17-1. A shielded wire lead (not shown) is furnished with this instrument for connecting its output terminals to the receiver, being aligned. The shielding prevents radiation of the oscillator signal through the air to the wiring of the receiver under test.

17-3. **"Clough-Brengle" Model OC Oscillator.**—Figure 17-3 shows an external view of the Clough-Brengle Model OC all-wave test oscillator. The arrangement of its main parts is

Courtesy Clough-Brengle Co.

FIG. 17-3.—Exterior view of the all-wave oscillator whose rear view and schematic circuit diagram are shown in Figs. 17-4 and 17-5 respectively. It operates from either a 110-volt a-c or d-c line. (Model OC.)

shown in the interior view of Fig. 17-4. This service oscillator has several interesting features. It uses three tubes (a rectifier, an oscillator and a modulator tube), operates from either a-c or d-c power lines, and makes use of fundamental frequencies only, to cover its entire range from 50 kc to 30 mc (6,000 to 10 meters).

As shown in the schematic circuit diagram in Fig. 17-5, the 110-volt a-c or d-c line enters a line filter network to a type '37 tube, with grid and plate connected together as a rectifier for the plate and screen grid B supply, using the conventional a-c—d-c circuit. This enables the instrument to be operated on either a-c or d-c current. The line filter prevents feedback through the power supply circuit. The output of the rectifier is filtered by an iron-core choke and condensers C_7 and C_8; the positive B lead connects to one end terminal of the modulation choke L_8. The center tap of this choke supplies plate voltage to the type '36 oscillator tube and the other end terminal supplies plate voltage to the modulator tube; thus, constant-current "plate" modulation (see Art. 15-25) is secured.

The oscillator circuit is of the electron-coupled type, whose frequency is not affected by wide fluctuation in tube voltages (see Art. 15-31). Modulation may be applied to the plate circuit. The grid, cathode and ground leads terminate in three

wiping contacts which make connection with the corresponding terminals of whichever oscillator coil happens to be in the circuit. The six tuning coils are all mounted on one rotatable form, and are turned into position as used so that their terminals make contact with the leads, rather than the leads being switched to make contact with the coils, as is usually the case. This results in very short leads throughout the tank circuit, which reduces undesired interaction at the high frequencies. Six tapped, shielded, rotatable coils are used in all (see Figs. 17-4 and 17-5), and the frequency range of each band is as follows: (1) 50-175 kc; (2), 155-530 kc; (3), 500-1,750 kc; (4), 1,750-6,000 kc; (5), 6,000-21,000 kc; (6), 21,000 kc-30 mc.

The high B voltage is dropped through resistor R_3 to the value required by the screen grid of the '36 oscillator tube. The plate circuit also contains a choke L_7 through which the high-frequency plate current flows. Coupled to this coil is another, L_9, which leads to the output attenuator. The oscillator tube

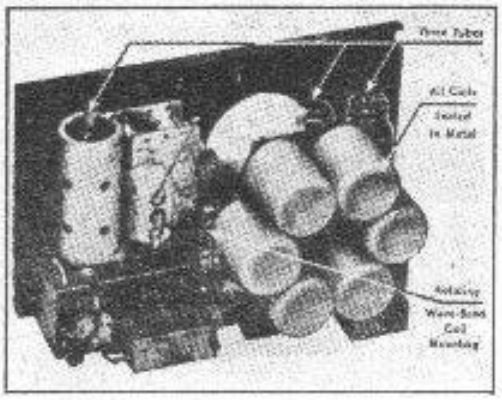

FIG. 17-4. — Rear view of the interior of the oscillator shown in Figs. 17-3 and 17-5. The three tubes, tuning condenser and six shielded coil units may be seen.

Courtesy Clough-Brengle Co.

obtains its proper bias through the use of grid leak R_2 and grid condenser C_2.

The separate a-f modulator stage employed assures freedom from "frequency drift" (see Art. 15-28) and also a pure 400-cycle note that does not shift with line voltage variation or tube replacement. The grid coil of the separate modulator tube is coupled to its plate circuit, since it really is the secondary of a transformer of which L_8 is the other coil; in this manner, a 400-cycle modulating current is generated. A third coil (lower)

picks up part of this 400-cycle oscillation for external use through the tip jack J_3. The modulation switch SW_1 across the entire modulation choke is used to stop the generation of the 400-cycle oscillation when an unmodulated carrier is desired. The grid coil of the modulator tube is also equipped with a jack which allows the insertion of an external modulating source whenever desired. In other words, this jack allows a phonograph or microphone circuit to be connected to the input of the

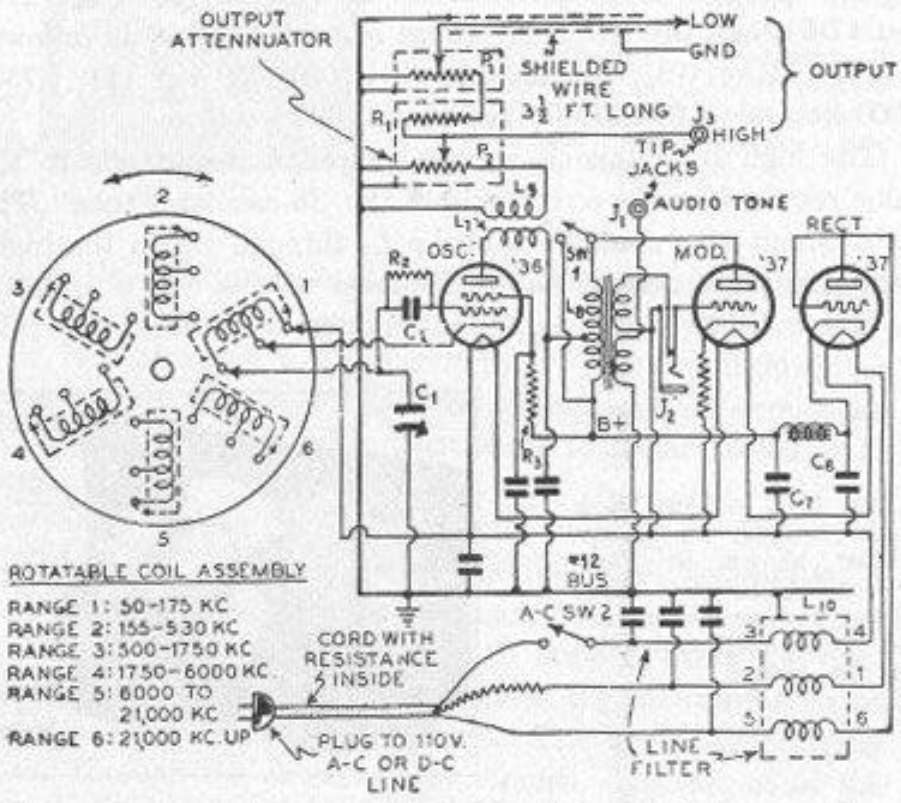

FIG. 17-5.—Schematic circuit diagram of the all-wave line-operated test oscillator illustrated in Figs. 17-3 and 17-4. Three tubes are employed, and a fundamental-frequency range from 50 kc to 30 mc is provided. The oscillator is of the "electron-coupled" type.

modulator tube for modulation of the oscillator; the 400-cycle oscillation is not generated when this is done because the normal grid circuit is broken by the jack.

Two separate attenuators are used: one for high output and the other for low output. When the *Gnd.* and *Low* terminals are used, potentiometer P_1 is used for variation of signal out-

put strength; when *Gnd.* and *High* output terminals are used, potentiometer P_2 is used. By means of these two attenuators, the output of the oscillator may be varied continuously from less than 0.5 microvolt to 2 volts, low enough for sensitive receivers and high enough for receivers badly out of alignment and for all general work. The shielded output lead connects the test oscillator to the receiver being aligned, the inside wire and the shield serving as the two conductors. The purpose of the shielding is to prevent radiation of the oscillator signal.

A unique feature is the gear-driven tuning condenser, C_1, with a 100-division dial extending over 360 degrees and a separate four-position marker dial. The effect of this dial is to spread the 100 divisions to 400 divisions, which are, in turn,

FIG. 17-6. — Exterior view of the all-wave line-operated test oscillator whose circuit diagram is shown in Fig. 17-7. The large scale of this instrument is reproduced in Fig. 17-8. Notice the compactness and provisions for ease of manipulation of this instrument. (Model 440)

Courtesy Jackson Elect. Instr. Co.

spread over nearly 28 inches of scale length. The manufacturers claim that this dial may be read to an accuracy of 1/10 of 1 per cent, as compared with an accuracy of 1/2 of 1 per cent to which the oscillator is calibrated.

17-4. "Jackson" Model 440 Oscillator.—The Jackson Model 440 service test oscillator is a three-tube all-wave instrument designed for operation from either an a-c or d-c power line. An illustration of the instrument is reproduced in Fig. 17-6, and its schematic circuit diagram is shown in Fig. 17-7.