*Build:* VLF Rcvr., Syncopated Metronome, Super-Speed Strobe

# ELECTRONICS ILLUSTRATED

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EXCITING NEW READER-PARTICIPATION FEATURE BEGINNING IN THIS ISSUE!

## UNCLE TOM'S CORNER

*Conducted by* Uncle Tom Kneitel


## *Build This* PALM-SIZE HAM TRANSMITTER!

**It weighs just 28½ ounces, gives you 15 watts on 40 meters, has 2 tubes and no transformers!**

# the Mini Mitter


By RUSS ALEXANDER W6IEL

IT occupies little more space than a telegraph key, weighs less than the power transformer it does not have, yet is more powerful than any of the popular lunch-box rigs—that's our Mini-Mitter, a neat 28½-ounce package that can put a clean 15-watt (input power) signal on the 40-meter band.

Secret of the Mini-Mitter's small size, of course, is the missing power transformer. In its absence, power is provided by a solid-state voltage doubler. The two tubes aren't visible because they're mounted on the outside of the back panel to keep everything cool. And because the two tubes have 50-V heaters they are connected in series with a power resistor across the line. This means no filament transformer, either.

The first day we put the Mini-Mitter on the air in California we contacted not only the East Coast but UAØER in *Russia* as well (see log excerpt)!

Unless otherwise indicated in column 6, type of emission is A2, freq. is 7 Mc., input power is 15 watts. (MINI MITTER)

| 1. DATE YR. 65 | 2. TIME OF QSO START | 2. TIME OF QSO END | 3. STATION CALLED | 4. CALLED BY | 5. HIS SIG. RST | MY R.S.T. | 6. OTHER INFORMATION AND CHANGES |
|---|---|---|---|---|---|---|---|
| 3/22 | 5 30/A | 5 35/A | UAØER | 7004 | 5-6-9 | 5-7-9 | HANDLE QTH "ED" SAKHALIN ISLES, RUSSIA |
| 3/22 | 23 5/1 | 40/A | CQ 7030 | W4Y-IA | 5-6-9 | 5-6-9 | "PAUL" RELCROSS, N.C. |

Fig. 1—Portion of the author's log shows a contact made with UAØER in Russia with the Mini-Mitter on 40 meters. Input of 15 watts goes to show you that power isn't everything.

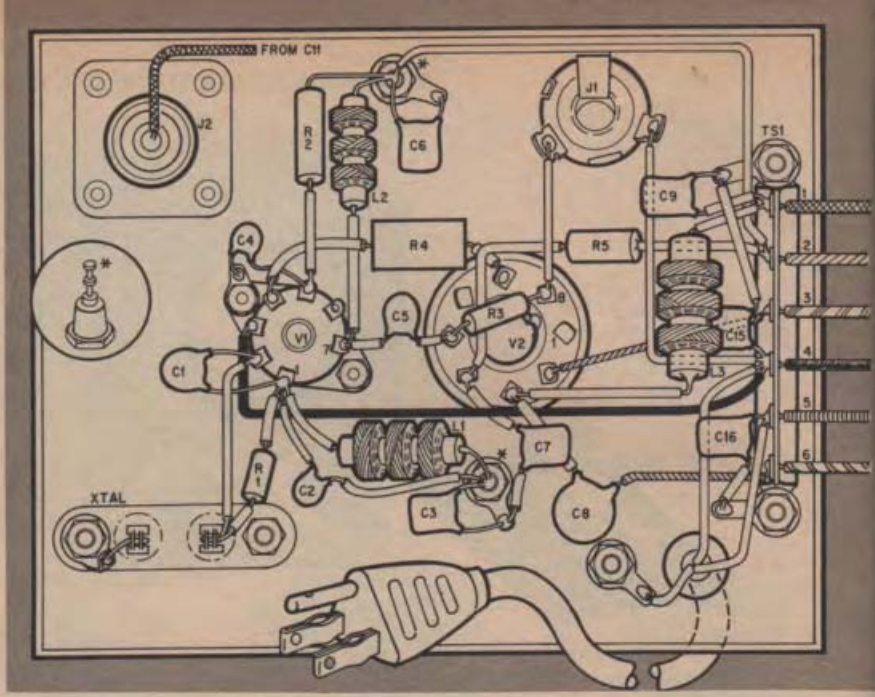



Fig. 2—Rear (above) and front (right) panels. Standoff terminals (circle at extreme left) that hold R9 are sol-

# Mini-Mitter

Later we worked Japan, Alaska and many points in the U.S.A.

When our main rig failed, Mini-Mitter kept up our MARS schedules and maintained other schedules up and down the Pacific Coast. Because of its vest-pocket size, Mini-Mitter has been carried along on several field trips without difficulty. It and a Drake 2-B receiver were powered by a 12 VDC-to-117 VAC converter in the car. On several radio picnics we used all sorts of antennas hung from trees, kites and balloons.

The Mini-Mitter circuit is pretty straightforward but includes several unusual features. As we said, instead of the usual heavy power transformer, there is a solid-state voltage doubler for the plate supply. A neon lamp is used as an RF-resonance indicator.

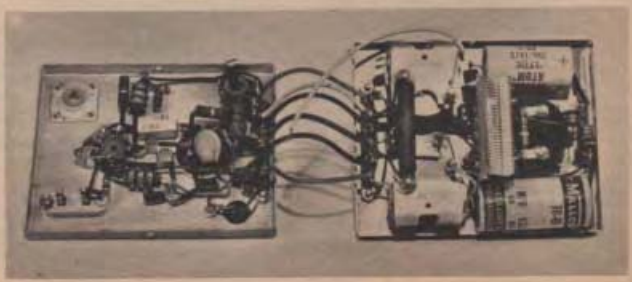
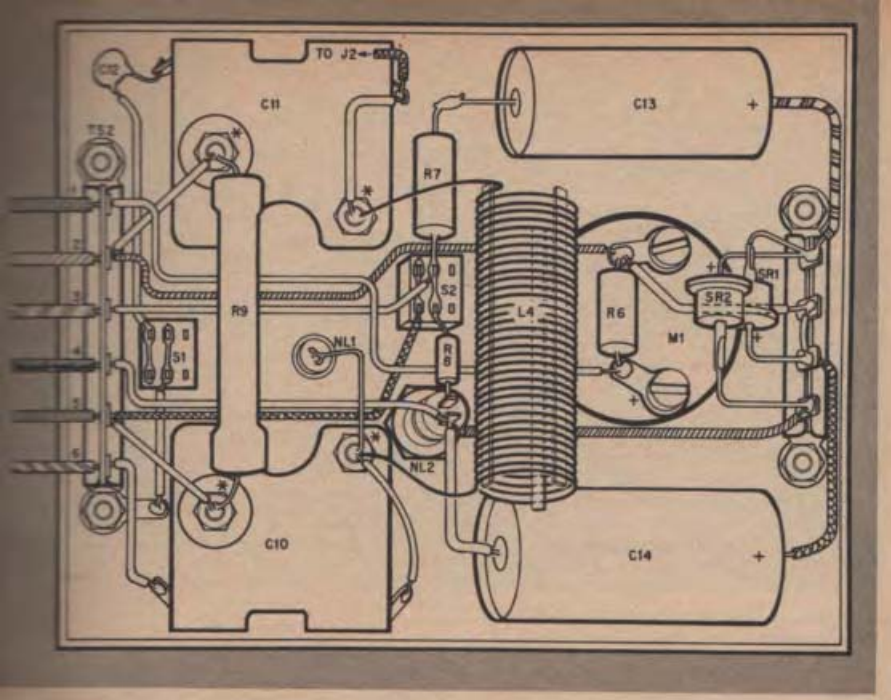


Fig. 3—Photo of completed panels ready to be installed in cabinet. Only lead from C11 on right panel remains to be connected to J2 in upper corner of left panel. Watch for loose strands on interconnecting wires at terminal strips. These strips are close to panel edges. Mount all of the components near panels.




to C10, C11. Mount others with screws, seeing that screw heads on L4's don't touch plates of C10, C11.

The rapid response of the lamp to RF voltage provides visual monitoring while you send and is of great help when tuning.

The final has pi-net tuning and there's a switch to add or remove capacity for matching to different impedance antennas. The power supply delivers about 310 V when the key is down. All of this goes to putting out a mighty easy-to-copy signal.

Mechanically, the Mini-Mitter has several features which simplify its construction. Refer to the pictorial in Fig. 2. Note that the front and back panels are separate parts that are joined electrically by flexible leads. This makes it possible to mark and drill the panels and then mount and wire the components on a flat surface. Layout and handling are thus simplified.

### Construction

The first step is to remove the front and back panels from the 3 x 4 x 5-in. case. Holes

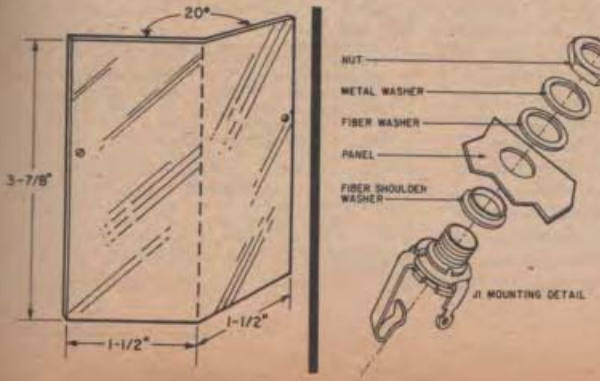



**Fig. 4—Sketch at far left is of supporting plate (of 1/16-in. scrap aluminum) that should be used to support and electrically connect front and rear panels so transmitter can be operated out of cabinet. Plate is shown in use in Fig. 6. Sketch at left shows method of mounting key jack J1 so it is insulated electrically from cabinet.**

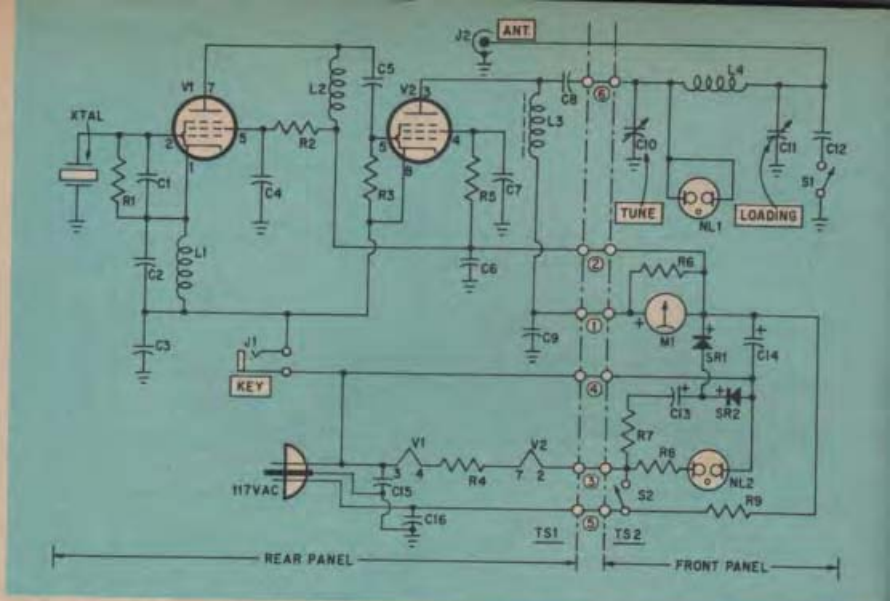



**Fig. 5—Schematic of Mini-Mitter. Since J1 is connected directly to one side of line, it must be insulated from cabinet. Make sure the AC plug is wired so that one side of the key will not be hot.**

# Mini-Mitter

for mounting the components should be drilled next. As an aid to laying out the panels, rubber-cement brown wrapping paper on them. After marking and drilling is completed the paper can be pulled off easily and the rubber cement can be rolled off. This technique prevents the panels from being scratched and permits laying out all holes with easy-to-see pencil markings.

Next, install 6-lug terminal strips (TS1, TS2) on the bottom of each panel. The lugs are the component and wiring terminations (shown as circles on the schematic) and are used to join circuits on front and back panels.

The power-supply filter capacitors (C13 and C14) are mounted by cementing their cardboard jackets directly to the front panel. Cambion (Cambridge Thermionic Corp.) standoff terminals rather than ordinary terminal strips are used to support several components. These lugs are excellent space savers for miniature equipment. One is shown in detail in the circle at the extreme left of the

**PARTS LIST**

**Capacitors:** ceramic disc unless otherwise indicated
C1—30 μμf, 1,000 V, C2—220 μμf, 1,000 V
C3, C6, C9, C15, C16—.02 μf, 500 V
C4, C5—.001 μf, 500 V, C7, C8—.01 μf, 500 V
C10, C11—10-365 μμf variable capacitor (J. W. Miller No. 2111. Newark Electronics 40F190. $2.10 plus postage)
C12—390 μμf, 1,000-V
C13—60 μf, 150 V electrolytic
C14—60 μf, 350 V electrolytic
J1—Open-circuit phone jack
J2—Coax connector, SO-239
L1—620 μhy RF choke (J. W. Miller No. 4650)
L2—.15 mh RF choke (J. W. Miller No. 4644)
L3—2.5 mh RF choke (J. W. Miller No. 6302)
L4—Barker and Williamson Miniductor No. 3007. 2-in. long, ⅝-in. dia., 16 turns per in. (Lafayette 40 R 1616 or equiv.)
M1—0-100 ma DC milliammeter (Lafayette 99 R 5055 or equiv.)
NL1, NL2—NE-2 neon lamp
**Resistors:** ½ watt, 10% unless otherwise indicated
R1—47,000 ohms, R2—8,200 ohms, 1 watt
R3—27,000 ohms, R4—130 ohms, 5 watts
R5—6,200 ohms, 1 watt, R6, R7—10 ohms, 1 watt
R8—100,000 ohms, R9—40,000 ohms, 10 watts
S1, S2—Miniature DPDT toggle switch (Lafayette 99 R 6162 or equiv.)
SR1, SR2—Silicon rectifier, minimum ratings: 750 ma., 600 PIV
TS1, TS2—6-lug terminal strip
V1—50HC6 tube, V2—50L6GT tube
XTAL—40-meter crystal and socket
**Misc.**—Solder terminals (6 reqd. Cambion No. 1947-2. Newark Electronics 40F1842), 7-pin tube socket, octal tube socket, 3 x 4 x 5-in. utility box (LMB No. U-C 971, Newark Electronics 91F1025), 4-lug terminal strip

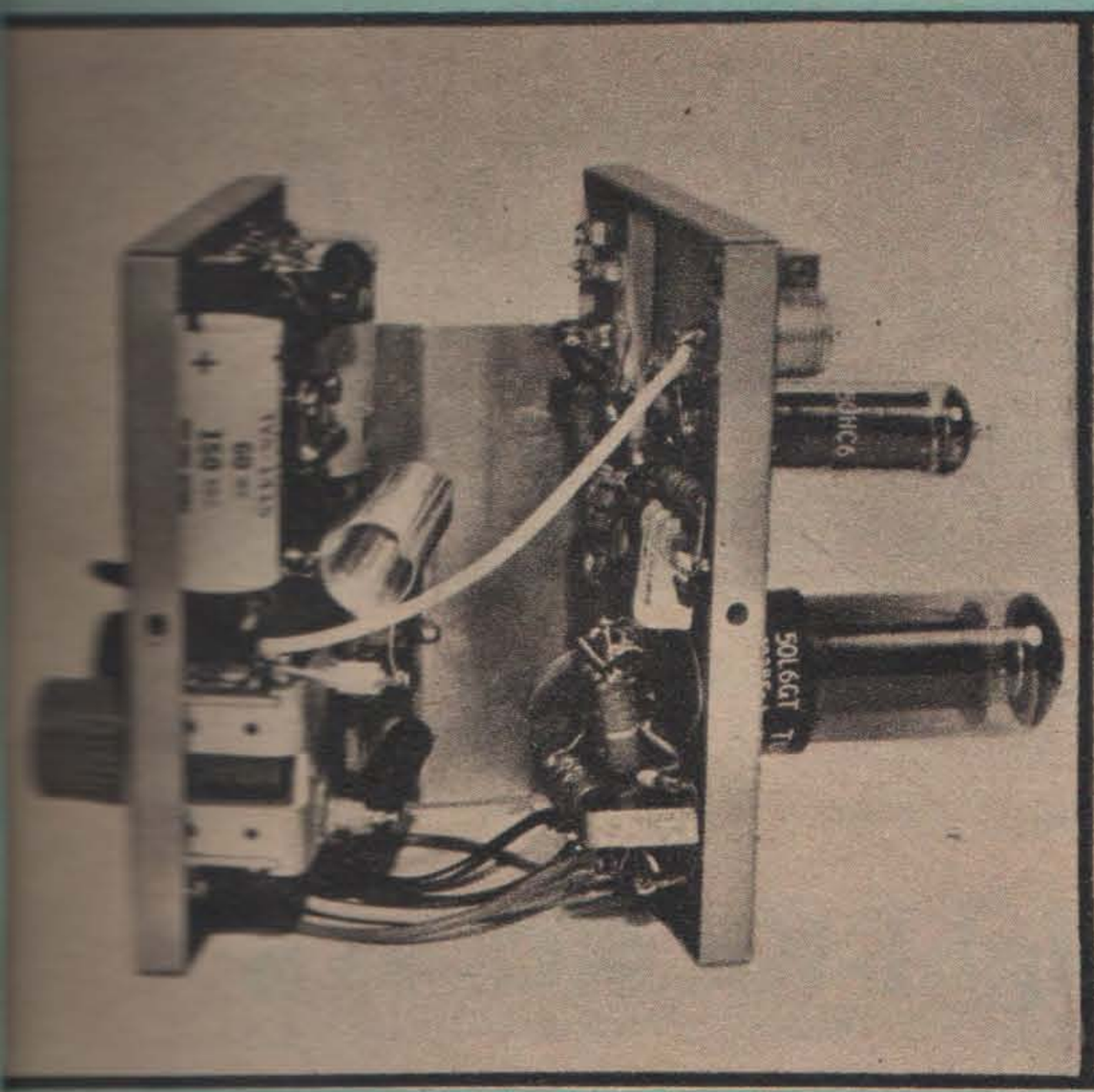


Fig. 6—Photo shows how mounting plate shown in Fig. 4 supports front and rear panels to permit transmitter to be operated out of the cabinet.

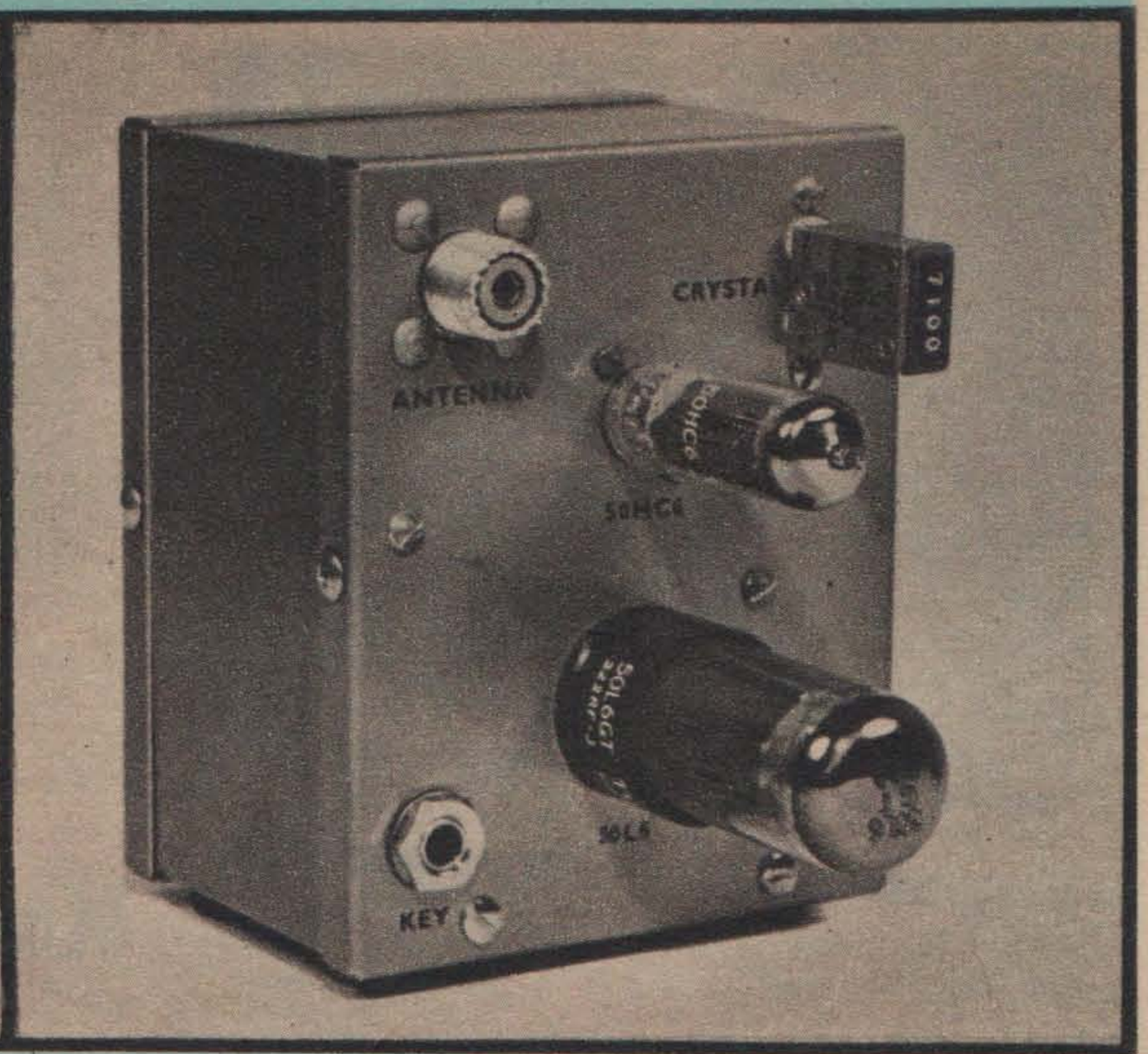



Fig. 7—Rear view of Mini-Mitter. If you feel uneasy about building the transmitter in such a small box the answer is obvious. Get a larger cabinet!

pictorial in Fig. 2. Their locations are indicated by asterisks.

Tank coil L4 and bleeder resistor R9 are mounted on two terminals which are soldered to the frames of variable capacitors C10 and C11. Key jack J1 *must* be insulated electrically from the panel with fiber shoulder washers as shown in Fig. 4. To be sure the jack is insulated from the cabinet, check it with an ohmmeter.

Since one side of the line is connected to the key (and J1) be sure you wire the power cord correctly or there will be a dangerous shock hazard. After the unit is wired, connect the front and back panels with the plate shown in Fig. 4. Turn on power and measure the voltage between jack J1 and either panel. If you measure line voltage, interchange the line cord's leads to lugs 4 and 5 on TS1.

Both leads of neon lamp NL1 are soldered together and connected by a single wire to the ungrounded side of *tuning* capacitor C10 at a standoff terminal. The bulb should protrude slightly through a ¼-in.-dia. hole in the front panel. The lamp's internal elements are coupled capacitively to the panel and RF energy through this capacitance lights the lamp.

After wiring both front and back panels connect the two with flexible insulated leads between the indicated lugs on TS1 and TS2;

## Tune Up

The Mini-Mitter is now ready for testing with a 15-watt, 117-V lamp. After inserting the tubes, plug in a 40-meter crystal and the key. Turn on your receiver and tune it to the crystal's frequency. Turn on the receiver's BFO. Turn on the Mini-Mitter's power and note if NL2 and the tubes light up.

After a warmup of about one minute, press the key. If the Mini-Mitter is wired correctly you'll hear its signal on your receiver. Close S1 and adjust C10 (*tune*) to obtain the brightest glow from NL1 and the lowest plate current, as indicated on M1. (From the full counterclockwise position, we used the first dip.) The 15-watt lamp should glow, indicating RF output.

To load the transmitter, gradually decrease the capacity of C11 (open its plate), simultaneously dipping plate current by adjusting C10. At maximum loading the meter should indicate about 80 ma and the neon and 15-watt lamps will glow brilliantly.

The Mini-Mitter is now ready to go on the air. Connect it with RG59/U coax to a dipole or vertical 40-meter antenna and tune it again, using an SWR or field-strength meter, if available. Capacitor C12 may be cut in or out of the circuit, as needed, for different antennas.