classroom use. Due to the ingenious manner that this volume is presented, recitations, computations and occasional lectures supplemented by laboratory sessions can be obtained.

The first two chapters deal with the electric and magnetic circuits. Direct-current machinery is discussed in the following five chapters. Properties of alternating currents and their circuits are treated thoroughly in the next three chapters. Alternating current machines and transformers are discussed. The last chapter deals with conversion apparatus. All these data are given in accordance with modern practice and standardization. The beginner as well as the advanced will find a lot of interesting matter in this book.

* * *

Radio: Beam and Broadcast, an interesting book on the history of radio-telegraphy and telephony and its patents, by A. H. Morse, Associate, Institute of Electrical Engineers, Member, Institute of Radio Engineers. Published by D. Van Nostrand, N. Y. City.

In this book patents of the American and British inventors relating to radio are treated fully. It is the authors' object to help to correct the perspective of newcomers in the patent field. This book is also intended to be of some assistance to the British and American agents and attorneys who are new to the art, and also to the inventors, experimenters and radio enthusiasts on both the American and British soil. The evoluton of radio is traced through the patent office, therefore this volume is of historical value.

JOIN THE A. B. C.

A. B. C. stands for American Broadcast Club, an organization of fans banded together to promote the welfare of radio. There are no dues, no obligations. Address A. B. C. Editor, RADIO WORLD, 1493 Broadway, New York City. The names and addresses of new members follow:

Edwin L. Parrish, 216 W. 31st St., Norfolk, Va.
John H. Simon, 1747 N. Croskey St., Philadelphia, Pa.
Edward Hassel, 513 Superior St., Grove St., Pa.
William Haugsted, 606 9th St., Nevada, Ia.
Jerome L. Cheatham, 24 Hillside Ave., Montclair, N. J.
Clifford Corbett, 65 Whiting Ave., Tarrington, Conn.
Gaston Casanova, 7 Dr.-Vadi St., Mayuquez, Porto Rico.
Alex Sliva, 945 15th Ave., Milwaukee, Wis.
Roy Sadler, 2501 East 9th St., Kansas City, Mo.
Vialis F. Walz, Glen Haven, Wis.
William C. Peace, 126 Seaton Place, Washington, D. C.
J. F. Greenan, 228 Garden Ave., Toronto, Canada.
L. A. Tucker, R. I. Box 52, Azle, Tex.

LISTEN IN every Friday at 7 P. M. and hear Herman Bernard, managing editor of RADIO WORLD, discuss "Your Radio Problem," from WGBS, Gimbel Bros., New York City, 315.6 meters.

Both N. Y. Shows Succeed

Wound Wire Aerial

The Wound Wire Aerial Co. of Reedville, Va., submitted to Radio World's Laboratories a roll of their wound wire antenna wire. This was tested on a standard receiver and the results obtainable were excellent. The signals were louder than with the common type of antenna wire employed. Most of the ideals that make up the perfect antenna are incorporated in this antenna. The outer coating of wire is coiled, with about 6 turns of the wire to the inch. The wire used for this coiling is No. 18 enameled copper wire. Underneath this coil of wire is the antenna wire, which is No. 14 soft drawn enameled copper wire. This type is very good for use as an indoor antenna. The total area covered by this kind of winding is much greater than with any other type, which gives us a greater space for the collecting of electromagnetic energy. Enameled wire is much better for reception of signals than with plain copper hard drawn wire.

Coming Events

SEPT. 21 to 26—First Annual Radio Expos., Broadcast Listeners' Association, Cadle Tabernacle, Indianapolis, Ind. Write Claude S. Wallin, Hotel Severin.

SEPT. 21 to 29—International Radio Exposition, Steel Pier, Atlantic City, N. J.

SEPT. 28 to Oct. 3—National Radio Exposition, American Exp. Palace, Chicago. Write N. R. E., 440 S. Dearnborn St., Chicago, Ill.

SEPT. 28 to OCT. 3—Midwest Radio Week.

OCT. 3 to 10—Radio Exposition, Arena, 46th and Market Streets, Philadelphia, Pa., G. B. Bodenhof, manager, auspices Philadelphia Public Ledger.

OCT. 5 to 10—Second Annual Northwest Radio Exposition, Auditorium, St. Paul, Minn. Write 515 Tribune Annex.

OCT. 5 to 11—Second Annual Radio Show, Convention Hall, Washington, D. C. Write Radio Merchants' Association, 233 Woodward Bldg.

OCT. 10 to 16—National Radio Show, City Auditorium, Denver, Colo.

OCT. 12 to 15—South Texas Radio Exposition, Post-Dispatch (KPRC), Houston, Tex.

OCT. 12 to 17—Boston Radio Show, Mechanics' Hall. Write to B. R. S., 209 Massachusetts Ave., Boston, Mass.

OCT. 12 to 17—St. Louis Radio Show, Coliseum. Write Thos. P. Convey, manager, 737 Frisco Bldg., St. Louis, Mo.

OCT. 12 to 17—Radio Show, Montreal, Can., Canadian Expos. Co.

OCT. 17 to 24—Brooklyn Radio Show, 23d Regt. Armory. Write Jos. O'Malley, 1157 Atlantic Ave., Brooklyn, N. Y.

OCT. 19 to 25—Second Annual Cincinnati Radio Exposition, Music Hall. Write to G. B. Bodenhof, care Cincinnati Enquirer.

OCT. 26 to 31—First Annual Rochester Times-Union Radio Exposition, Convention Hall, Rochester, N. Y. Write Howard H. Smith, care Times-Union.

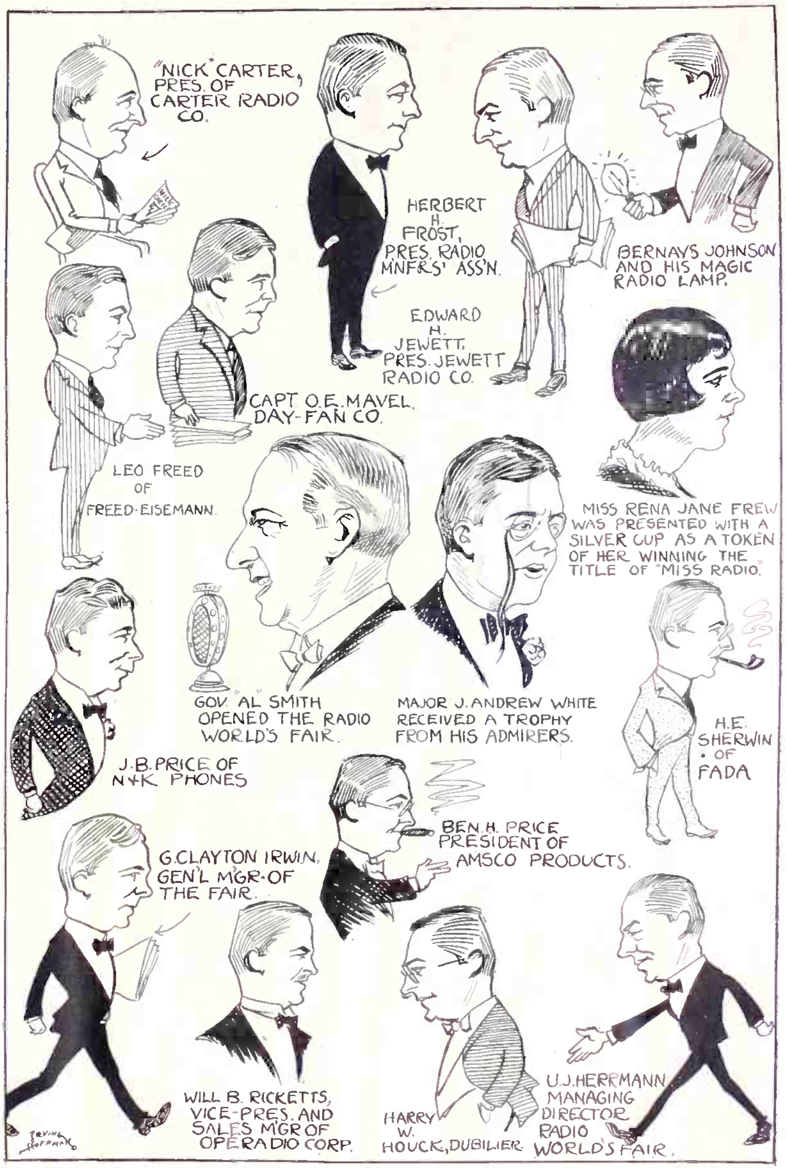
NOV. 2 to 7—Radio Show, Toronto, Can., Canadian Expos. Co.

NOV. 3 to 8—Radio Trade Association Exposition, Arena Gardens, Detroit. Write Robt. J. Kirschner, chairman.

NOV. 19 to 25—Milwaukee Radio Exp., Civic Auditorium. Write Sidney Neu, of J. Andrae & Sons, Milwaukee, Wis.

NOV. 17 to 22—4th Annual Chicago Radio Exp., Coliseum. Write Herrmann & Kerr, Cort Theatre Bldg., Chicago, Ill.

Big Men at the Armory Event



THE Second Annual Radio World's Fair (Manufacturers' Association) at the 258th Field Artillery Armory, New York City.

Lessons from Two Shows

What a thing of beauty the real radio set of today has become was brought home very forcefully at the two recent radio shows in New York City. Next to enhanced beauty, in point of manufacturing development, came simplicity. There were more than seventy receivers operated of the single-control type.

Much of what was new in point of appearance or design was not immediately purchaseable. This brings up the prevalent merchandising plan of radio manufacturers—to start advertising, and even exhibiting samples of their products long before any deliveries can be made. This practice is not followed from sheer perversity. Some of the favorable factors are:

(1) The trade and consumer response may be roughly measured and the production plans formulated accordingly.

(2) The shrinking of the gap between the previous production of the product and the subsequent demand for it.

(3) The expediting of actual production due to the psychological effect of having to meet an already existing demand.

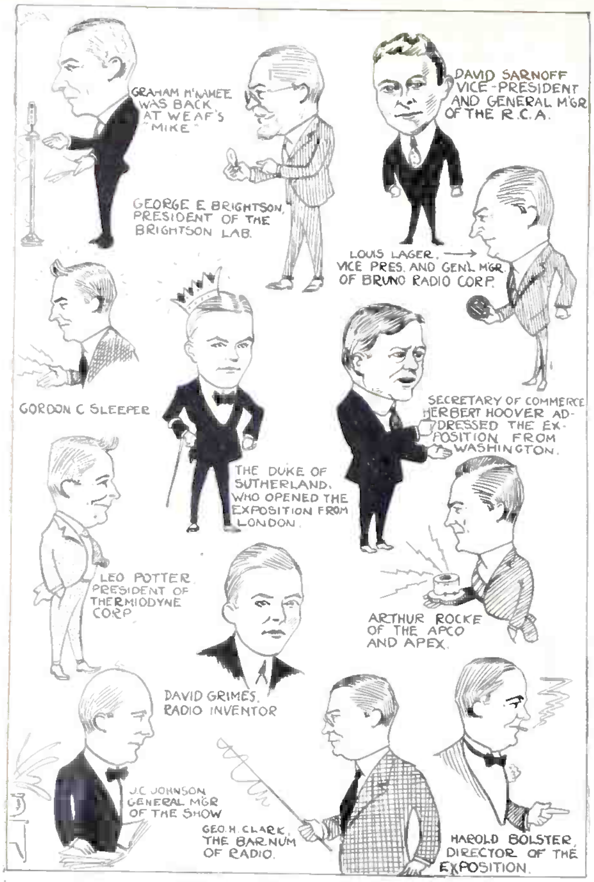
Therefore economical considerations impel many manufacturers to avoid, so far as possible, gross overproduction.

Contradicted in Other Lines

But the practice is against what is regarded as the better mode in most forms of business. Where it is considered not only wasteful to wage a publicity cam-

(*Continued on next page*)

Personages at Fourth Annual



THE Fourth Annual Radio Exposition at Grand Central Palace, New York City.

BEAUTIES graced the Fourth Annual Show, the models in a special fashion show draping themselves gracefully about the landscape. What it all had to do with radio not all fully understood, but the crowds flocked to where the beauties were. Bess Mitchell is shown in the bell of the speaker. (Acme.)

STATUESQUE indeed was this pretty miss, fashion show model, appearing at the Fourth Annual Radio Show. Wonder if the regular fashion shows ever have radio adjuncts? (Acme.)

(*Continued from preceding page*)

paign long before production can be expected, but to savor somewhat of trifling with the trade and the public.

In radio the trade takes no particular offense if informed that an advertised product that they order from distributor or manufacturer will not be ready for delivery for several weeks. Experience has calloused the trade to the practice. What the reaction of the consumer public is can only be guessed, but as yet no definite proof has been offered that the public, either, is greatly offended because the manufacturer is even more anxious than they to obtain his own product.

It is undeniable, however, that the public is being trifled with when pre-production campaigns are waged, and the measure of response used as a production gauge. The question remains unanswered whether this is good because of the margin of safety that it affords the manufacturer. Prosperity in the trade is a boon to the public, and failures of radio concerns hurt the public more considerably than most persons suppose. Products that skim the horizon today and sink tomorrow leave hordes of owners almost wholly unprotected as to repair service. It might seem that the public would soon learn to deal only with long-established firms, and if this is so it would be deleterious indeed, since keenness for new products, whether of new or old firms, is to be encouraged. The measure of public response should be on the basis of the value of the product, not on the seniority of the manufacturer, even though previous good service by a given concern is bound to be a cumulative asset.

A gap must exist somewhere between production and popularity and the problem is where to locate that gap.

Take the popularity of the product for granted, regardless of the chronological point at which that trade and public esteem is established. No human being can so nicely balance the two considerations that the moment he is on a quantity production basis the trade and public are consuming his output at exceeding pace.

The factory is a place of many vexations and problems up to the point of quantity production, and meanwhile another branch of the business—the advertising department or agency—has its own great problems to meet. There must be perfect synchronization between the advertised description of the product, both as to appearance and operation, with the actuality. These days many tons of literature are circulated, among the trade particularly, in the honest expectation that every wash drawing shown thereon and every descriptive word written coincides exactly with what the finished product will be. But as the product can not be said to be finished until quantity production sets in, changes do occur. The problem is often solved by the discard of hundreds or thousands of dollars of such literature before insulation, because of a disparity, or the distribution of a new circular. Under either plan the wasteful expense is suffered.

The Schemers

If the advertising long precedes the time when a ready supply of the product can be furnished, then an anxious gap exists. The manufacturer is swamped with orders. He may get a false impression. Especially if some recognized company is producing a new article, dealers and jobbers will order promiscuously, on the theory that the orders will be filled on a percentage basis. Assuming that all orders could not be filled for weeks or months, the order-gushers assume that the 10,000 articles they cunningly ordered will entitle them, on say a 10 per cent. basis, to a shipment of 1,000. Even 500 would be fine. Indeed, 100 would be quite acceptable. Imagine ordering 10,000 of anything (with the usual cancellation privilege for any unfilled part), and being gratified to receive only a few hundred. Manufacturers know this trick, of course, and fill orders on the basis of the buyer's normal outlet and his credit standing, broad smiles now greeting the huge orders from the little schemers.

Both Methods Used

That situation exists when the gap, in chronological order, is between the demand and the ability to supply it. But if first, the product is ready, or almost

(*Concluded on next page*)

(*Concluded from preceding page*)

ready, and the demand is started then, a manufacturer may find that competitors, using the other method, have captured the field, because everybody has been talking about and asking for the other fellow's product. Hence maybe the existing practice has a material force or perhaps a happy medium may be struck, whereby the public and the manufacturer both share the gap. At least it is true that several very substantial concerns this year advertised their products only when ready to deliver.

Such an example is the Amsco Company, with its straight-line frequency condenser. A contrast with this method exists in the case of the Karas Company, which advertised its SLF condenser to the public in July, the copy having been prepared probably in late May or early June, whereas some dealers found it impossible to obtain any of the Karas condensers until mid-September, and this condition may be assumed to have been general.

The psychological effect of having to meet a previously-created condition has its advantages, but is it too much to ask that manufacturers base their enthusiasm on their product for its own sake? After all, they are selling a radio article, not publicity. It is the radio article that they SELL, the publicity that they BUY.

Remembering that the radio business is a young one, and that the principles of merchandising that prevail in much older lines are at variance with the general practices in radio, it may be assumed that overdoing the publicity work before production, and underdoing it afterward, is an attribute of adolescence and will disappear when the youth reaches his majority.—H. B.

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,
1493 Broadway, New York 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 ....

Leonard B. Napora, 16 Concord St., Buffalo, N. Y.
H. H. Donaldson, Tupper Lake, New York.
W. H. Milne, 1216 Goodfellow Ave., St. Louis, Mo.
D. G. Libbey, Box 13, U.S.S. Nevada, San Francisco, Cal.
Robert Hitner, Webb City, Mo.
Guy L. Howard, 6707 Fir Ave., Cleveland, O.
Frank Jones, Wright, Kan.
Jewell-Bradley Radio Shop, 84 Livingston Ave., Albany, N. Y. (Dealer.)
Louis Kelman, 1013 Kirby E., Detroit, Mich.
Edward Lack, Germantown, Philadelphia, Pa. (Dealer.)
A. E. Browning, 4739 Vermont Ave., Detroit, Mich. (Dealer.)
Cook Hardware Co., Dow City, Ia. (Dealer.)
Joseph Siemietkoski, 134 Kenilworth, Philadelphia, Pa.
Columbia Radio Co., 4 Roland Ave., Baltimore, Md.
H. A. Geldert, Box 251, Groveland, Fla.
John B. Jones, Ridgeway, Va.
James H. L. Jewell, 84 Livingston St., Albany, N. Y.
G. M. DeRose, Roseburg, Ore.

NEW INCORPORATIONS

National Radio Service League, N. Y. City, $100,000; J. L. Diamond, M. B. Moscowitz. (Atty., J. A. Byrne, 305 Broadway, N. Y. City.)

Frevan Corporation, N. Y. City, radio equipment, 500 common, no par; C. Taylor, J. M. Clark, G. Tilson. (Atty., C. Ogburn, 120 Broadway, N. Y. City.)

Rodgers Radio Co., Wilmington, Del., $250,000. (Corporation Trust Company of America.)

Slap Radio Corp., N. Y. City, $10,000; N. Feinberg, A. Kiernan, A. Slap. (Atty., S. Ginsberg, 1 Madison Ave., N. Y. City.)

Gumaer Corp., Jersey City, N. J., radio supplies, $100,000 in preferred and 2,500 shares, no par common; John R. Turner, Basking Ridge, N. J.; J. E. Braud, Plainfield, N. J.; Alfred D. McCabe, Brooklyn, N. Y. (Atty., Corporation Trust Company, Jersey City, N. J.)

White Radio Corp., Jersey City, N. J., builders, $500,000. (Registrar and Transfer Company.)

Attention, Radio World Subscribers!

Subscribers will note that the end of their subscriptions is indicated on the labels on wrappers. If your wrapper shows the date later than the current issue, you are behind in your subscription. Please send payment for renewal. Thank you!

RADIO WORLD, 1493 Broadway, New York City.

Diamond Finely Selective, Wonderful for DX Reception

(*Concluded from page 6*)

on my outdoor antenna (which is a good one, too) that I could not get on a loop. This supports my theory, which I have repeatedly stated: circuits to-day afford such great amplification at radio frequencies that the comparatively small amount of energy picked up by a loop is amply sufficient and enables clearer and more distant reception than an outdoor antenna. The outside aerial is likely to cause an abnormally high static level for the reception of distant stations and also induce tube overloading, which affects quality. The directional qualities of the loop, moveover, put the Diamond on a loop in the same selectivity class as the Super-Heterodyne, and enable the separation of low-wave stations that are only 10 kilocycles apart in their frequency assignment, yet very close at hand physically. If there is any set that a person can build at home that gets greater distance and affords finer quality of tone on outdoor aerial or loop, with great volume, I do not know what that set is.

The tuning is not difficult, except for reception of some distant stations, and for the general run of DX reception all receivers are a little difficult to tune. C1 and C3 are the wavelength controls and are at left and right on the panel, while the regeneration control is in the center. Local stations should be tuned in by the voice or music, with the tickler so positioned that it causes no whistle or squawk on any low wave, even before tuning in is attempted. Once a station is received the condenser settings should be noted for logging purposes. It is impossible to log an inductive feedback coil, such as this tickler, so the coupling is tightened until the desired volume is obtained. For reception of distant stations it is necessary to catch the whistle caused by the carrier wave and the oscillating receiver beating. Then the tickler-coupling is made less until the whistle disappeared and only the program is heard.

Many hundreds, if not thousands, built the 1925 Model Diamond, and not one reported serious difficulty. However, anybody who encounters any trouble whatsoever, or who desires information concerning parts or on any point I have not covered, is invited to send his questions to me at 1493 Broadway, New York City.

* * *

FROM CANADA HE GETS MIAMI BEACH ON DIAMOND

DIAMOND EDITOR:

I have just completed building The Diamond of the Air, and tuned in tonight for the first time, using a 115-foot aerial. The stations I listened to were: WBBR, Staten Island, N. Y.; WBZ, Springfield, Mass.; WGY, Schenectady, N. Y.; WPG, Atlantic City, N. J.; WEEI, Boston, Mass.; WHAR, Atlantic City, N. J.; WHT; WIBO; WBBM, Chicago; WOAT, San Antonio, Texas, and WMBF, Miami Beach, Fla.

Every one of the above was received on the speaker with sufficient volume to be enjoyed in the next room. In fact WBZ and WGY nearly blew my Amplion speaker to pieces. I built the J. E. Anderson low-loss Superdyne as described in RADIO WORLD, Nov. 22 and 29, 1924, and although I had remarkable results with it I think Herman Bernard with his Diamond has stolen a march on Mr. Anderson.

A. E. MEGARITY,
49 Cranston Ave., St. John, N. B., Canada.

List Shows What Channels Are Used for Short Waves

WASHINGTON.

With winter and better radio reception approaching, officials of the Department of Commerce are beginning to worry again about the wavelength situation.

The subject will be taken up at the National Radio Conference which Secretary Hoover will call late in September or early in October. It is possible, although highly improbable, that the conference may be able to find some solution of the problem.

To give a clearer picture of the situation, the following table, showing the allocation of all wavelengths, is presented:

Meters		Meters	
0	to	4.69	—Beam transmission.
469	to	5.35	—Amateur.
5.35	to	16.7	—Public service and mobile.
16.7	to	18.7	—Amateur.
18.7	to	21.4	—Public service and mobile.
21.4	to	26.3	—Public service.
26.3	to	27.3	—Relay broadcasting exclusive.
27.3	to	30.0	—Relay broadcasting.
30	to	33.3	—Relay broadcasting exclusive.
33.3	to	37.5	—Public service and mobile.
37.5	to	42.8	—Amateur and army mobile.
42.8	to	52.6	—Public service.
52.6	to	54.5	—Relay broadcasting exclusive.
54.5	to	60	—Public service.
60	to	66.6	—Relay broadcasting exclusive.
66.6	to	75	—Public service and mobile.
75	to	85.7	—Amateur and army mobile.
75.7	to	105	—Public service.
105	to	109	—Relay broadcasting exclusive.
109	to	120	—Mobile.
120	to	133	—Aircraft, exclusive.
133	to	150	—Point to point, non-exclusive.
150	to	200	—Amateurs.
200	to	545	—Broadcasting.
545	to	600	—Aircraft and fixed saving of life stations.
600	to	1,052	—Marine and coastal, including radio compass and beacons.
1,052	to	3,156	—Government, point to point, marine and experimental.

The Super-Heterodyne 8-Tube DX Receiver

(*Concluded from page 8*)

left off terminal of the .0005 mfd. condenser and to the P post on the filter RFT. Connect the F posts of the filter RFT and the other two RFT together. This common lead goes to the mid-section (arm) of the potentiometer and to one terminal of the .005 mfd. condenser. The other terminal of the .005 mfd. condenser goes to the outer terminal of the potentiometer (resistance wire), and to the F minus post of all the tubes. The left-out F post on the last RFT goes to the F plus post on the second detector and to the left off connection of the potentiometer, which also goes to the resistance wire of the detector rheostat. The arm portions of both rheostats are connected together and go to the A plus lead. The resistance wire of the last rheostat goes to the F plus posts on all the other tubes. The grids of the Filter, 1st and 2nd, RF all go to their respective grid posts on the sockets (Filter to the 1st tube of radio frequency, 1st RF to the grid of the second radio-frequency tube, etc.). The grid post of the last RFT goes to one terminal of the grid condenser and leak. The left off connection of the leak and the condenser go to the grid post of the 2nd detector tube. The plate posts on the 1st RF, 2nd RF and the 3rd RF go to their respective plate posts on the sockets, viz., plate post on 1st RFT to plate post of the 1st radio tube, etc. The B post of the 1st, 2nd and the 3rd RFT go to the B plus 67½-volt post. One terminal of a .1 mfd. condenser goes to the A minus post, and the other post goes to the B plus 67½ volts. The plate of the 2nd detector tube goes to the bottom terminal of the double circuit detector jack, and also to one terminal of the .002 mfd. condenser.

LIST OF PARTS

One Welty antenna coupler.
One Welty oscillator coupler.
One Welty tuned input (filter) transformer.
Three Welty matched intermediate-frequency transformers.
Two Heath radiant .0005 mfd. variable condensers.
Two Keystone audio-frequency transformers.
One 7x24" panel.
Eight sockets.
2 6-ohm rheostats.
One 400-ohm potentiometer.
Two .00025 mfd. grid condensers.
Two .002 mfd. fixed condensers.
Two .005 mfd. fixed condensers.
One .0005 mfd. fixed condenser.
One .001 mfd. fixed condenser.
One .1 mfd. fixed condenser.
Two "Megit" grid leaks, 1 megohm.
Two 4" vernier dials.
Three jacks, two single circuits and one single circuit.
One filament switch.
One 7x23" baseboard.
Two rheostat 2" dials.
Accessories: One small variable condenser (optional), soldering lugs, bus bar, wood screws, phones, loud speaker, A and B batteries, connecting wire etc.

The other terminal of this condenser goes to the F minus post on the sockets. The audio-frequency portion of the wiring is standard, and there is no need of going into detail of this wiring, as it has been repeated consistently. A C battery is used. The negative post of this battery goes to the F minus posts of both AFT. The plus post goes to the A minus post. Across the primary of the second AFT a .001 mfd. condenser is placed. Across the output post a .005 mfd. is connected. There are 90 volts used on the plates of the amplifier tubes.

For those who wish to use the outside antenna, the following data are given: The antenna post goes to the antenna and the ground post goes to the ground post. Connect the loop post which connects to the filament plus side, to the beginning of the secondary winding. Connect the end of this winding to the other loop post. Automatically, when this is done, the condenser is shunted across the secondary of the coil.

How to Obtain Success

This set is by no means an easy job to wire. All wiring is done with No. 14 rubber covered wire. All leads should be as short as possible. Where soldering can be avoided, do so, as the soldering most people do is a detriment to the set instead of a help. Make tight connections.

The special variable condenser should be used in place of the .0005 input fixed condenser. This condenser should be adjusted when the set is tuned to a distant station.

The transformers as shown in the diagram are somewhat different from those now supplied by the Welty people. When wiring connect to posts as lettered on top of new transformers, as the location of these posts has been changed over from the old transformers as shown in the diagram to facilitate wiring.

In the case signals are not loud enough, reverse the A battery leads. Use UV201A tubes throughout. UV199 tubes may be used. The new UX tube may be used in the last step of AF. The panel is 7x24". The baseboard is 6x22".

Stations Off Their Waves Cause Whistles In Sets

WASHINGTON.

The Department of Commerce is attempting to minimize heterodyne interference which has troubled so many fans, said Dr. C. B. Jolliffe, an engineer of the Bureau of Standards.

"At times, when tuning-in a broadcasting station," remarked Mr. Jolliffe, "there is heard in the receiving set a whistling sound whose pitch (frequency) cannot be changed no matter what is done to the controls of the set. As the tuning adjustments are changed, the whistle reaches greatest intensity at one point on the dials and dies away gradually as they are turned from this tuning point. The fact that the note remains the same pitch distinguishes it from the whistle of varying pitch ('birdies') produced by you own or some other person's generating (oscillating) receiving set.

"If the tuning controls are turned slowly while one listens carefully it will usually be found that there are two stations which can be heard very close together when the whistle is at its maximum loudness. These two transmitting stations are 'beating' and producing the whistle. Let us take, for example, two stations that are on frequences of 800 and 801 kilocycles per second (wavelengths 375 and 374.5 meters).

"Signals from both of these stations enter the receiving set and in addition to giving up to the set the messages (music, etc.), which the radio-frequency currents produced by the carrier waves, combine and produce a note which has a frequency equal to the difference between the frequencies of the two received waves, in this case 1000 cycle (1 kilocycle) per second. This is a high-pitched whistle.

"Any two stations that are closer together than 3000 cycles will give a whistle which can be heard and which is very annoying. The frequency of the whistle is always the difference in the frequencies of the waves of the two beating stations.

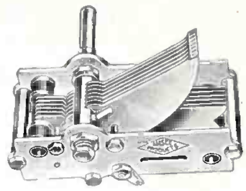
"The assignment of frequencies (wavelengths) which is made by the Department of Commerce to the transmitting stations is such that two Class B stations operating simultaneously should be no closer in frequency than 10,000 cycles. Two stations having a difference in their frequencies of 10,000 cycles produce a beat note which is too high to be readily audible. So if all Class B broadcasting stations maintain accurately the frequency which they are legally entitled to use they would produce no beat interference. These Class B stations are the ones to which the large majority of the people listen.

SEEK PLACE ON AIR

Last winter, with stations crowded so closely together, thousands of complaints reached the Department of Commerce of interference. Unless there is a change, conditions will be no better this winter and as a result fans will be unable to get a lot of stations that they like to listen in on.

To make matters even worse, there are pending nearly 200 applications for licenses for new stations. The owners are very anxious to go on the air.

SLF Condenser Found Marvelously Accurate



AMSCO .0003 mfd. SLF Condenser

When a straight-line frequency condenser is used, if the exact frequency variation is to be obtained, each division of a 100-division dial representing 10 kilocycles, the proper coil should be used. If there is even a relatively large deviation from the fundamental coil, the stations still will be spread out very well, but the scientific achievement of 10 kcy. separation between adjoining divisions will be only approximate. Reporting on the .0003 mfd. Amsco SLF condenser, one of the three different capacity condensers made by this company, Lester L. Jones, consulting engineer, 693 Broadway, New York City, says:

"The condenser plate is shaped for use with an inductance coil having an inductance of .275 millihenries and in a circuit having a total effective capacity across the condenser of .000029 mfd. In such a circuit the condenser will tune from 522 to 1,510 kilocycles (or a wavelength of from 575 to slightly under 200 meters). The variation in frequency between 6 and 100 degrees on the condenser is quite exactly 10 kilocycles per division (scale having 100 divisions). The variation from the straight-line frequency curve is less than 1%."

The .000029 mfd. capacity was made up of .000009 tube-socket capacity .000012 coil capacity, and .000008 lead capacity.

Two New Stations

WASHINGTON.

Two new class A stations were licensed recently. They follow:

Station	Owner and Location	Mtrs.	Wts.
KFRM	First Field Artillery, Fort Sill, Okla.	242	50
WBBZ	C. L. Carrell, Portable Station Chicago, Ill.	215.7	50

RESULTS

1,200 Miles on Speaker Easy to Get on Powertone

RESULTS EDITOR:

I have just finished my first set from RADIO WORLD hookups and want to say that I surely am pleased. I constructed the Powertone 5-tube 1-control set. There are six local stations over here, of which three are over 1,000 watts power. I have just tuned in several Los Angeles stations and Portland, am now listening to Vancouver, B. C. (1,200 miles) and can hear it distinctly 30 feet from speaker. I never expected to get such good results from a 1-dial set. It is just as selective as 2- or 3-dial sets. What I like most about it, is the wonderful tone of the audio amplifier, using one transformer and two resistance-coupled stages. Thanks to the inventor of the Powertone for his articles, August 29, September 5 and 12 issues.—George Shoptaugh, 209 Ridgeway Avenue, Oakland, Cal.

* * *

"Wonderful Success," His Report on Powertone

RESULTS EDITORS

I want to tell you of my wonderful success with the Powertone by Herman Bernard in the August 29, September 5 and 12 issues.

I got better results than on my neighbor's 5-tube Freed-Eismann Neutrodyne. Your staff sure knows their "stuff." I have built at least one hookup every issue and I find them all good.—Ed. Harlan, Berkeley, Cal.

* * *

DIAMOND A DX-GETTER ON A LOOP, FAN FINDS

Diamond Editor:

Last night I completed The Diamond of the Air. From my home in Niles, O., I picked up the following stations with speaker volume, using a home-made loop: KDKA, WCAE, Pittsburgh; WEAR, WTAM, Cleveland; WSAI, WDW, Cincinnati; WCCO, Minneapolis-St. Paul; WEAF, New York; CNRO, Ottawa, Canada; WBZ, Boston; WCX, WJR, Detroit; and KYW, Chicago.

This convinced me that The Diamond will "do its stuff" with a loop. It is a remarkable circuit. Tell Hancock to "give 'er another whirl."—E. J. CARIS, 139 Sheridan avenue, Niles, Ohio.

EASY TO MAKE, HARD TO BEAT IS DETROITER'S ESTIMATE

DIAMOND EDITOR:

This is the answer that I have for your critic regarding your hook-ups.

I constructed The Diamond of the Air and at first had a little trouble in tuning, but after a little practice I found out that this is a circuit easy to make, easy to tune and mighty hard to beat.—Geo. D. Kelsey, 4178 Lenox, Detroit, Mich.

* * *

STATION FOR PARAGUAY

Paraguay is to have a broadcasting station. The Ministry of War and Marine has been authorized to purchase 60,000 Paraguayan paper pesos worth of material and tools for the radio stations which is to be erected at Fuerte Olimpo. As one Paraguayan paper peso is worth approximately two cents, it is not believed the station will be very powerful.

HOW TO BUILD THE POWERTONE, 1 dial, 5 tubes, described in RADIO WORLD, issues of Aug. 29 and Sept. 5. Powertone Trouble-shooting, Sept. 12. Send 15c for all three. Special diagrams and "blueprint in black" included among the many illustrations. RADIO WORLD, 1493 Broadway, New York.

Constants for the 5-Tube Browning-Drake Set

(*Concluded from page 9*)

home would have a standard parlor receiver, too.

"I can use almost anything for an aerial," he said, "and clamp on to cold water pipes for a ground. I carry the set with me in my car."

The rheostats in the list of parts are for the 4½-volt dry-cell tubes. For the 6-volt type use two 20-ohm and one 15-ohm.

LIST OF PARTS

One aerial transformers, L1L2.
One 3-circuit tuning coil, L3L4L5.
Two .0005 mfd. variable condensers, C1, C2.
One neutralizing condenser, N.
Two 30-ohm rheostats, R1, R2.
One 15-ohm rheostat, R3.
One double-circuit jack, J1.
One single-circuit jack, J2.
Fixed condensers: one .00025 mfd. grid condenser; one .001 mfd. by-pass; one 1.0 mfd. by-pass; one .0001 mfd.
One variable grid leak.
One A battery switch.
Five sockets.
One 7x21" panel.
One baseboard.
Three dials.
One tap switch.

GERNSBACK'S SET

(*Concluded from page 15*)

appeal to those who wish the simplest possible control of a radio set.

[*The coils used by Mr. Gernsback were wound on a 2½" diameter stator tubing, No. 24 silk over cotton wire being used for the 10-turn primary and the 52-turn secondary. About ¼" separation exists between primary and secondary. The tubing is 3" high. The tickler has 40 turns of No. 28SSC wire on a 1½" diameter, 1¼" high. The secondary inductance in each case is shunted by a .0005 mfd. condenser.*

Mr. Gernsback by special arrangement has consented to answer queries on this circuit. Address Mr. Hugo Gernsback, care RADIO WORLD, *1493 Broadway, New York City, and your letter will be handed to him personally.*]


EVERY LEAK is thoroughly tested by the audible beat method, with an Osglim tube (above), and again on a megometer. (Foto Topics.)