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for the Radio Amateur

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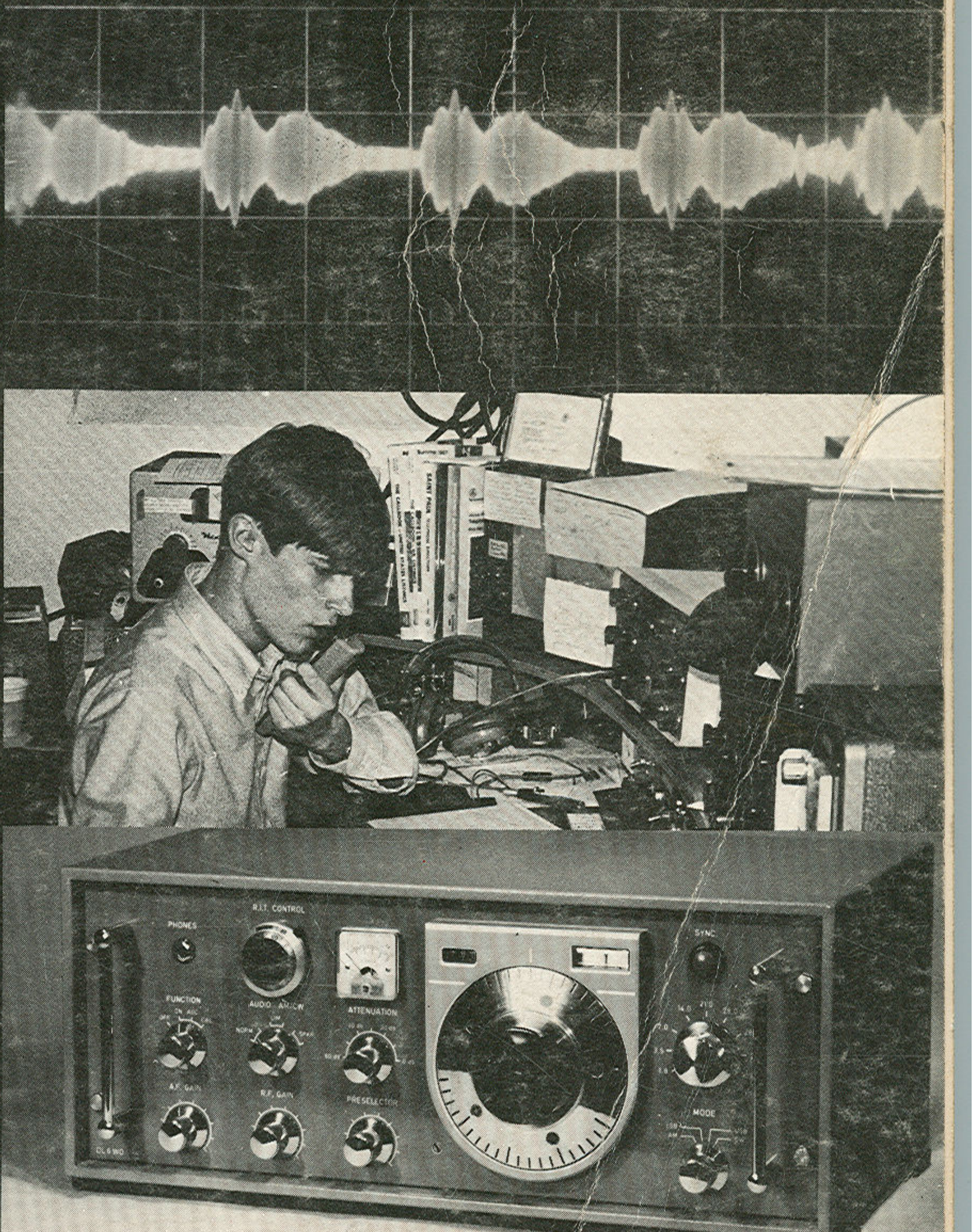

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ONE-BAND KILOWATT AMPLIFIERS

Separate kilowatt amplifiers on each of the bands 80 through 10 meters has always been the *ne plus ultra* of transmitter construction. However, space limitations and cost are the two key factors that have prevented many from realizing this goal. The amplifiers to be described are compact and are constructed economically; the builder may wish to construct one amplifier for his favorite band or the group of five for versatile all-band operation. Advantages of the separate-amplifier philosophy include optimum circuit *Q* for every band, simplified construction and band switching, less chance for tube failure because each amplifier is pretuned, and fast band changing for the contest-minded. The supply voltages remain on all the amplifiers; only the filament and excitation power are switched to the desired final amplifier.

The availability and proven dependability of the 813 make a pair of them the logical choice for the kilowatt amplifier. A shrewd amateur should have no trouble procuring the tubes through surplus channels or by bartering with local hams.

Referring to the circuit diagram, Fig. 2, the amplifier control unit contains the filament, bias and screen supplies. A 3-position mode switch, S_2, selects the bias for either Class-AB_1 or -C operation, and in the third position grounds the screen grids, to limit the plate current during initial tuning. Another 3-position switch, S_1, allows the total or individual screen currents to be read. The latter position is useful in matching tubes. The high-voltage supply should furnish from 1750 to 2250 volts.

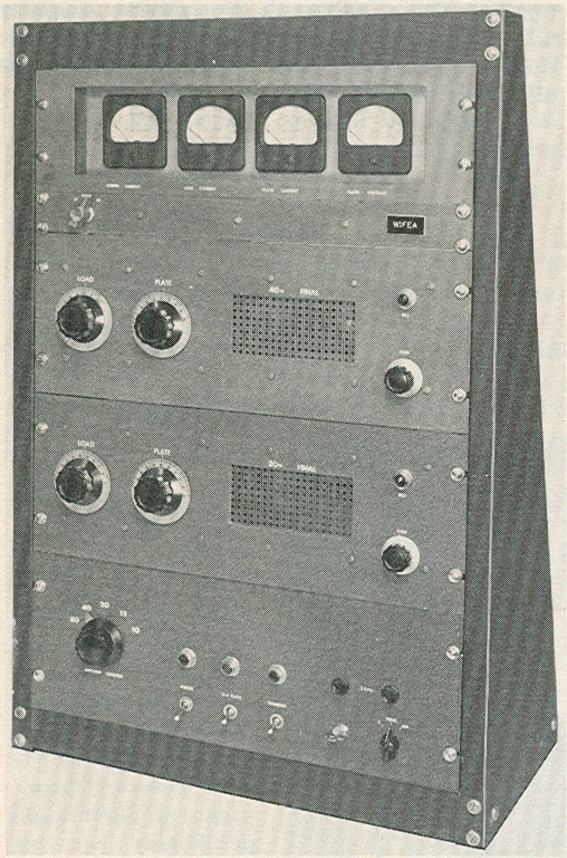

FIG. 1—Individual kilowatt amplifiers for two bands plus complete metering and all control circuits and power supplies (except plate) fit handily into a table rack. Amplifiers for five bands plus the plate supply will mount in floor rack. Band switch at lower left (S_8 in Fig. 2) switches filament supply, excitation and output connections to all amplifiers in use; screen and plate supplies are connected to all amplifiers at all times.

Construction

Each amplifier is assembled on a 13 × 17-inch aluminum bottom plate. Two 5 × 13 × 3-inch aluminum chassis are used as the sides of the enclosure. The paint is removed from the back of a 7-inch aluminum rack panel, and a piece of Reynolds cane metal is sandwiched between the panel and the two chassis. A rectangular window in the panel provides additional ventilation and a means for inspecting the color of the tube plates. The top and back of the enclosure are formed from a single piece of cane metal, bent to fit the chassis rear and top. Three lengths of 1 × 1 × 1⅛-inch aluminum angle stock are used in the corners of the enclosure, as can be seen in Figs. 4 and 5.

The variable tank capacitors, C_4, are mounted on 1-inch stand-off insulators, to bring the shafts to the proper panel height. In the 10-meter amplifier the capacitor shaft must remain above r.f. ground, and a suitable insulated shaft coupling is used. On the other bands, the rotors of the capacitors are grounded to the chassis through metal straps.

On 20, 15 and 10 meters the tank coils are wound self-supporting of ¼-inch diameter soft-drawn copper tubing, and they are supported by their leads. On 80 and 40 the coils are lengths of Air-Dux stock, and they are supported by small ceramic insulators.

The special plate r.f. chokes, RFC_2, are constructed by close-winding No. 24 enameled wire on ¾-inch diameter ceramic insulators. Four-inch long insulators (National GS-4) are used on the 80- and 40-meter bands, and 2-inch long insulators (National GS-3) are used on the other bands. In each case the original base of the insulator is removed and the insulator is mounted on a stand-off (Johnson 135-20). The high-voltage lead and the "cold" end of the choke are connected to a soldering lug mounted between the two insulators.

Bridge neutralization is included in the 20-, 15- and 10-meter amplifiers. The neutralizing capacitors are made from two ½-inch wide aluminum strips 5 inches long. One strip is connected directly to the plate lead at C_3 and the other is supported by a ceramic feed-through insulator that connects to the rotor of C_1. The amplifiers are neutralized by adjusting the spacing between the aluminum strips.

The metal ring surrounding the base of the

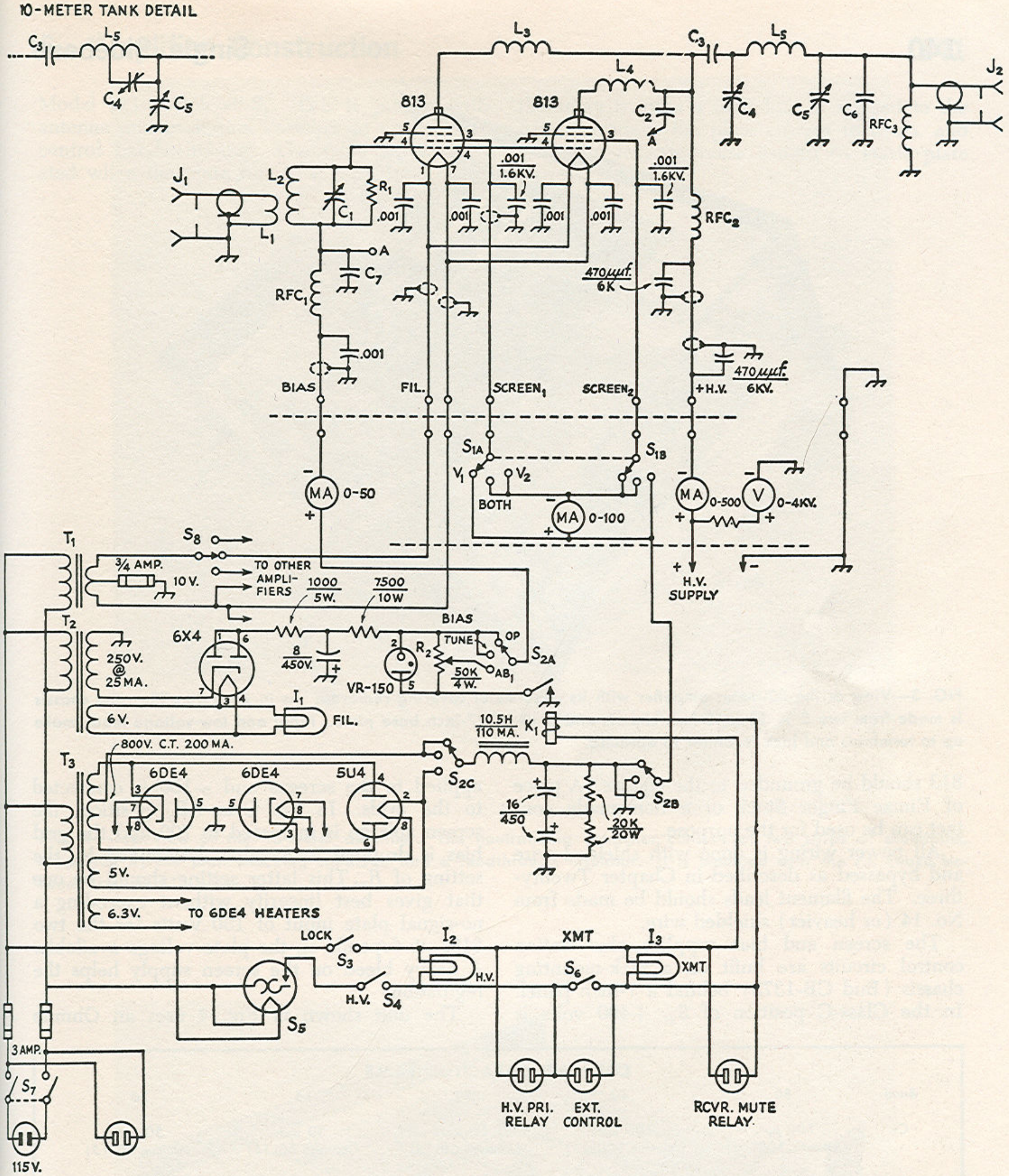

FIG. 2—Circuit diagram of a single parallel-813s amplifier and the control section. Diagram of each amplifier is similar, except as noted below. Unless specified otherwise, capacitances are in μf., capacitors marked with polarity are electrolytic, fixed capacitors are ceramic, resistances are in ohms.

C_2—Not used on 80 or 40 meters; see text.
C_3—Two 500-μμf. 20-kv. ceramic (Centralab TV-207) in parallel on 80 m.; single 500-μμf. 20-kv. ceramic on other bands.
C_7—0.001-μf. 1-kv. ceramic on 80 and 40 m.; 240-μμf. silver mica on other bands.
I_1—6-v. pilot lamp.
I_2, I_3—115-v. pilot lamp.
J_1, J_2—Coaxial cable receptacle.
K_1—S.p.d.t. relay, 115-v. a.c. coil.
L_3, L_4—Not required on 80 or 40 m.; 6 turns No. 14 on 1/4-inch diam.
R_1—10,000 ohms, 2 watts, composition.
R_2—50,000 ohms, 4 watts (Mallory M50MPK).
RFC_1—2.5-mh. 75-ma. r.f. choke.
RFC_2—See text.
RFC_3—2.5-mh. 300-ma. r.f. choke.
S_1—Two-pole 3-position rotary switch, shorting type.
S_2—Two-pole 3-position rotary switch, non-shorting type.
S_3—S.p.s.t. lock switch (AHH 81715-L).
S_4, S_6—S.p.s.t. toggle.
S_5—Time delay relay (Amperite 115N060).
S_7—Heavy duty d.p.s.t. toggle.
T_1—10-volt 10-ampere filament transformer.
T_2—250-volt 25-ma. transformer (Stancor PS-8416).
T_3—800-v.c.t. 200-ma., 5- and 6.3-v. heater windings.

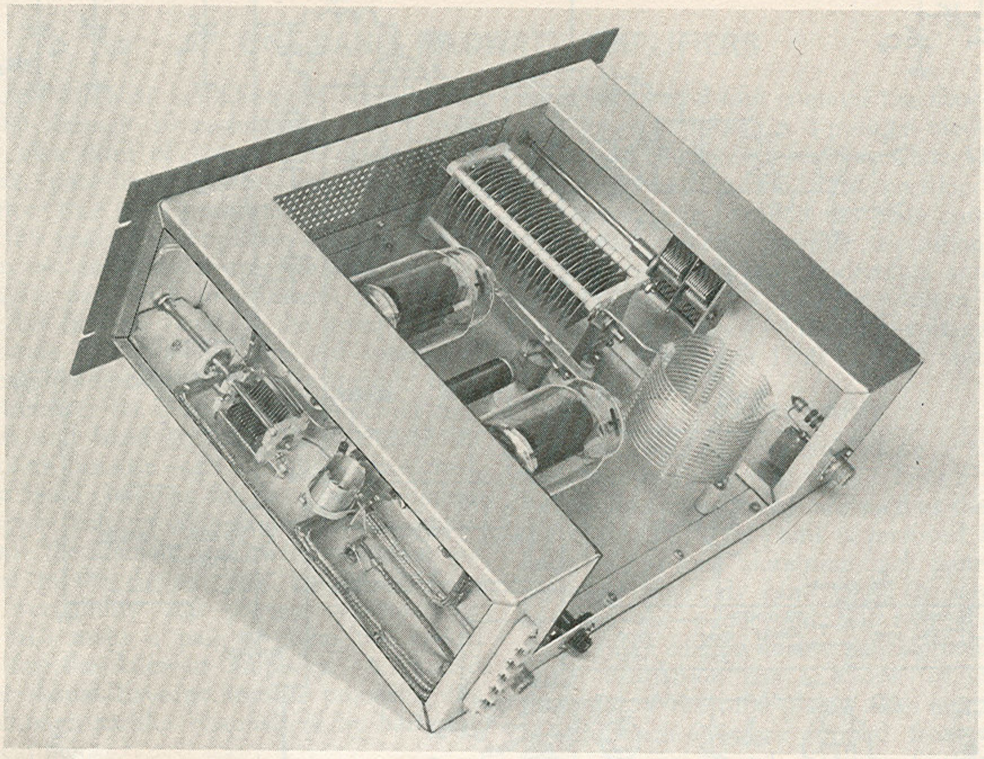

FIG. 3—View of the 80-meter amplifier with its cane-metal covering removed. As in each amplifier, the chassis is made from two 5 × 13 × 3-inch chassis and a 13 × 17-inch base plate. Input and low-voltage leads make up to terminals and jack in center foreground.

813 should be grounded to the chassis. A piece of Eimac Finger Stock or a homemade contact can be used for the purpose.

All power wiring is done with shielded wire and bypassed as described in Chapter Twenty-three. The filament leads should be made from No. 14 (or heavier) shielded wire.

The screen and bias supplies plus station control circuits are built on a rack-mounting chassis (Bud CB-1373) behind a 7-inch panel. In the Class-C position of S_2, +400 volts is applied to the screens and −150 is connected to the grids. In the Class-AB_1 position, the screen voltage is increased to 700 and the grid bias is dropped to a value determined by the setting of R_2. This latter setting should be one that gives best linearity without exceeding a no-signal plate input of 150 watts for the two 813s; it depends on the plate voltage available. A heavy bleed on the screen supply helps the regulation.

The unit shown in Fig. 4 uses an Ohmite

COIL AND CAPACITOR TABLE

Band	*80*	*40*	*20*	*15*	*10*
C_1	100 μμf. (Johnson 100L15)	100 μμf. (Johnson 100L15)	50 μμf. (Johnson 50L15)	50 μμf. (Johnson 50L15)	50 μμf. (Johnson 50L15)
C_4	150 μμf. (Johnson 150E45)	150 μμf. (Johnson 150E45)	35 μμf. (Johnson 35E45)	35 μμf. (Johnson 35E45)	50 μμf. (Hammarlund MC-50-MX)
C_5	710 μμf. (2-gang 365 μμf.)	325 μμf. (Hammarlund MC-325-M)	325 μμf. (Hammarlund MC-325-M)	325 μμf. (Hammarlund MC-325-M)	325 μμf. (Hammarlund MC-325-M)
C_6	500 μμf. (Centralab TV-207)	100 μμf. (CRL 850S-100N)	—	—	—
L_1	4 t. No. 22*	3 t. No. 22*	2 t. No. 22*	1 t. No. 22*	1 t. No. 22*
L_2	32 t.p.i. No. 24, 1 inch long, 1 inch ,diam. (B&W 3016)	16 t.p.i. No. 20 1¼ inch long, 1 inch diam. (B&W 3015)	8 t.p.i. No. 18 1⅜ inch long, 1 inch diam. (B&W 3014)	8 t.pi. No. 18, ¾ inch long, 1 inch diam. (B&W 3014)	8 t.pi. No. 18, ½ inch long, 1 inch diam. (B&W 3014)
L_6	6 t.p.i. No. 12, 3 inch long, 3 inch diam. (Air Dux 2406)	4 t.p.i. No. 12, 3¾ inch long, 2½ inch diam. (Air Dux 2004)	2 t.p.i. ¼-inch copper tubing, 4½ inch long, 2½ i.d.	2 t.p.i. ¼-inch copper tubing, 3 inch long, 2½ i.d.	2 t.pi. ¼-inch copper tubing, 2 inch long, 2½ i.d. C_4 tap 2 turns.

* Insulated hookup wire, wound over C_7 end of *L* .

Model 111 switch at S_8. This is ganged with antenna and excitation switches to permit one-control bandswitching. The relay K_1 is actuated when the plate supply is turned on; when the relay is open a high bias is applied to the 813s to reduce the plate current to 0 ma. and eliminate receiver noise caused by static plate current.

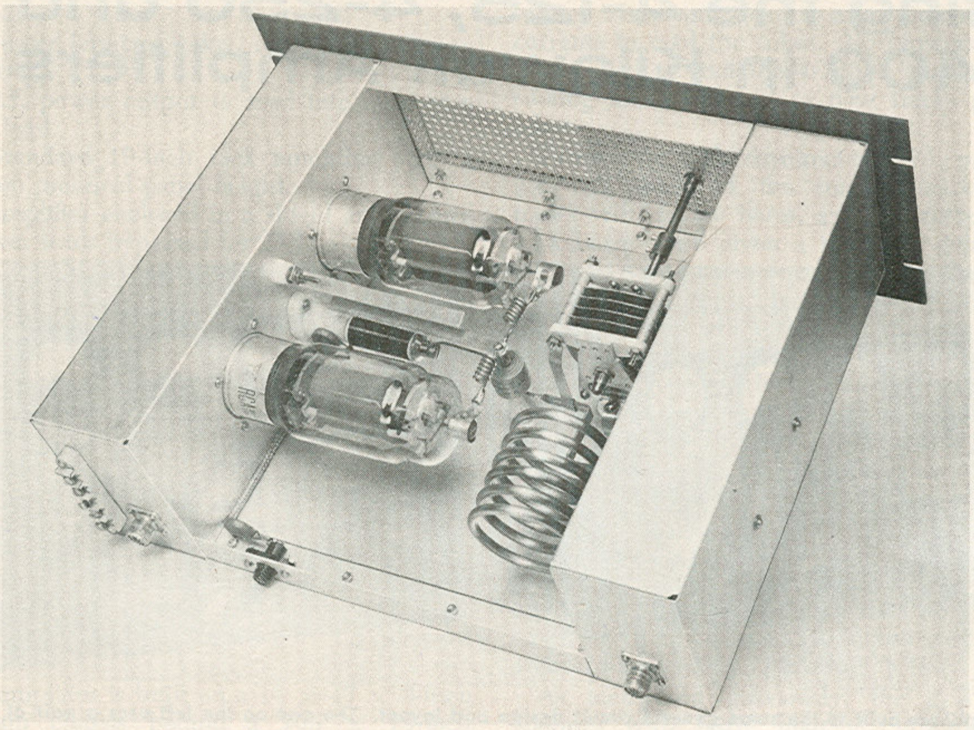

FIG. 4—Top view of the 15-meter amplifier. The neutralizing capacitor consists of two strips of aluminum, supported by the plate-blocking capacitor and a feedthrough insulator. It is mounted over the r.f. choke between the two 813 tubes.

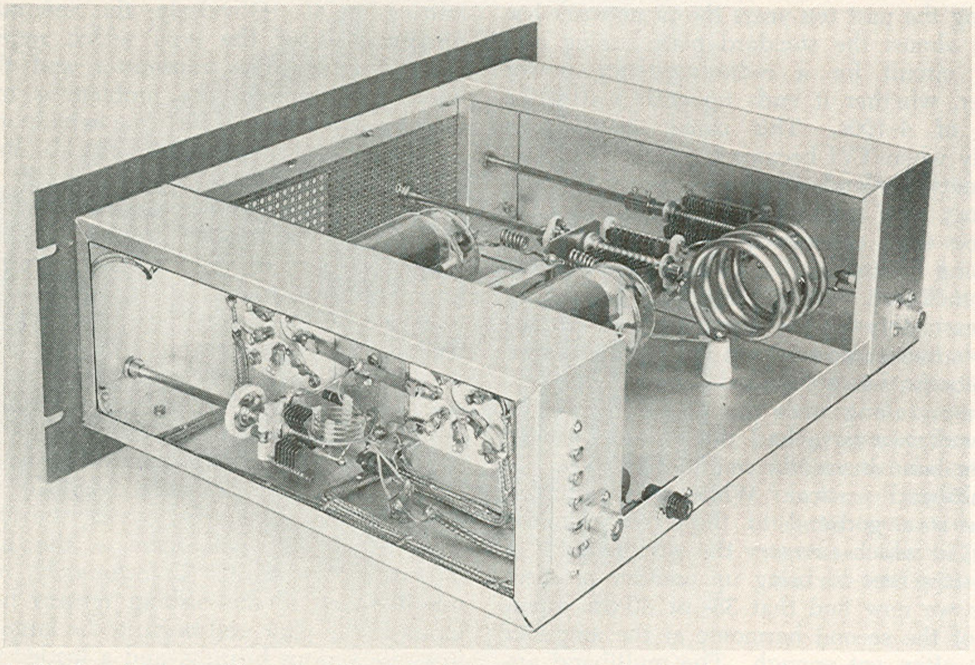

FIG. 5—As in the other amplifiers, the 10-meter final uses shielded wires in the filament, screen, and grid-return circuits. For tuning this amplifier uses a small variable capacitor connected across half of the plate coil, to maintain to favorable L/C ratio.