HERE'S a pint-sized crystal radio with enough comp to drive a 2½” speaker. This little unit's selectivity is far better than you'd expect to find in a crystal receiver and volume is equal to that obtained with sets using a transistor. No external power source is required.

The unusual selectivity of this radio is due to its special double-tuned circuit. A pair of diodes connected as a voltage-doubler provides the extra kick to operate the small speaker. An output jack is provided for headphone listening and for connecting the set to an amplifier.

Construction. The model was built on a 2½" x 4½" wooden chassis with a 3½" x 4½" metal front panel. However, size is not critical, and other materials can be substituted if desired.

Two standard ferrite looped coils, L5 and L3, are used. Both must be modified by the addition of a second winding, L6 and L4, respectively. Each of the added windings consists of 22 turns of No. 24 cotton-covered wire wound on a small cardboard tube as shown on the pictorial. (Actually, any wire size from No. 22 to No. 28 with cotton or enameled insulation will do the job.)

Voltage-doubler circuit drives miniature speaker.

By WALTER B. FORD

HIGH-POWER CRYSTAL SET

ELECTRONIC EXPERIMENTER'S HANDBOOK
**Layout** is not critical but L2 and L3 should be mounted at right angles to each other.

The crystal set shown was built on a wooden chassis. If a metal chassis is used, be sure to insulate the Farnsworth clips (antenna and ground) from the chassis.

1961 Edition
For phone operation only, the speaker, transformer, and resistor R1 can be omitted. In this case, connect high-impedance phones in place of R1.

diameter of the cardboard tube should be slightly larger than L2 and L3 so that L1 and L4 will slip over L2 and L3 easily.

Resistor R1 is used only for feeding the set into an amplifier; it should be omitted for both earphone and loudspeaker operation. Trimmer capacitor C2 should be soldered across the stator terminals of two-gang variable capacitor C1a/C1b, as shown. The speaker and output transformer can be mounted wherever convenient.

After all of the parts have been mounted on the chassis, wire them together following the schematic and pictorial diagrams. Be sure that diodes D1 and D2 and capacitors C3 and C4 are correctly polarized.

Alignment and Operation. To align the receiver, first connect it to an antenna and ground. (The optimum length of the antenna varies with location, but 50 feet will usually be suitable in areas serviced by several broadcast stations.) Next, plug in a high-impedance earphone at jack J1. Tune in a station near the high-frequency end of the broadcast band—say 1500 kc.—and adjust the trimmer capacitors on variable capacitor C1a/C1b for the loudest signal.

Trimmer capacitor C2 should then be adjusted for the best selectivity and volume over the entire broadcast band. Finally, coils L1 and L4 can be optimally positioned by sliding them back and forth over coils L2 and L3. If a nearby station interferes with reception of a weaker one, tune the slug on L5 for minimum interference.

For loudspeaker operation, simply unplug the earphone from J1—strong local stations should come in with fair volume. To operate the set as an AM tuner, wire R1 in place and connect J1 to the crystal-phonograph input of a preamplifier or integrated amplifier. The set should give excellent results with a quality hi-fi system.

**PARTS LIST**

C1a/C1b—2-gang, 365-μf., variable capacitor (Lotusite Model 140 or equivalent)
C2—180-μf. compression-type trimmer capacitor
C3, C4—.065-μf. fixed capacitor
D1, D2—1N94A diode
J1—Closed-circuit phone jack
L1, L2—22 turns of No. 24 cotton-covered wire (see text)
L3, L5—Ferrite antenna coil (Miller 6300 or equivalent)
R1—7500-ohm, 1/4-watt resistor (see text)
T1—Replacement-type output transformer; 3000- to 10,000-ohm primary; 4-ohm secondary
Snp.—2½" speaker. 4-ohm voice coil
Misc.—Hardware, wood, aluminum sheet, Fahrenheit stock clips, etc.

**HOW IT WORKS**

The receiver employs a double-tuned circuit feeding a crystal-diode voltage-doubling/detector which drives a small speaker. In operation, r.f. signals picked up by the antenna system are induced into coil L3 from coil L1. The desired signal is selected by tuned circuit C1a-L2 and coupled through capacitor C2 to a second tuned circuit, C1b-L3, which improves the selectivity by narrowing the r.f. bandpass. The twice-tuned r.f. signal is then induced into coil L4 from coil L3. The positive half of the r.f. signal appearing across L4 passes through diode D2 to charge capacitor C4; the negative half of the signal passes through diode D1 to charge capacitor C3. Polarity of the charges on C3 and C4 are such that the effective voltage is doubled. This voltage appears across the primary of output transformer T1, which changes the high impedance at the output of diodes D1 and D2 to the low impedance required by the speakers.

When high-impedance earphones are plugged into closed-circuit jack J1, the speaker is disconnected and the output from the diodes feeds directly into the earphones. Optional load resistor R1 is placed across the output of the diodes when the receiver is used with an amplifier.