

With the latest disks and even later music off the airwaves, you're equipped for any party—anywhere.

## Portable Phono-Radio Combination

By GEORGE O. SMITH

FOR CANNED or current entertainment, here's an all-around music box that will keep you in the swing. Built into a small case that usually holds only a phonograph, this set contains a five-tube superheterodyne receiver that can be used alone or as an amplifier for the record player. The radio operates on A.C. or D.C., making the unit useful wherever 115-volt current is available. A universal motor would give the record player an equal amount of flexibility, but since one may be hard to come by, either an A.C. or D.C. motor can be used in its place. In this event, of course, you will have to see that the phonograph part is not used on the wrong current.

To get the radio into a small cabinet, the tubes and intermediate-frequency transformers are mounted on one edge of the chassis. This "in-line" layout fits below the phonograph motor and tends to isolate several of the oscillation-producing components. A standard 1½" by 5" by 9" blank is used for the chassis, but a satisfactory substitute can be formed from 20-gauge steel or aluminum. Aluminum may be better if heavier stock is used, and it should offer no soldering difficulties since connections to the

chassis are made with lugs. The complement of tubes and transformers will fill the edge of the chassis with no room to spare, so, as a step in space conservation, use spring-type tube bases; these fit into mounting holes of approximately 1 5/32" diameter and are secured by retaining clips.

The rest of the layout will depend upon the space available in your cabinet. In mounting the gang condenser, don't forget to allow for the swing of the rotor plates. It may be possible to make a direct coupling in some cases; in others, a flexible coupling or flexible shaft must be used. The latter will allow the condenser to be mounted at some distance from the dial. If none of these methods is feasible, you may have to resort to the dial-cable system shown in the photograph at the top of page 194. Cut the condenser shaft short of the front panel, and fasten over it a knob with straight sides. Build up the hub of the dial assembly with tape or a metal bushing, and wrap the cable around it. To secure the cable ends, replace the knob setscrew with a longer screw of the same thread, slotted at one end. Tighten the knob with this screw, pull the cable firmly through the slot, and solder it fast.

When cutting the board for the phono-

graph motor and turntable, it is necessary to place the disk over to one side in order to leave enough room for the pickup arm. Try out the position of both units with the largest record you expect to use before drilling the board.

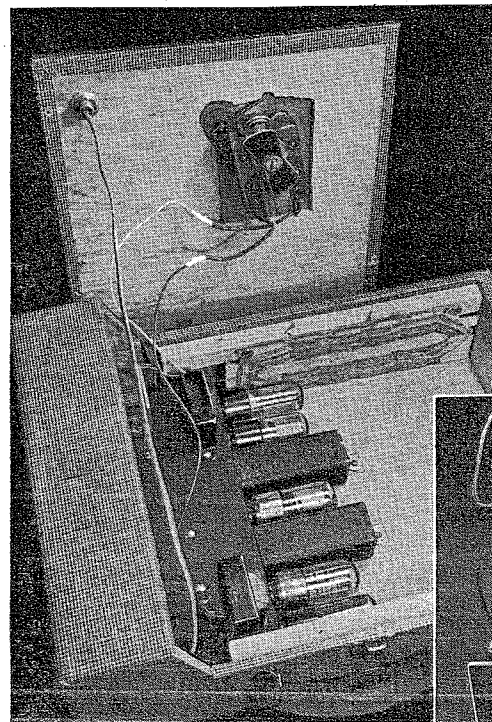
The recessed-control panel eliminates the protruding knobs that may either become damaged or do damage during transit. Separate rectangles are cut out of the cabinet front, and the panels holding the dial and control knobs are fastened behind the openings. If you have a large sheet of bakelite or other material suitable for use as a panel, you may prefer to cut a single rectangle long enough for the speaker and both control sections. Whichever way you do it, be sure to leave finger clearance around the knobs.

Remove the crystal cartridge from the pickup arm by taking out the two screws

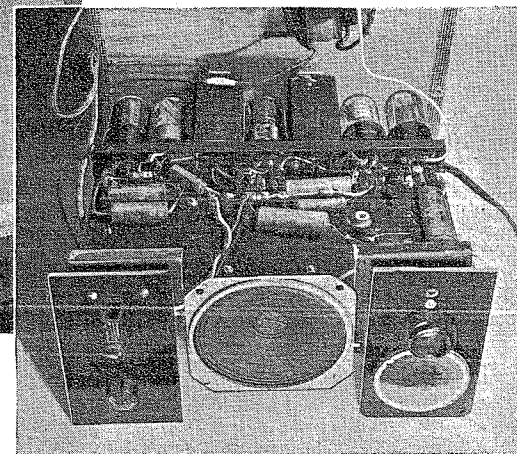
on the sides. The cartridge probably has two lugs used in making connections to the amplifier, and a third, grounded lug which is usually riveted to the case and soldered to one of the connecting lugs. Unsolder this connection. Using two-conductor shielded cable, run the shield to the cartridge-case lug, and the two wires to the crystal-element lugs. These connections will isolate the circuit from the chassis and pickup arm.

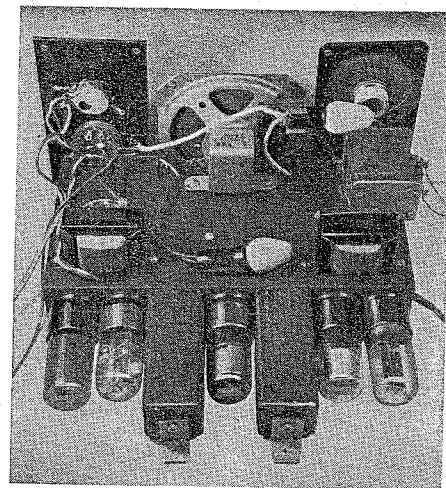
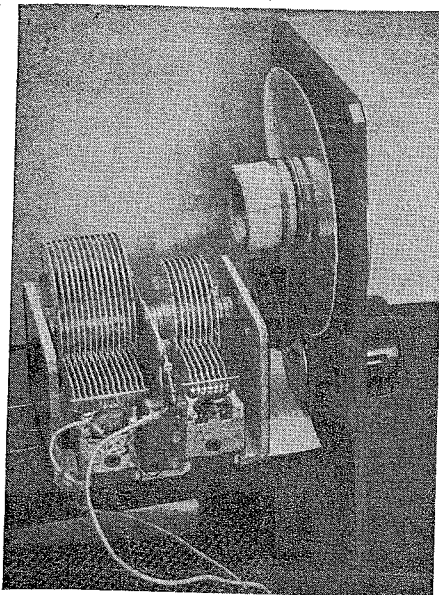
With great good luck you may be able to find a manufactured loop that will fit your cabinet. In the more likely event that you can't, a plan for the loop is shown in the photo and drawing at the bottom of the next page. Follow the pattern as closely as possible; if you must revise it to fit your carrying case, alter the internal dimensions proportionately. Cut the form from heavy cardboard or medium fiber, making an uneven number of slots so that the alternate turns will cross above and below each tongue. Wind the loop with No. 22 silk-covered wire; be sure there is an enamel coating on the wire, for the thin silk insulation may part where the wires cross, and an uncoated wire would cause shorted turns. After winding, either paint the loop liberally with coil dope or immerse it in melted paraffin to keep moisture out.

The three-position, four-pole rotary switch turns on the radio in one position, turns everything off in another, and in its third slot operates the phono amplifier and the motor. Pilot lights illuminate the radio dial or the turntable area, depending upon which part is in use. Hum pickup is min-



The "in-line" radio-amplifier layout utilizes the normally wasted space in front and below the phonograph motor. Tubes are mounted along one edge of the chassis, with the speaker and control panels fixed along the opposite edge.

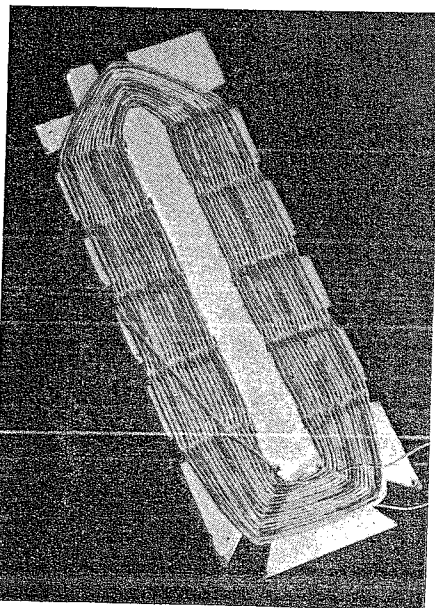




At left, the dial-cable assembly, showing the knob on the condenser shaft and the built-up bushing on the dial hub. Above, note the angle brackets atop the I. F. transformers for fastening to the case.

imized by breaking the 115-volt line at the B-minus side of the switch. This side is directly connected to the audio return circuit, where little hum voltage exists.

Alignment and adjustment of the set follow the usual procedure. If a signal generator is available, trace the signal through

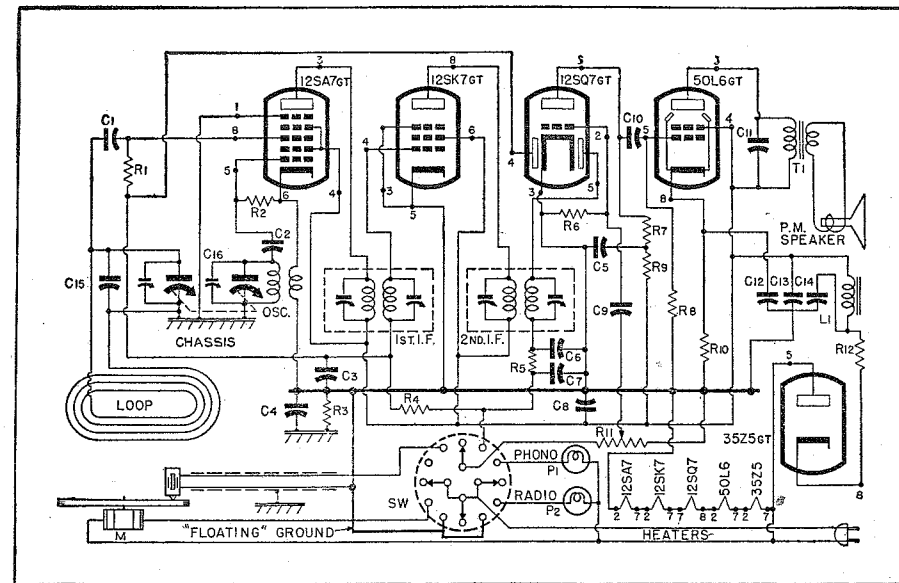
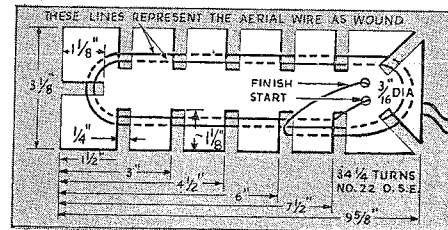


the I. F. transformers, and adjust for maximum output. Without a generator, the adjustment can be made on the air. Intermediate-frequency transformers are generally tested at the factory and set approximately to operating frequency. It is only necessary for you to compensate for the difference between the manufacturer's test equipment and your circuit by tuning in a strong local station (which should come through the factory-set transformers) and adjusting for maximum strength.

If a high-resistance voltmeter is handy, clip it directly across the outside terminals of the volume control. Use a meter scale that includes at least .5 megohm (on a 1,000-ohms-per-volt instrument, this would be the 500-volt scale) and align the I. F. trimmers for maximum voltage.

On the oscillator section of the gang con-

If it is necessary to alter the dimensions of the antenna, try to maintain the proportions as shown.



denser, C 16, the trimmer should be set to about one full turn out from the "tight" position. It may be necessary to alter this setting later if the frequency coverage of the receiver is incorrect, but use this as a starter. Tune the set to a station near the high end of the band (i.e., with the condenser almost fully open), and adjust the trimmer on the antenna section of the condenser for greatest signal volume. If the peak volume is not passed by the time the trimmer is fully tightened, add a 10-mmf. or 20-mmf. mica condenser (C 15) across the gang-condenser section. Use whichever value is needed to peak the trimmer.

Now tune in a station at the low end of the dial, and see if the signal strength can be improved by altering the setting of the trimmer. If more capacity—tightening of the trimmer—is needed, add about a half turn to the antenna loop, and repeat the tuning procedure, starting at the high end. Continue adding wire, a half turn at a time, until no trimmer change is needed at the low end of the dial. The set is then properly tracked. If less capacity is needed on the first trial at the low end, remove a half loop of the antenna and continue removing turns until tracking is right.

The set is held in the cabinet by two L-brackets placed under the hold-down nuts on top of the I. F. transformers, and by screws connecting the panels and cabinet.

#### LIST OF PARTS

- C1, C2: 50 mmf. mica.
- C3: .05 mfd., 250 volts.
- C4, C5, C8: .25 mfd., 250 volts.
- C6, C7: 100 mmf. mica.
- C9: .002 mfd., 250 volts.
- C10: .02 mfd., 250 volts.
- C11: .01 mfd., 450 volts.
- C12, C13, C14: triple-capacity electrolytic. C12, 20 mfd. 25 volts; C13, C14, 20 mfd. 150 volts.
- C15: 10 or 20 mfd. See text.
- C16: Two-gang tuning condenser with trimmers.
- R1, R8: 1 meg.
- R2: 35,000 ohms.
- R3: 250,000 ohms.
- R4: 2 meg.
- R5: 50,000 ohms.
- R6: 10 to 20 meg.
- R7, R9: 500,000 ohms.
- R10: 170 watt, 1/2 watt.
- R11: 500,000-ohm pot.
- R12: 25 ohms, 1/2 watt. (Resistors 1/4 watt unless otherwise specified.)
- T1: Output transformer.
- L1: Filter choke.
- Osc.: Oscillator coil.
- Sw: 4-pole, 3-position rotary switch.
- P1, P2: 115-volt pilot lights.
- M: Phonograph motor.
- Permanent-magnet speaker, 2 intermediate-frequency transformers, crystal pickup, tubes, sockets, knobs, dial, misc. accessories.