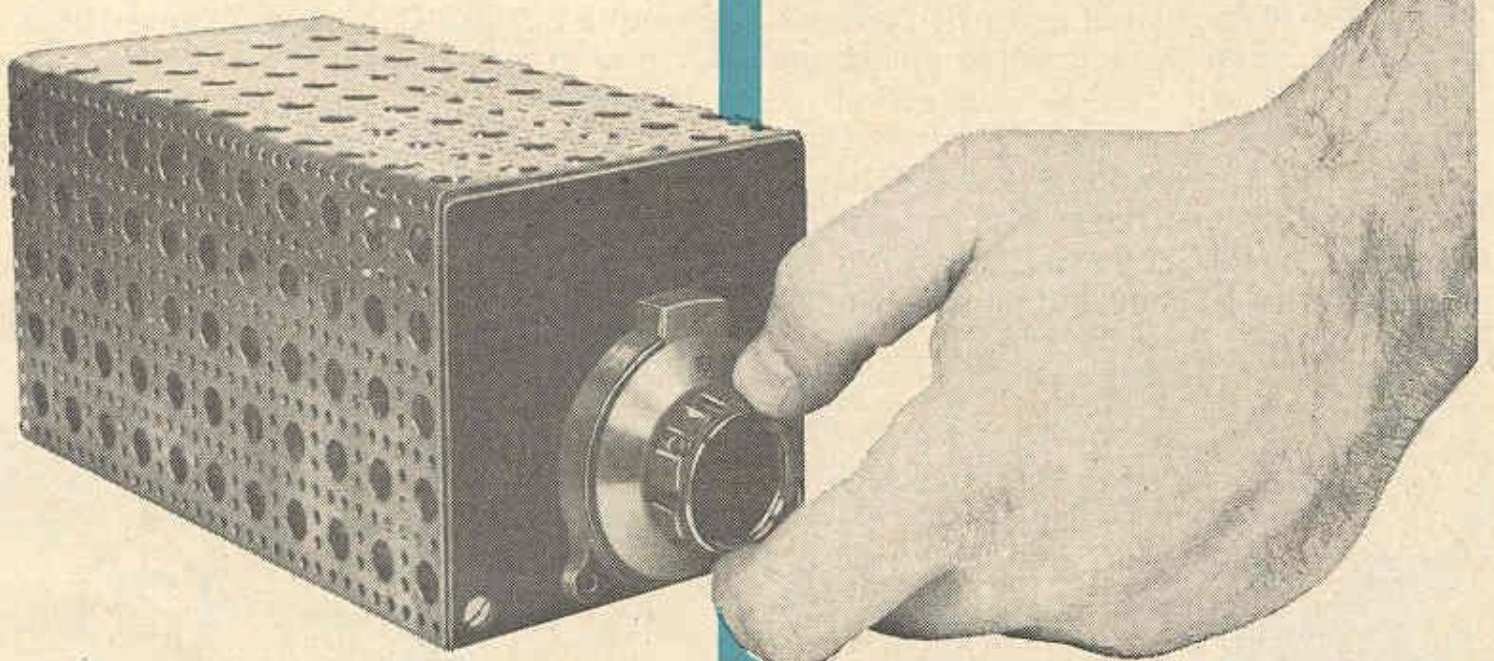
ONE-TUBE FM TUNER



Superregenerative circuit provides FM reception at rock-bottom price, incorporates features of more elaborate sets

By ROBERT E. DEVINE, W6AVW

HERE'S a one-tube FM tuner that's inexpensive, easy-to-build, and remarkably good-sounding to boot. Naturally, the set's sensitivity doesn't compare with that of commercially available tuners, but it will pull in most stations within a range of approximately 10 miles. Parts for the tuner, including power supply, will cost about $11.

Because it's built around a superregenerative detector, the set is comparatively insensitive to pulse interference—auto ignition noise, for example. Another inherent characteristic of a superregenerative detector is its tendency to hang on to a signal; this gives the set a sort of automatic frequency control action.

Although the tuner circuit isn't much more complicated than some fancy crystal sets, bear in mind that its operating frequency is measured in *mega*cycles, not *kilo*cycles. A good many sets will get by with long, sloppy leads at broadcast frequencies, but things just won't perk at 100 mc. unless the wiring is as short and direct as possible. For this reason, it's best to follow closely the general layout shown.

Construction. The tuner and power supply were assembled on a 3½" x 6½" x ½"

piece of plywood. End pieces are 3½" x 3½" x ¼" plywood; the cover is a 10½" x 7" piece of perforated metal bent into a "U" shape. If you have trouble with body-capacity effects, try mounting a 3½" x 2½" piece of sheet metal on the back of the front panel to isolate tuning capacitor *C2*; ground the metal plate.

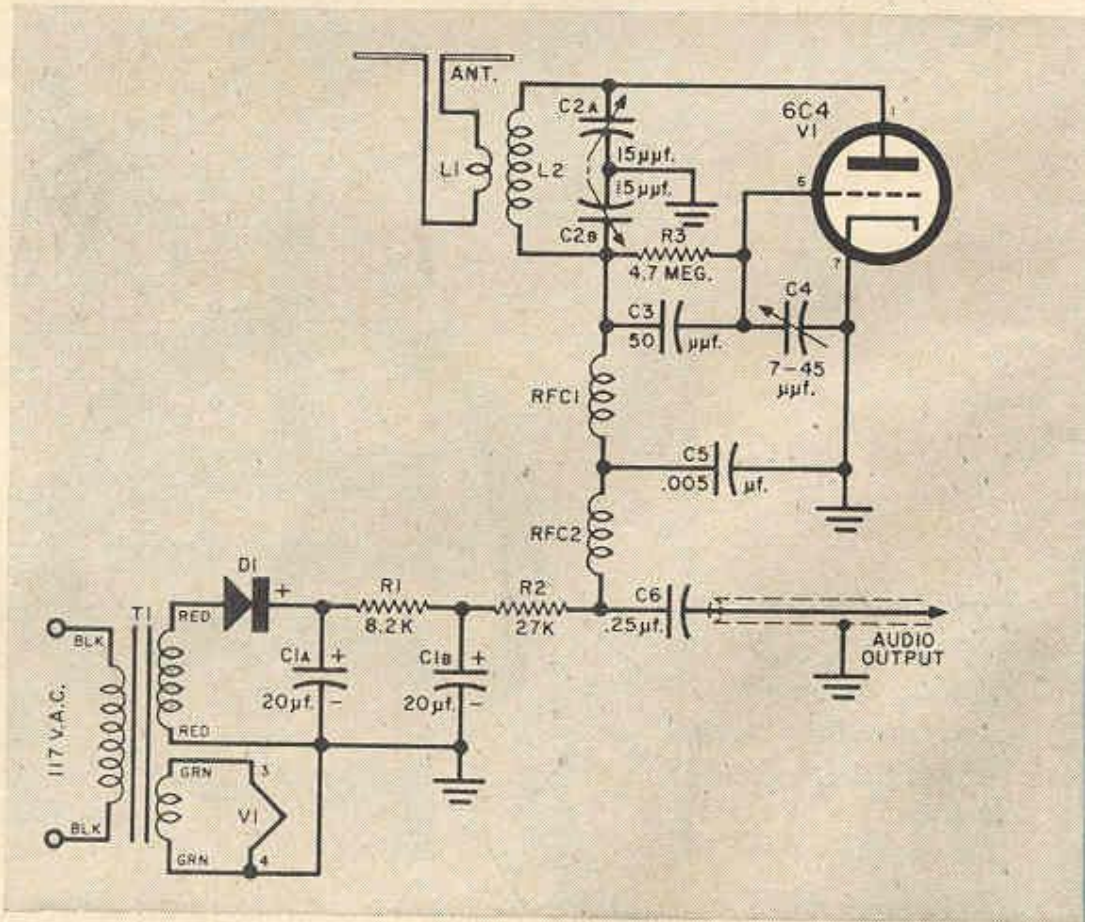
Since pins 2 and 5 on socket *SO1* were not needed in wiring, they were removed. The metal grounding post in the center of the socket was also removed and replaced with a wood screw to mount the socket on the board. A *4-40* nut placed under *SO1* acts as a spacer to keep the remaining pins from being pushed out flat as the socket is tightened down.

Choke *RFC1* was wound on a ½" dowel, then coated with polystyrene dope to make it easier to handle. If you don't have No. 23 enameled wire on hand, but do have No. 22 holes slightly undersized to grip the leads firmly.

Note that transformer *T1*'s mounting strap is grounded. One red lead from *T1* is soldered to a lug under one of *T1*'s mounting screws; another lug is used under the other mounting screw. Be sure to scrape off the paint around *T1*'s mounting holes to insure good electrical contact.

One last construction tip—don't fudge on the values of resistor *R3* and capacitors *C3* and *C4*. The total cost of these three parts is relatively small, and their values are quite critical. Capacitor *C3* must be a silver mica unit as specified.

Operation. With the a.c. power cord plugged in, an outside antenna attached (a TV antenna will work well), and the audio output lead plugged into an amplifier, you should hear either a hiss or a station. Now all you have to do is adjust *C4* or *L1* for best performance, and expand or compress *L2* so that the tuning capacitor covers the 88- to 108-mc. range.

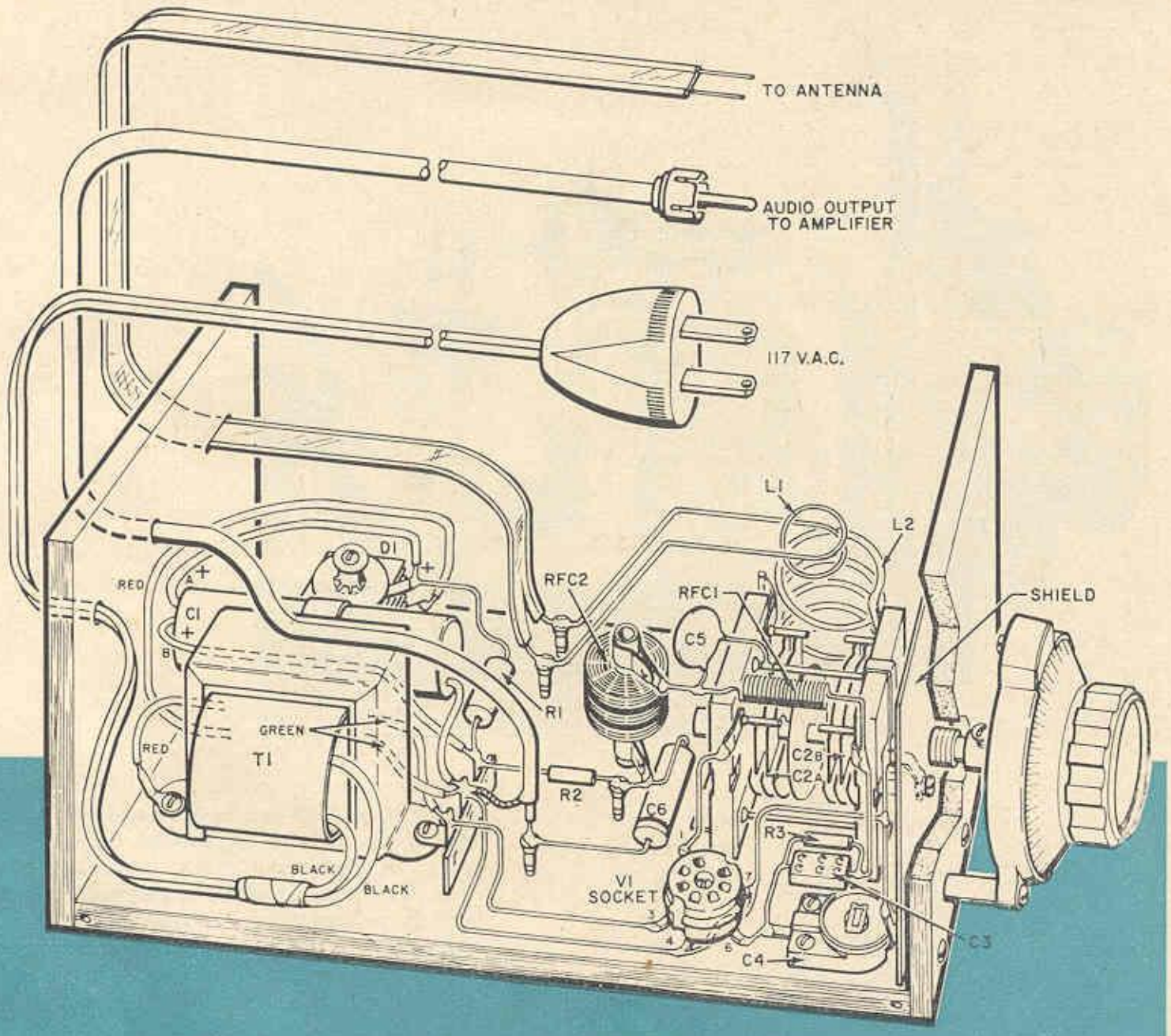


Circuitry of the FM tuner is extremely simple, as the schematic diagram shows. A single triode (V1) is connected in a superregenerative hookup; power for the tube is furnished by rectifier D1.

Capacitor *C4* is properly set when its capacitance has been increased as much as possible with the detector still oscillating over the entire frequency range. With *C4* at maximum, the receiver will be dead over part or all of the FM band. Too tight a coupling between *L1* and *L2* will also stop

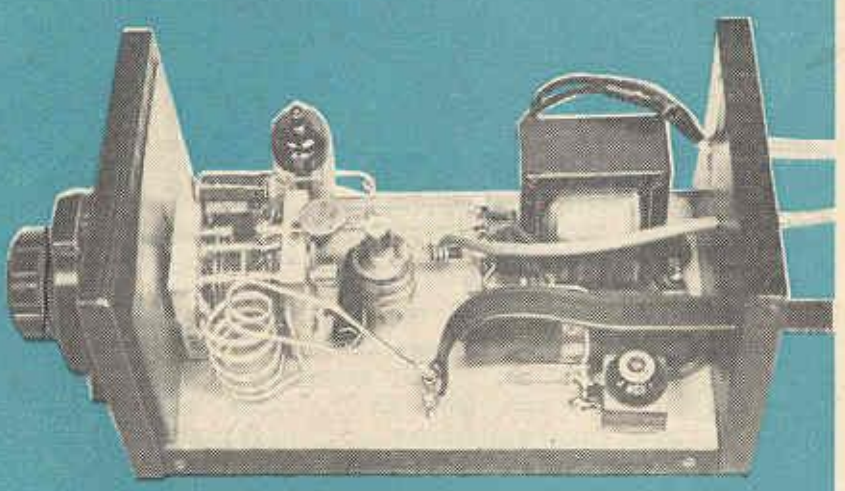
or 24, use it instead. Choke *RFC2* isn't overly critical, either—any 7- to 10-mh. r.f. choke should be satisfactory.

The B+, ground, and heater leads are terminated on a three-terminal mounting strip; *RFC2* and *L1* are soldered to brass screws driven into the plywood. The a.c. cord, the shielded audio output cable, and the 300-ohm twin lead can be passed through holes in the rear panel; make these

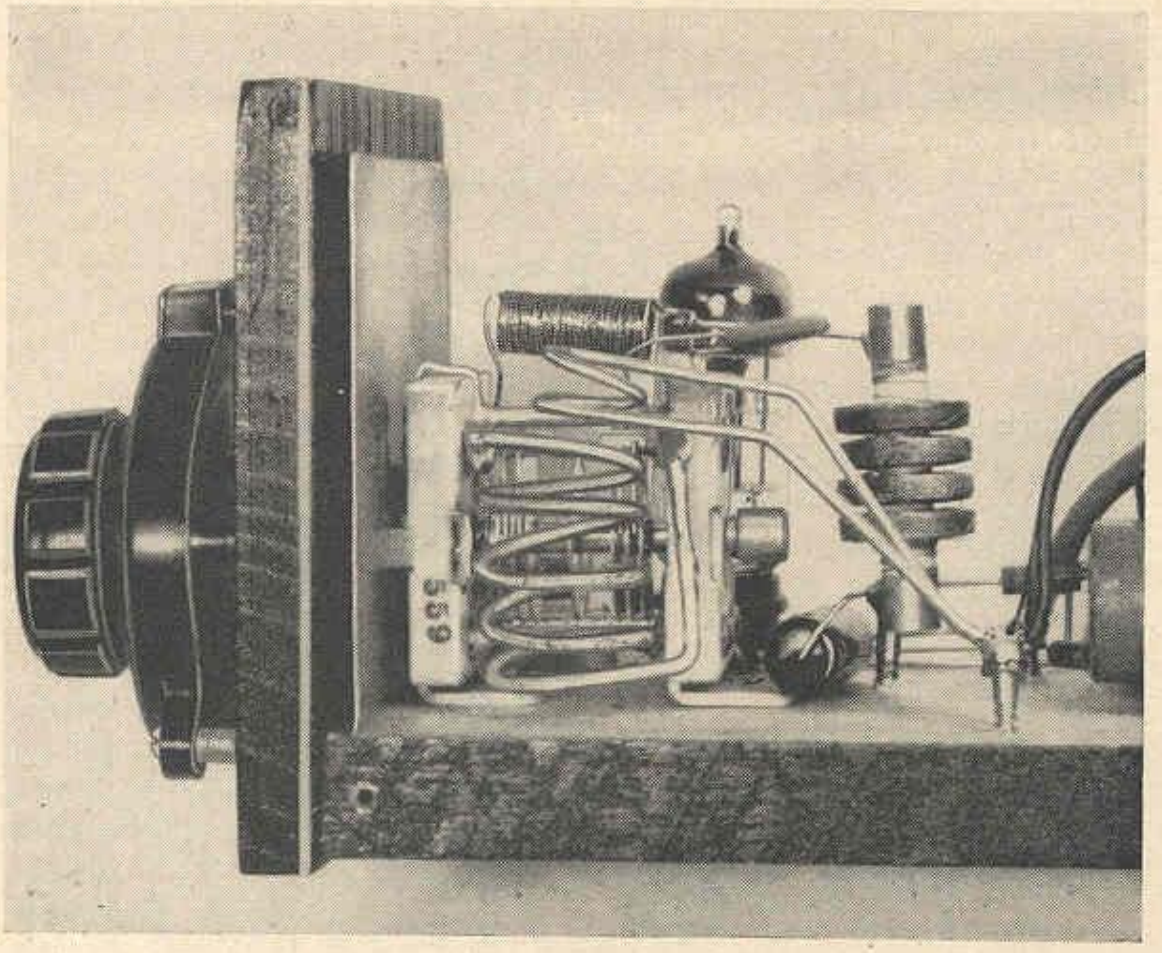


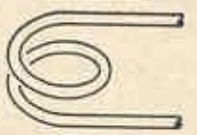
PARTS LIST

C1a/C1b—20-20 μf., 150-volt electrolytic capacitor
C2a/C2b—15-μμf. dual variable capacitor (Bud LC 1680 or equivalent)
C3—50-μμf. silver mica capacitor
C4—7-45 μμf. trimmer capacitor (Centralab Type 833 or equivalent)
C5—.005-μf. disc capacitor
C6—.25-μf., 400-volt capacitor
D1—50-ma., 130-volt selenium rectifier
L1—1½ turns of #14 enameled wire, ¼" long, ⅜" in diameter
L2—4½ turns of #12 enameled wire, ¾" long, ½" in diameter
R1—8200-ohm, 1-watt resistor
R2—27,000-ohm, ½-watt resistor
R3—4.7-megohm, ½-watt resistor
RFC1—30" length of #23 enameled wire wound on ¼" form
RFC2—8-mh. r.f. choke
S01—7-pin miniature socket
T1—Power transformer: primary, 117 volts a.c.; secondaries, 125 volts at 15 ma., 6.3 volts at 0.6 amp. (Stancor PS-8415 or equivalent)
V1—6C4 tube
1—3½" x 6½" x ½" sheet of plywood
2—3½" x 3½" x ¼" sheets of plywood
1—10½" x 7" piece of perforated metal
Misc.—Tuning knob, a.c. cord and plug, shielded wire and phono pin plug, 300-ohm twin lead, three-terminal mounting strip, wire, solder, etc.

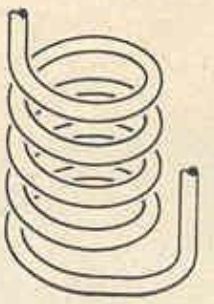


Parts are assembled in breadboard fashion on a 3½" x 6½" plywood base; slightly undersized holes in rear panel hold 300-ohm twin-lead, line cord, and audio output cable securely. Shield behind front panel is optional.





L1
1½ TURNS #14
WIRE, ⅜" DIA.



L2
4½" TURNS
#12 WIRE,
¾" LONG,
½" DIA.

Coils L1 and L2 are hand-wound from No. 14 and No. 12 wire respectively and held in place by their own leads. Although the coils should be as close together as possible, they should not touch each other. Spacing of L2 can be varied until the tuner covers the entire 88-108 mc. FM band.

HOW IT WORKS

A single triode is used as a superregenerative detector in the familiar Colpitts circuit. Incoming signals from the TV or FM antenna pass through the 300-ohm twin-lead to *L1*. Since coils *L1-L2* act as a transformer, voltage is induced into *L2* with specific stations selected by tuned circuit *L2-C2*. The signal passes to the grid of *V1* through grid leak resistor-capacitor combination *R3-C3*. Since both grid and plate circuits of *V1* are tuned to the same frequency by *L2-C2*, oscillation takes place at that frequency.

Because of the presence of *R3-C3*, oscillations occur simultaneously at another and lower frequency. This second or "quenching" frequency throws the detector in and out of oscillation at its main frequency some 20 to 30 thousand times a second. Since sensitivity in a regenerative detector is maximum when the detector is about to go into oscillation, throwing the detector in and out of oscillation at a ultrasonic rate results in sensitivity so great that thermal noise can be heard as a hiss between stations.

The a.f. component in the output from the detector is filtered by the r.f. chokes and capacitor *C5*, then fed to an external amplifier through d.c. blocking capacitor *C6*. Power for the detector is furnished by transformer *T1* working in conjunction with half-wave rectifier *D1* and filter *C1-R1*.

the oscillation, but the coupling here should be as close as possible to bring in stations strongly and eliminate hiss. You can also try grounding one side of *L1;* make the connection permanent if it results in a stronger signal.

If you can't get stations on the high end of the band, unsolder *L2*, expand it slightly, re-solder it in place, and see if the high end of the band comes in. If it does not, repeat this procedure until it does. On the other hand, if the tuning capacitor becomes fully enmeshed before you get to the lower-frequency stations, unsolder *L2* as above, but compress it before replacing it. If this doesn't work, add one turn to the coil—you'll have to make a new coil to do so, but this should take only a few minutes.

Prepare to be pleasantly surprised if you have a hi-fi rig to feed the tuner into. Many people are astounded at the quality of sound that emanates from this ultra-simple unit. In fact, you're likely to be swamped with friends by the bushel who want you to whip up one for them. —30—