A "No Compromise" 2000 Watt PEP Antenna Tuner

BY RICHARD JAMES,* W4DQU

No respectable amateur station should be without a good antenna tuner. Here's a high-efficiency tuner using a novel plug-in coil arrangement to achieve a matching range of from 25 to 5000 ohms.

THE reasons for using an antenna tuner or transmatch have been covered extensively by Lew McCoy, W1ICP in "Why a Transmatch" (*QST* Jan. 1968). Three of the best reasons are:

1. To reduce feed line losses.
2. To enable one antenna to be used in all portions of several bands.
3. To permit the transmitter to "see" 50 ohms at all times.

The No Compromise tuner described here achieves high efficiency by using separate coils instead of one or two tapped coils (tapped coils are lossy). Plug-in coils eliminate interaction between coils, switching problems, switching losses, and the expense of high quality, high power switches. The unique design of this tuner which allows changing the type of tuning by changing the components are plugged-in. This eliminates loose wires and clips, keeps wiring short and efficient, and, of course, simplifies changing the type of tuning. The ability to tune Parallel low C, Parallel high C, Series low C, and Series high C enables the tuner to cover a wider range of antenna impedance than any commercially available tuner.

The impedance range of this tuner is from a

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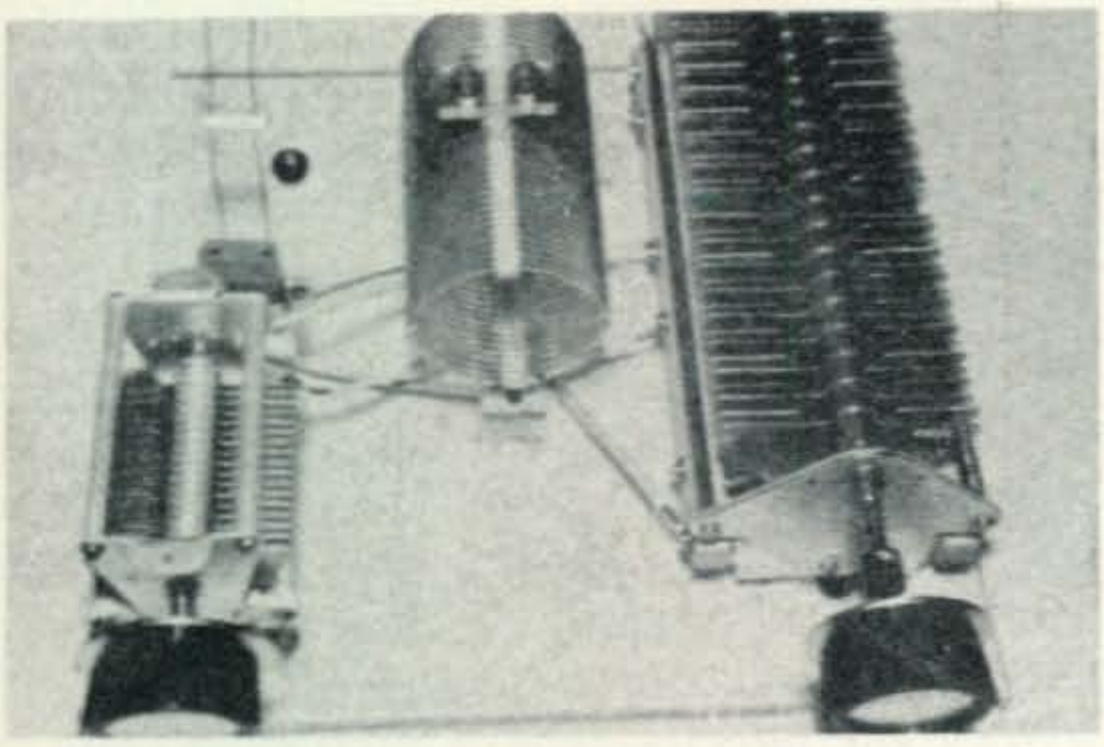


The No Compromise antenna tuner is constructed on a large sheet of plexiglass. It is shown here with a coil plugged in and shorting bar B in place atop the coil. In this parallel-tuned configuration, the open wire feedline is plugged into A as in fig. 1.

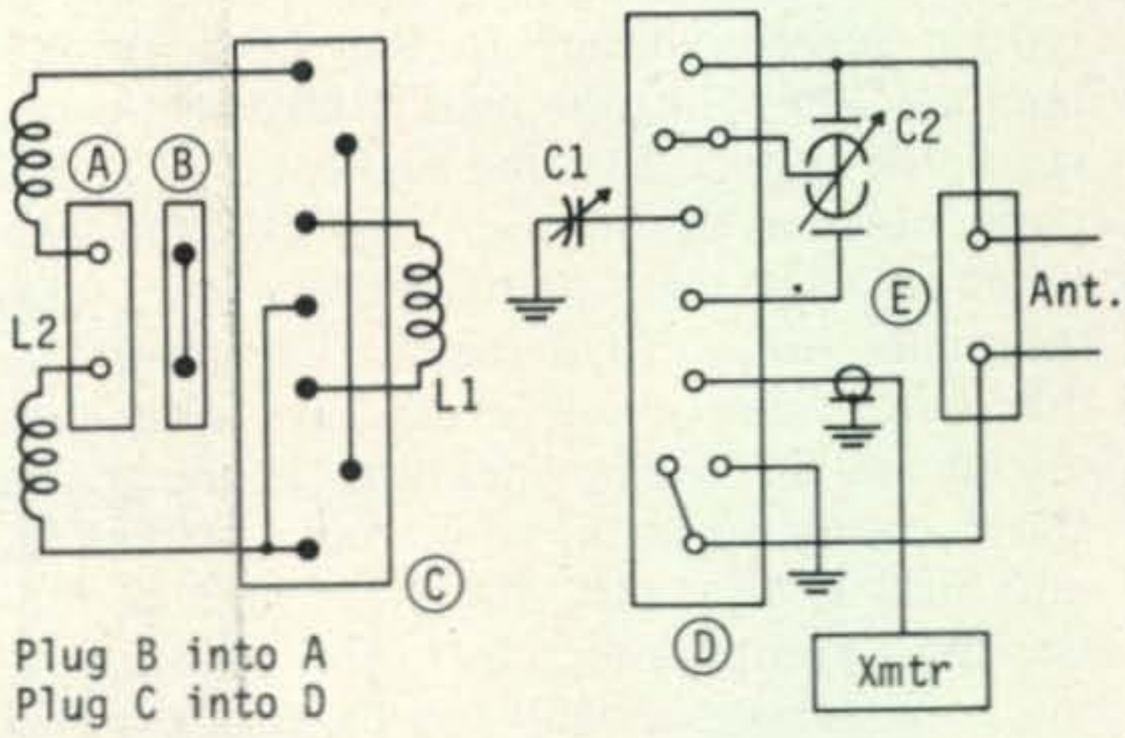


Fig. 1—Schematic of the No Compromise antenna tuner and plug-in coil, set up for Low C Parallel Tuning.

Parts List

C_1—13-353 pf variable, 1 kv spacing. Johnson 154-2 or equivalent.

C_2—Dual 100 pf transmitting variable, 5 kv spacing or more. Millen O4100,14100, or equivalent.

Jacks—H.H. Smith 1508 or 1509 Nylon banana jacks. 11 required for basic tuner. 2 required for each coil.

Plugs—H.H. Smith 462 banana plugs. 9 required for each coil and shorting bar.
H.H. Smith 1672 double banana plug. 1 required for antenna feedline connection.

Coils—See Table I for all coil information.

Table 1—Coil Table

Band (mHz)	L_1		L_2	
	Turns	Coil Stock	Turns	Coil Stock
1.8- 2.0	24	1	79	2
3.5- 4.0	12	1	39	2
7.0- 7.3	6	1	13	3
14.0-14.35	3	1	7	3
21.0-21.45	3	1	5	3
28.0-29.7	2	1	3	3
50.0-54.0	1	1	1	3

Coil Stock:

1—2" dia. #16 tinned, 10 t.p.i. (B & W 3907-1 or equivalent).
2—2½" dia. #14 tinned, 8 t.p.i. (B & W 3906-1 or equivalent).
3—2½" dia. #12 tinned, 6 t.p.i. (B & W 3905-1 or equivalent).

low of about 25 to 50 ohms to a high of about 4000 to 5000 ohms. One commercially built tuner goes to only 1200 ohms, and uses a tapped coil and switches—two lossy items.

An excellent all-band antenna for use with this tuner is a dipole or Inverted V 135 feet long, fed with 600-ohm open-wire line (or even 450-ohm or 300-ohm open-wire line—even the television type will work). If space is limited, you can use a dipole or Inverted V as short as 50 feet on 80 through 10 meters; however, make it as long as you can to improve your 80-meter signal. Besides these antennas, you can use this tuner to feed beams and quads, fed with either twin-lead or open-wire line.

If you work 160 meters, you will find you can load a dipole or inverted V as short as 130 feet—or perhaps even shorter. Theoretically, the antenna should be about 260-feet long, a half wavelength on 160 meters. Try

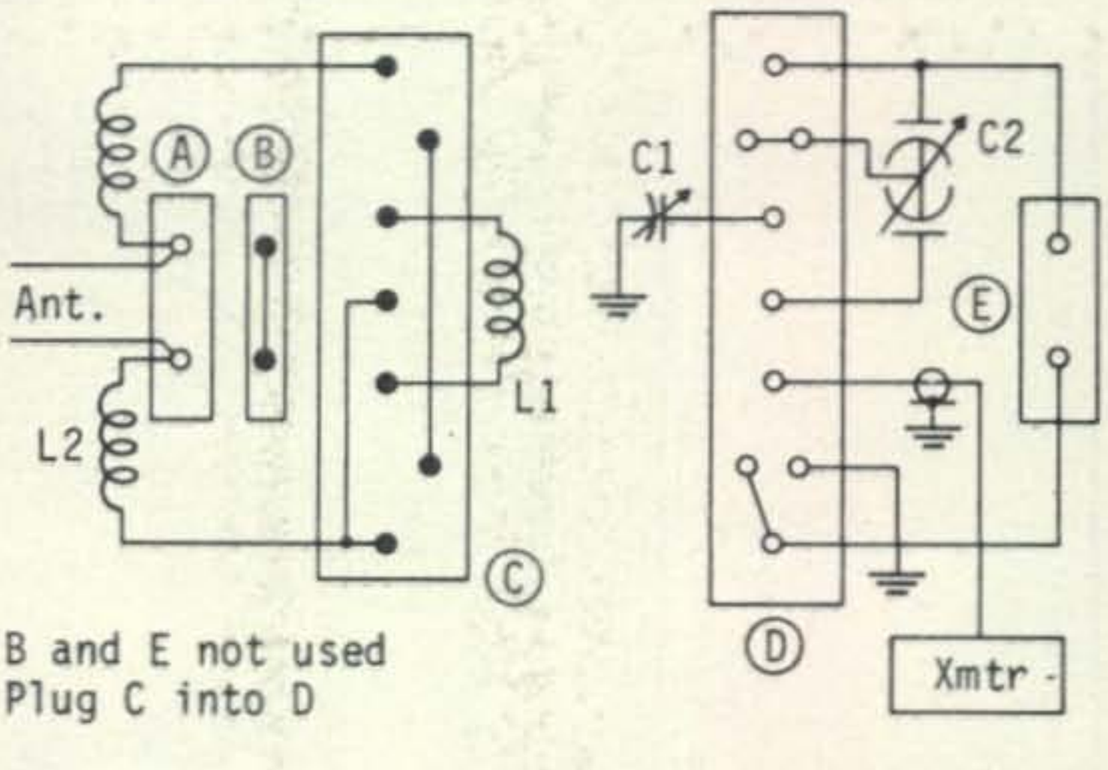


Fig. 3—With the plug-in coil in the same position as at fig. 1, but with shorting bar B not used and the antenna plugged into A, a Low C Series Tuned circuit results.

to make the antenna as long as it should be, but if you can't, just make it as long as you can, and leave the rest to the tuner.

You will note in figure 1 through 4 that the four different types of tuning are accomplished first by the way the coils are plugged into receptacle D, and second by plugging the antenna into either receptacle E or receptacle A. (Never plug anything but the antenna into E. Shorting bar B is plugged into A when the antenna is plugged into E, but is not used when the antenna is plugged into A.) Receptacles D and E are each mounted on two stand-off insulators.

Operation

Using an s.w.r. meter between the transmitter and the antenna tuner, tune the transmitter to very low power, set up the tuner for parallel low C tuning. Adjust the two capacitors alternately for minimum reflected power. If the reflected power can not be reduced to zero while you still have some forward power, first change from low C to high C by remov-

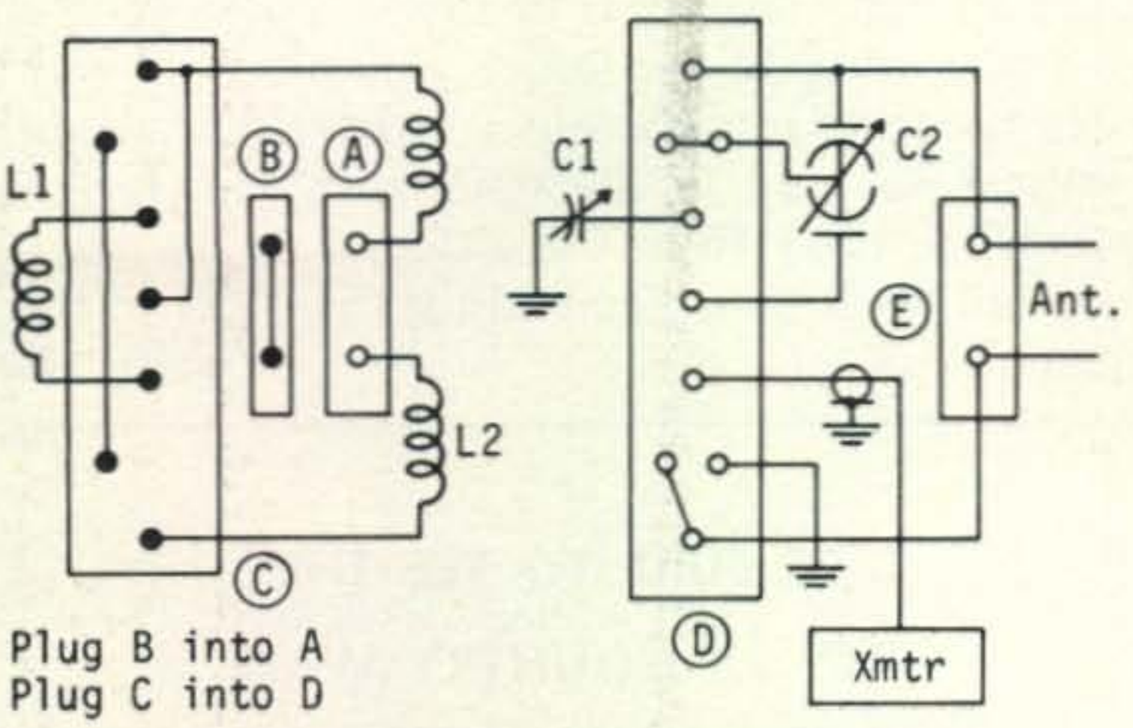


Fig. 2—Rotating the plug-in coil 180° and plugging it in again changes the circuit of fig. 1 to a High C Parallel-Tuned antenna tuner.

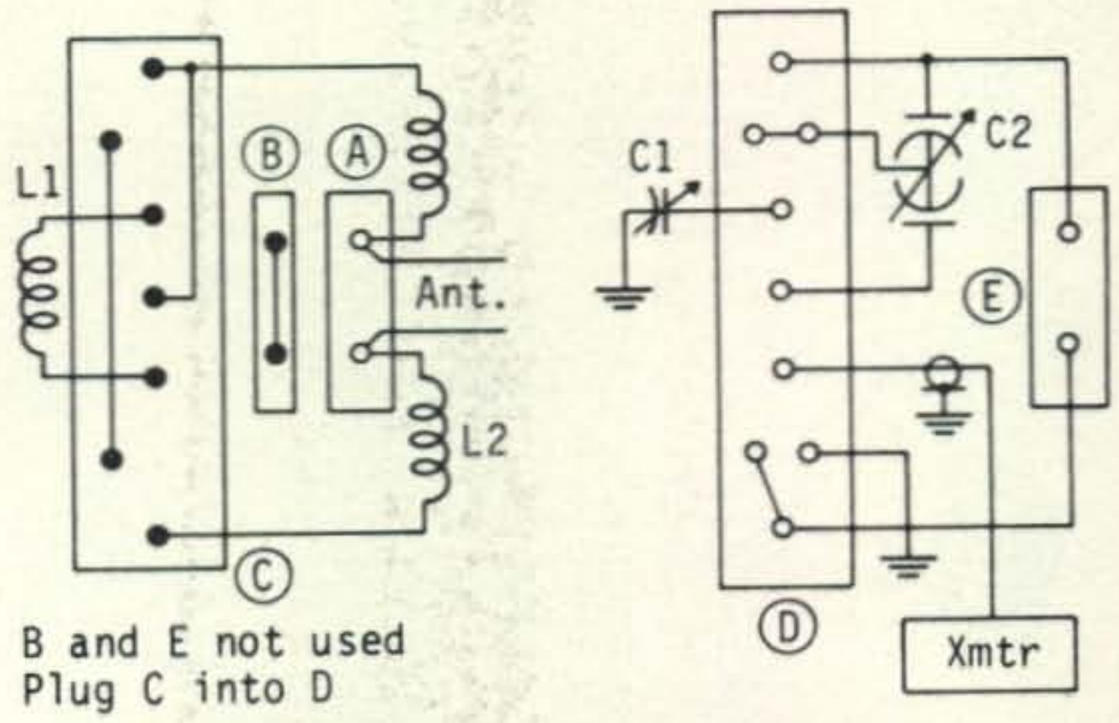


Fig. 4—Rotating the coil 180°, with the antenna still connected to A yields a High C Series Tuned antenna tuner. Shorting bar B is not used here.

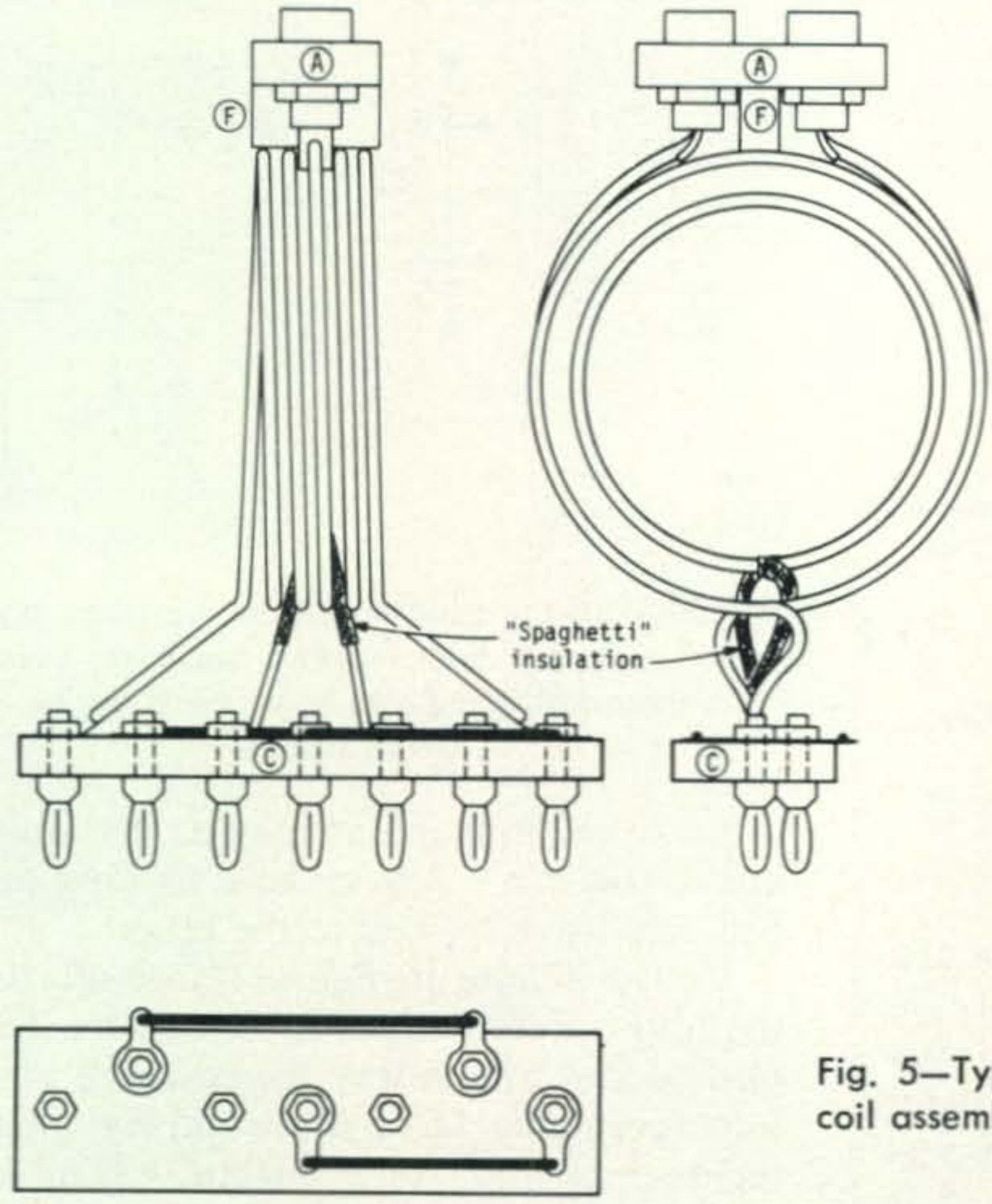
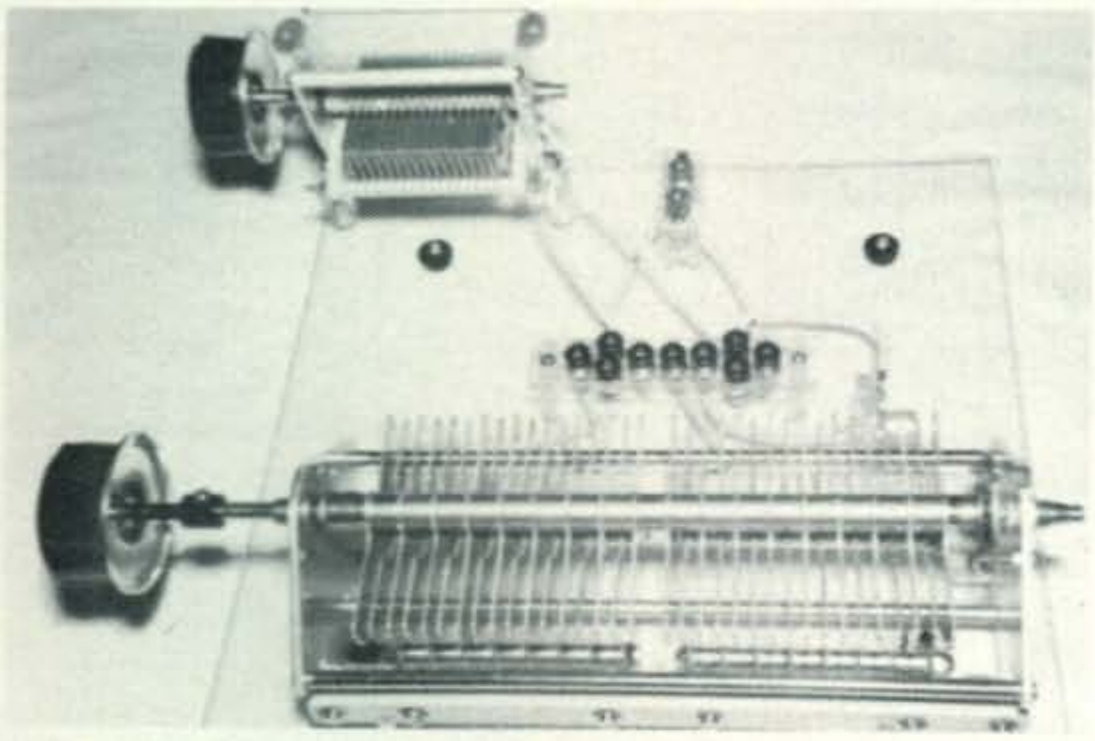


Fig. 5—Typical construction of one of the plug-in coil assemblies. The plexiglass supporting bars for the coil turns are not shown.

ing coil, rotating it 180 degrees and plugging it back into D. If you still cannot get zero reflected power change the antenna from E to A and try both series low C and series high C tuning. One of the four types of tuning will be correct and thereafter you can use that type of tuning for that antenna and band.

To use the tuner with a coax-fed antenna (as when you have a high s.w.r. and don't want your transmitter to see it or when you want to feed a long wire antenna), use just one side of the coil. Although you can plug the center pin of a coax cable fitting into a banana jack (if you do this, be sure to run a wire from the outside of the fitting or coax braid to ground), a better way would be to mount an S0239 coax receptacle near the rear of the tuner—making sure that the body of the receptacle is grounded—and to solder a short length of wire to the center pin of the S0239. To the other end of the wire, attach a banana plug. With this arrangement, you can now plug the banana plug into whichever receptacle you wish, and adjust the tuner in the normal way.

If you have a balun, it can be used for the same purpose by attaching two short wires to the antenna terminals of the balun. Attach a banana plug to the other end of each wire for plugging into the tuner (where you would otherwise plug in the open-wire lines). Attach the coax from the antenna to the coax end of the balun. Then adjust the tuner in the usual way. ■



With no coil in place the construction of socket D is visible.