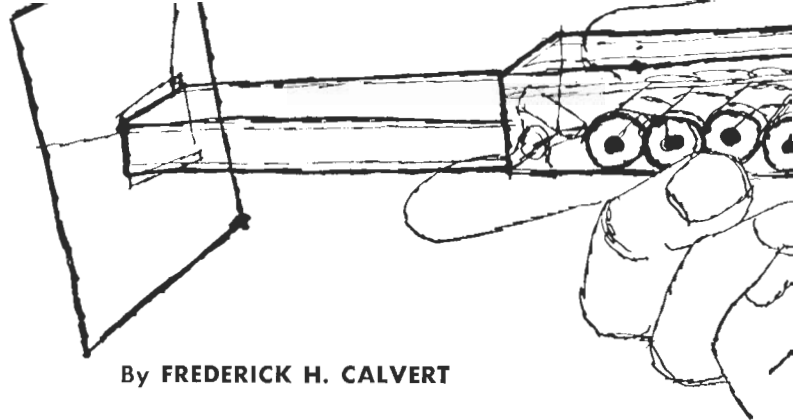


# SIMPLE METAL LOCATOR



By FREDERICK H. CALVERT

**A novel, 1-transistor circuit that will locate wiring and sheet-metal ducts in walls, floors, and ceilings.**

**W**IRING and sheet-metal ducts in floors, walls, and ceilings can be easily traced with this simple instrument, when used with an existing standard broadcast receiver.

The simple beat-frequency principle is used in this instrument. The technique involves beating a fixed-frequency signal against a variable-frequency signal and noting the change in frequency of the beat note when the search coil is brought near metal.

In this system, the fixed-frequency signal is provided by tuning any BC receiver to a station on the low end of the dial. In the author's case, WIND (560 kc.) Chicago was used. This, of course, provides an extremely stable source of reference signal. The lower frequencies provide greater depth penetration and minimize capacitance effects. This unit will penetrate to a depth of from 4 inches to 10 inches depending on the size of the concealed metal.

The variable-frequency signal is pro-

vided by a simple low-drift-type transistor oscillator whose tank coil is actually the search coil. Stabilization of the oscillator is obtained by putting as much resistance as possible in the emitter circuit and as little as possible in the base circuit. Bias for the base is supplied by one of the dry cells.

Amplification of the beat note is provided by the i.f. and audio system of the receiver with which the locator is used.

From the foregoing it can be seen that two-thirds of the circuitry normally required in a beat-frequency type of metal locator can be eliminated, *i.e.*, the reference oscillator and amplifier. Total cost of parts for this instrument should not exceed \$3.00 and the dry cells will last several hundred hours in continuous operation since the total current drain is about 3-4 ma.

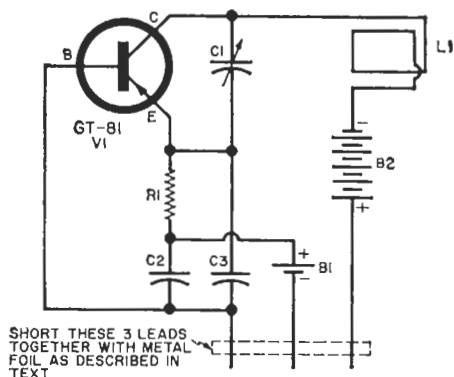
Maximum radiation distance of this unit is approximately 25 feet which is well within the limits established by the FCC. Optimum performance is obtained when the receiver and locator are no farther apart than five feet. A small transistor radio carried in the shirt pocket makes an excellent companion unit for use with this locator.

the latching end of the box and glue to the outside. After the glue dries, scrape these ends clean and free from glue. By placing a piece of metal foil over these three leads and closing the box cover on it, we have a simple switch for turning the unit on. After use, the metal foil is removed. The oscillator assembly is placed on top of the dry cells and the closed cover keeps it in place.

Under the hinged end, the two leads are brought out, trimmed to 1 inch, and soldered to the twisted pair from the search coil. Cement the cover from a plastic box of the type used to package phono cartridges (1" x 1/2" x 3 3/4") between the search coil and the oscillator box. Stranded wire, #26 plastic covered of the type found at hobby shops, was used in wiring the unit. Placement of parts and wiring is not critical.

With very little practice, it is possible to determine and outline the exact shape and location of the object you are seeking, thus saving a lot of futile plaster cracking and expense. —30—

This simple transistor oscillator circuit beats against the received signal in a broadcast set. A change in the pitch of the beat note shows presence of metal.



SHORT THESE 3 LEADS TOGETHER WITH METAL FOIL AS DESCRIBED IN TEXT

- R<sub>1</sub>—1000 ohm, 1/2 w. res.
- C<sub>1</sub>—50-330 μf. padder
- C<sub>2</sub>—0.1 μf. disc ceramic capacitor
- C<sub>3</sub>—0.01 μf. tubular capacitor
- L<sub>1</sub>—50 t. #34 en. wound around 3" x 3" piece of polystyrene
- B<sub>1</sub>—1.5-volt dry cell (Burgess Type NE or equiv.)
- B<sub>2</sub>—Three 1.5-volt dry cells (Burgess Type NE or equiv.)
- V<sub>1</sub>—"p-n-p" transistor (Type GT-81 or equivalent general-purpose audio or r.f. "p-n-p" type)

## Construction

Construction is simple. First, wind 50 turns of #34 enamel-covered wire around the edges of a 3" x 3" piece of polystyrene, lacing it around the notched corners. Allow six inches of the ends to be free, twist together and scrape the enamel 1/4-inch from the ends. Cover the winding with plastic cement and allow to dry.

Pre-wire the oscillator and dry cells before mounting in the 1 1/2" x 2 1/2" x 7/8" plastic box. Wrap plastic tape around the dry cells and place them in the bottom of the box. Place the padder capacitor at one end so it can be tuned when the cover is up, then glue in place with plastic cement. Transistor leads are cut to 1/2" and the .01-μf. and .001-μf. capacitors, along with the 1000-ohm resistor, are mounted directly on the transistor leads. Hold long-nose pliers on the leads at the point where they enter the transistor body to prevent damage during soldering.

Scrape 1/2-inch off the three leads at

The oscillator is built into a small plastic box. The search coil is wound on a three-inch square of polystyrene which is cemented to a plastic-box cover as shown in the photo below.

