

GETTING ACQUAINTED *with* SHORT WAVES

This is the fourth article of a series for the beginner which will provide a short-wave primer dedicated to an intelligent understanding of short waves and how to derive the greatest pleasure from them

James Millen

THE construction and study of a short-wave receiver presents an excellent lesson in the theory and practice of radio in general. At the same time it offers a fascinating introduction into the short-wave field which is becoming increasingly interesting and important. The purposes of this article are to describe in detail the construction of such a receiver, and then next month to take it apart, theoretically, to see just *how* and *why* it works.

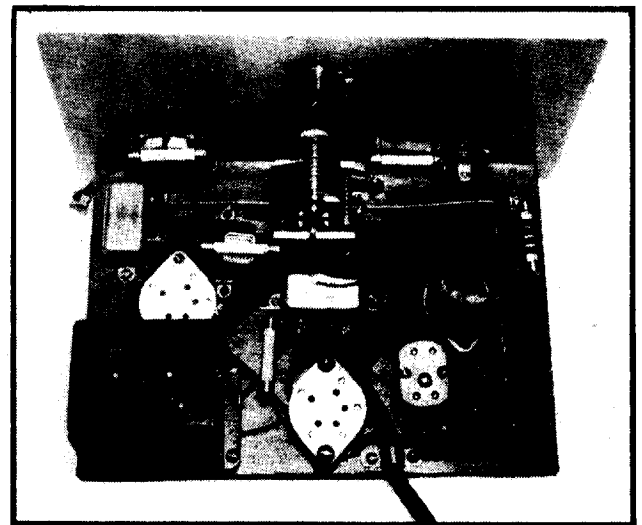
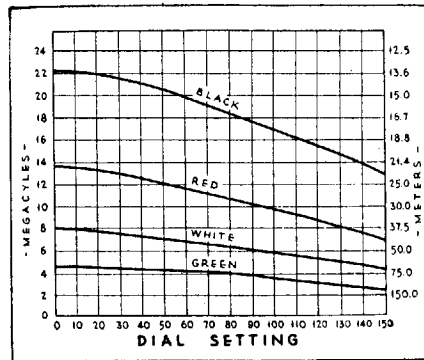
Accordingly, we have designed a short-wave receiver operable from power lines or batteries, which is so simple that anyone can build it, regardless of their mechanical ability or experience. As a matter of fact, we start with the assumption that the reader's practical acquaintance with things electrical is limited to fixing a floor plug or replacing a fuse.

It is first recommended that the prospective short-wave enthusiast familiarize himself with the general idea of short-wave reception by reading the first three articles of this series—appearing in *RADIO NEWS* for January, February and March of this year. Next, check the family tool chest for the necessary tools.

You will need a medium-size screw-driver, a small saw, wire-cutting pliers, a hand-drill and an electric soldering iron. A good iron can be bought for about one dollar. If you are missing the drill, your local garage man will be glad to drill the few holes in the panel. (However, we recommend the acquisition of the drill, for the chances are this will not be the last set you'll build!)

THE TUNING CHART

Figure 5. These are the tuning curves for the four most popular coils



THE TOP VIEW

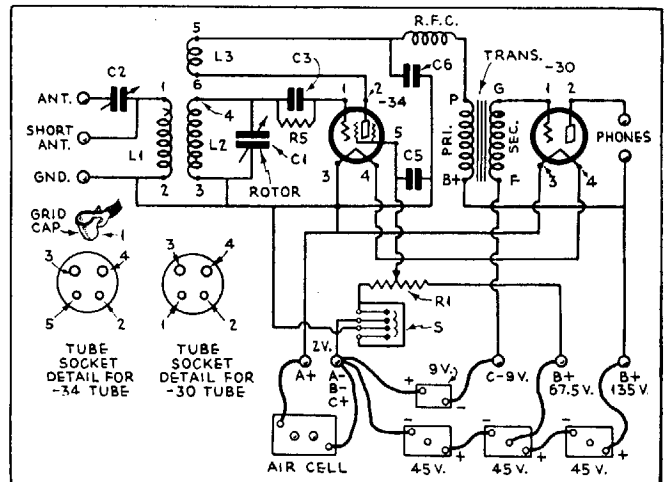
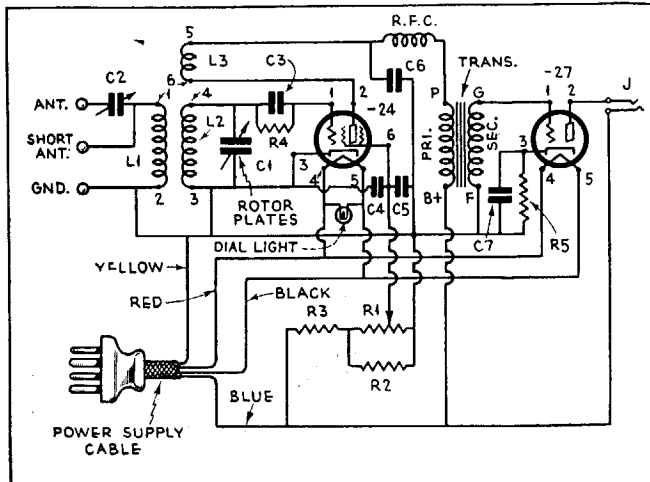
Figure 6. This shows the general layout and construction details of the complete set

Read this article at least twice before attempting to build the receiver. Study the circuit diagrams, layout drawings and photographs. Figure 1 is the a.c. set wiring diagram drawn with the conventional radio symbols. Figure 2 is a picture diagram of the same which will probably be of greater significance to the beginner. Figure 3 is the schematic diagram of the battery set. Compare these drawings and endeavor to identify the various parts in Figures 1 and 3. They carry the same labels as in Figure 2 and in the parts list (except for changes in the battery set).

The first step in actually building the short-wave set is to drill the holes in the front panel in accordance with the layout of Figure 4. While the parts list calls for an aluminum panel, considerable latitude in size (larger) and material may be permitted in the construction of a beginner's first receiver. Hard rubber or bakelite make excellent panels, but even clean, dry plywood can be used. The panel is mounted on the base-board, which may be made from any convenient slab of wood. Here, too, the constructor may vary somewhat from the mechanical procedure indicated

SCHEMATIC CIRCUITS FOR A.C. AND BATTERY OPERATION

Figure 1. (Left) The circuit of the simple a.c.-operated short-wave receiver for beginners. Figure 3. (Right) by making minor changes in wiring and parts, the a.c. circuit of Figure 1 is converted for battery operation

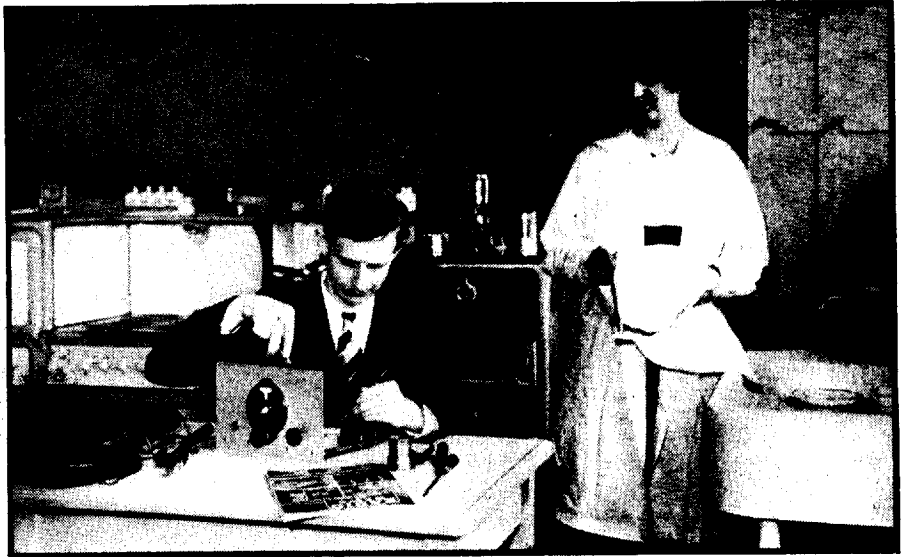


in the illustrations. The panel can be mounted by means of small angle brackets, obtainable in any hardware store, or, if the base-board is thick enough, the panel can be screwed directly to its front edge. While "feet" contribute to the appearance of the completed job, they are of course not essential.

When the panel and base-board have been joined, mount the condenser C1, jack (J), resistor R1, the dial and the pilot light. The legs supporting the tuning condenser, binding-post strips, sockets and transformer can be obtained from most hardware stores, but if more convenient, they can be built up with the required number of washers. The dial is fastened to the panel by small screws coming through the back, after first prying off the hub and loosening the set-screw so that the dial will slip over the tuning condenser shaft. Move the rotor as far out as it will go—that is, counter-clockwise—and set the dial on zero. Now tighten the set-screw and replace the hub-cap. When the condenser is turned all the way to the right, the dial should show the one hundred and fiftieth division. (Though there are 200 dial divisions, only three-quarters of them are used with a 270° condenser.)

The dial light is connected in parallel with the heater of the tube—that is, two wires (which should be twisted as shown in Figures 2 and 6) run from the two heater connections, 4 and 6, to the pilot light.

Now mount C4, the sockets and binding-post strips. The remainder of the parts are mounted as they are wired, being held in place by the bus-bar wire which also makes the connections. Flex-



THE BEGINNER'S KITCHEN WORKSHOP

In addition to indulging an intriguing hobby, this radio beginner avoids the job of drying the dinner dishes while the lady of the house acts the part of the "kibitzer"

ible leads are used only in connecting parts which are rigidly mounted. Inspection of the top-view photo will indicate where the stiff wire is employed.

Wire the sockets first, then go along with the rest of the connections in any order of sequence you please. Twist all heater leads as shown in Figures 2 and 6. The numbers in Figures 1, 2 and 3 identify just where the connections are made on the coil and tube sockets. The transformer connections are initialed as indicated. Be sure to connect the rotor plates of C1 to the wire running to the ground post.

The color-code of the power cable must be followed as indicated. Care should be exercised in wiring the volume control exactly as shown in Figure 2. If the outside connections are reversed, the volume will increase as the knob is turned backwards.

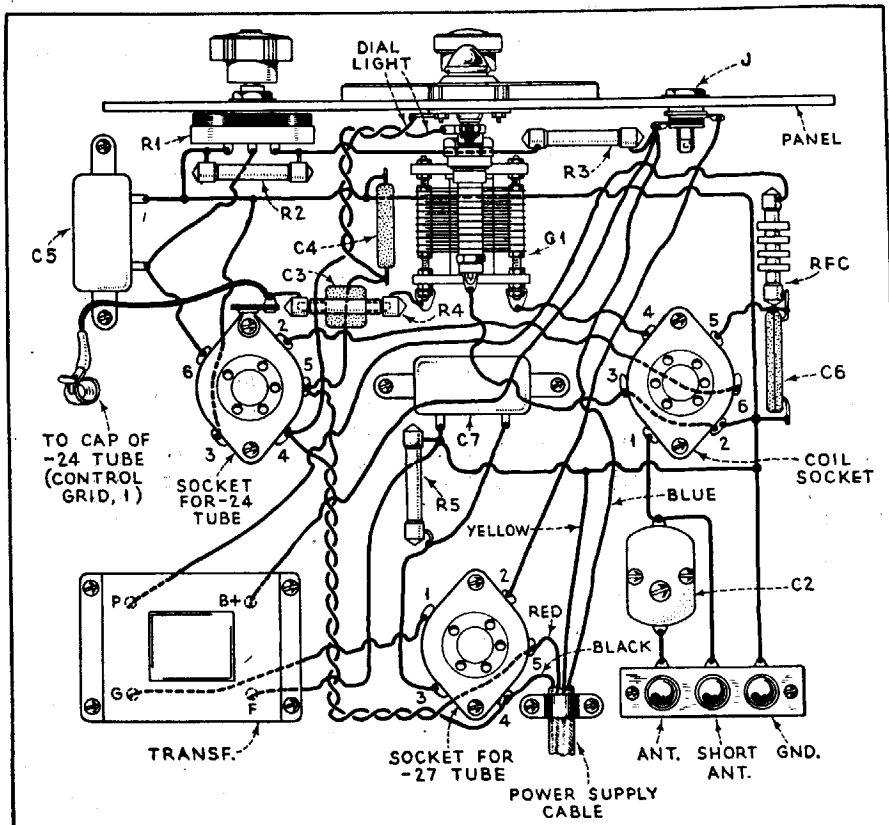
Further constructional details will be evident from the picture diagram, Figure 2, and the top-view photograph, Figure 6. While these illustrations were made from the a.c. version, the changes in the battery set are so slight that they may still be used as a guide.

In the battery set, switch S is mounted in place of the jack, J, on the panel. Be sure to make this connection exactly as shown. A misplaced wire here would still permit the switch to turn "on and off" the filament of the -34 tube, but would result in the rapid drain of half the B battery through the volume control.

If the dial light is used, make certain that it is the .06-ampere type, otherwise the air-cell battery may be discharged in a short time. The correct bulb can be identified by the pink glass bead supporting the filament. The additional binding posts required in the battery set may be conveniently mounted on a strip at the back of the base-board. (Continued on page 632)

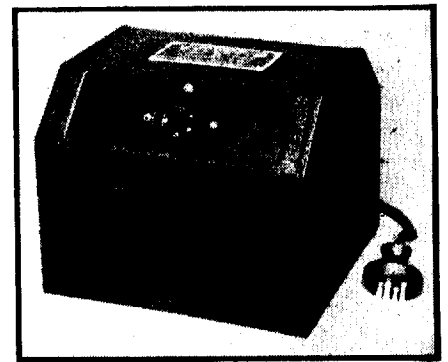
THE PICTURE-WIRING DIAGRAM

Figure 2. Reproducing Figure 1 as a picture diagram



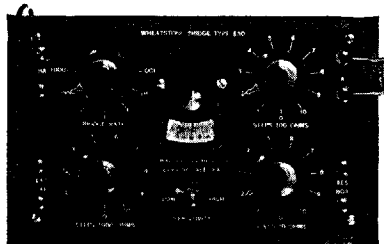
THE POWER SUPPLY

Figure 7. This power supply unit provides both heater and plate voltages for the a.c. short-wave model



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Getting Acquainted With Short Waves

(Continued from page 595)

The following parts will be used in the a.c.-operated receiver:

Parts List

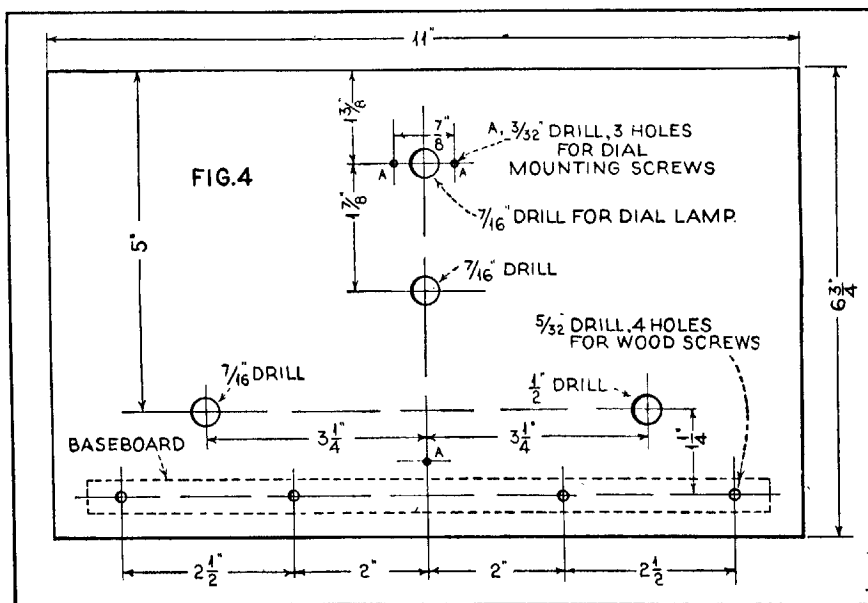
- One aluminum panel, size 7" x 11"
- One base-board, about 10" x 7" deep
- C1—National 100 mmfd. variable tuning condenser, type SE100
- C2—Fixed-variable 70 mmfd. variable condenser (screw-driver adjustment)
- R1—50,000-ohm potentiometer
- R2—Lynch 2-watt 5000-ohm pigtail resistor
- R5—Lynch 2-watt 2000-ohm pigtail resistor
- R3—Lynch 2-watt, 10,000-ohm pigtail resistor
- R4—Lynch 5-megohm pigtail grid leak
- RFC—National radio-frequency choke coils, type 100
- Two National 5-prong sockets (for tubes)
- One National 6-prong socket (for plug-in coil)
- One National 4-conductor power cable

lowing parts and accessories will be eliminated: C4, R2, R3, R4, 2 six-prong sockets (for the tubes), the type -24 tube, the type -27 tube, the type -80 tube, the telephone jack (J), the phone plug, the power supply plug and the power supply.

Taking the place of these a.c. parts in the battery set are:

Extra Parts List

- Two National 4-prong sockets (for the tubes)
 - Seven additional binding posts
 - S—Double-pole, single-throw toggle or jack switch
 - R5 (Figure 3)—Lynch 10-megohm grid leak
 - One type -34 tube
 - One type -30 tube
 - One Eveready air-cell battery
 - Three 45-volt, center-tapped B batteries
 - One 9-volt C battery
- The same coils are used in both the a.c. and d.c. models, and the following is a



- J—Telephone receiver jack
- Three binding posts
- One National VBC dial
- Trans.—National amplifying transformer, type S101
- C3—Mica grid condenser, .0001 mfd.
- C4—By-pass condenser, .01 mfd.
- C5, C7—By-pass condensers, .5 mfd.
- C6—Mica by-pass condenser, .00025 mfd.
- L1, L2, L3—National plug-in coils for the wave ranges desired
- One bakelite strip for mounting binding posts
- Miscellaneous screws, hardware, etc.
- One coil flexible hook-up wire
- One package bus-bar wire
- One National grid grip, type 24 (for connection to top of tube)

In addition to the above parts used in the actual construction of the short-wave set, the following accessories should be acquired:

Accessory List

- One type -24 tube for the detector
 - One type -27 for the amplifier
 - One type -80 tube for the power supply
 - One National complete power supply, type 5880-AB, for 110 volts, 60 cycles, or type 5880-AB-25 for 25 to 40 cycles
 - One telephone receiver head-set—2000 to 4000 ohms (with plug)
- If the battery set is constructed, the fol-

list of those in which the beginner will be most interested. The colors refer to the stripe on the face of the rim by which they are readily identified.

Coil Types and Ranges

- No. 11—black—13.5 to 25 meters—day-time, long-distance reception
- No. 12—red—23 to 41 meters—miscellaneous broadcasting
- No. 13—white—40 to 70 meters—long-distance night broadcasting
- No. 14—green—65 to 115 meters—amateurs, airplane
- No. 15—blue—115 to 200 meters—police broadcasts

The tuning curves of four of the most popular coils are illustrated in Figure 5. Do not try to buy these parts directly from the manufacturer. If you live in the city, you will have little difficulty in locating a convenient source of supply. Any radio serviceman can direct you to a store handling parts—and in most cases he will be glad to get them for you himself. If you prefer to purchase direct by mail, look through the advertising section of this magazine. You will find several radio parts houses who will send you their catalogs. These firms are reliable and their prices are cheap as possible for the designated parts.