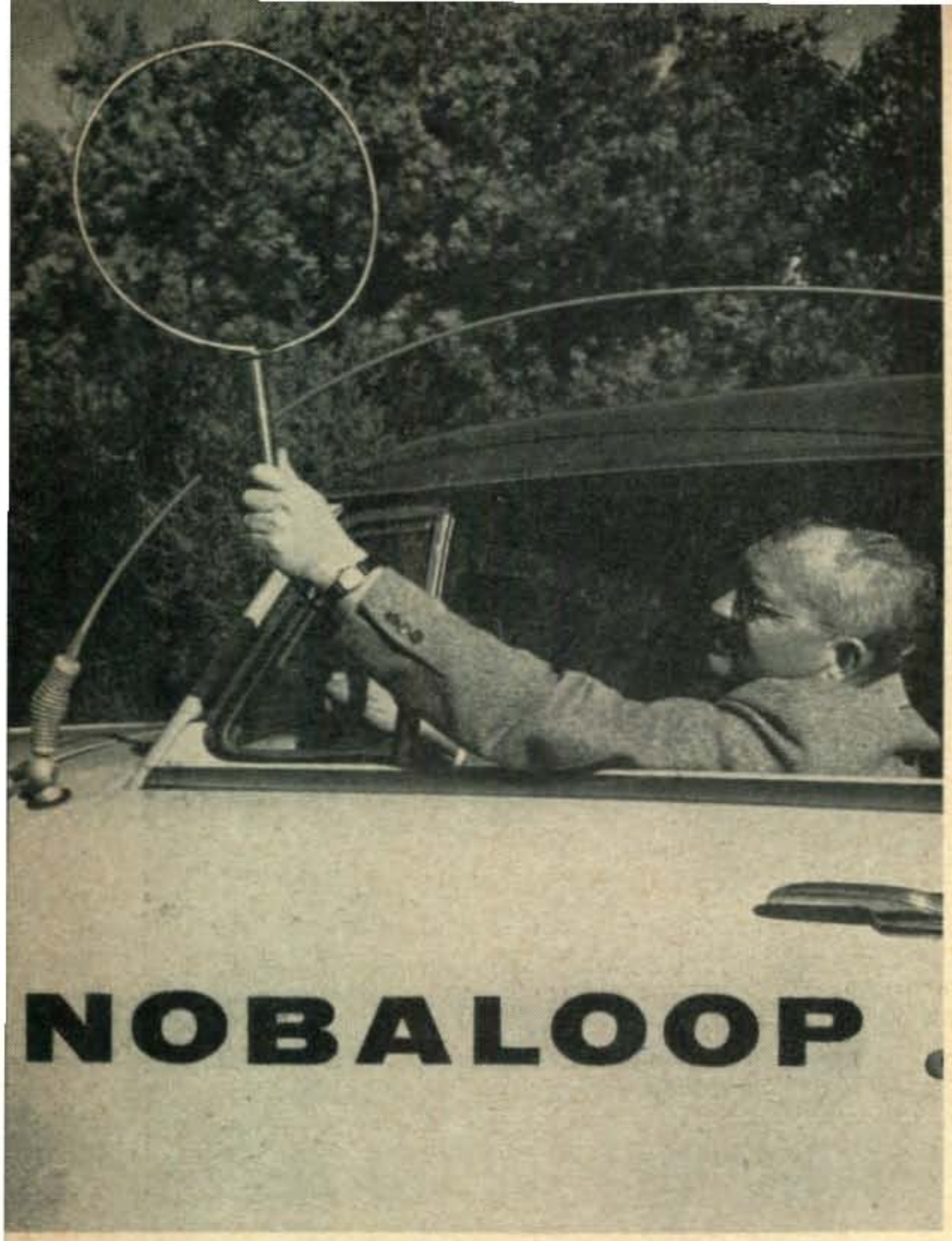


NOBALOOP

J. Roy Smith, W6WYA

Herein described is the simplest of DF loops, with no ambiguity of direction. It has but a single direction of maximum signal and a single null. It was designed for locating signals on the ten meter band but has been used with reasonable success on the lower frequency bands. The writer has used this loop in no less than 80 transmitter hunts, winning 15 first place findings and placing within the first 25 percent of early arrivals in nearly all the remaining hunts, which is excellent considering random factors involved in transmitter hunting—navigation, condition of roads and traffic laws.

And in San Diego there are more than a dozen of these loops in service, so hunting competition is really keen.

The business end of the Nobaloop is a 38- to 46-inch length of copper tubing (¼-inch gasline is fine) bent into a neat circle. The ends are flattened for about half an inch in a plane perpendicular to the radius. Number 28 holes are drilled through the flattened tubing about ¼-inch in from the ends. The loop is attached to a coax receptacle such as Amphenol 83-IR or military type SO239. One loop end is attached to the outer conductor by a 6-32 screw through one of the four holes. The other loop end is placed over the receptacle's center-conductor lug and soldered heavily. This completes the loop.

Approximately 70 inches of RG-59U coax is used to connect the loop to the receiver, with appropriate coaxial plugs attached.

A suitable handle for the Nobaloop may be made of ⅝-inch brass or copper tubing 8 inches or so in length. This is secured to the knurled part of the loop's coax plug by solder. If both the cable plugs are too large to be fed through the tubing used, remember to slip the tubing over the cable before attaching both plugs.

How to Use

The loop is held by hand out the window a few inches above the top of the car. It is held

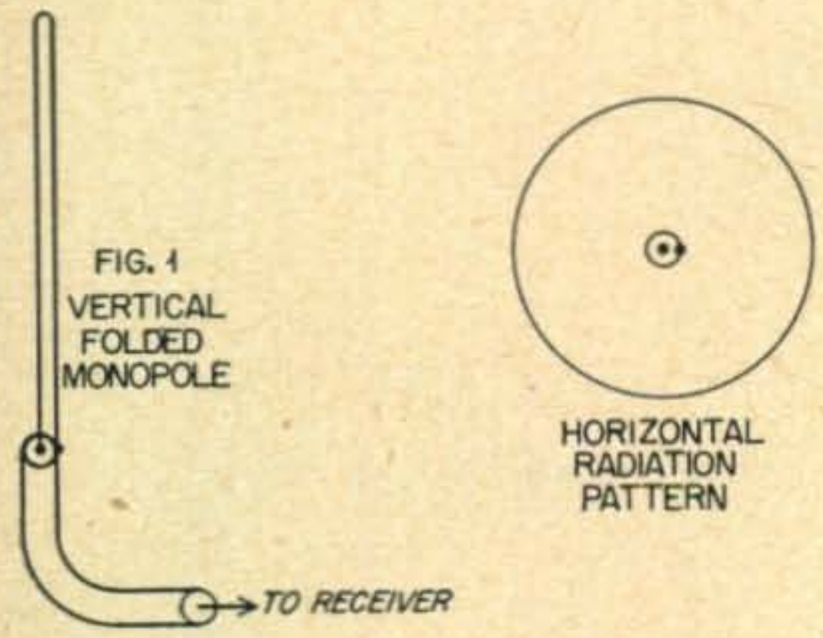


FIG. 1

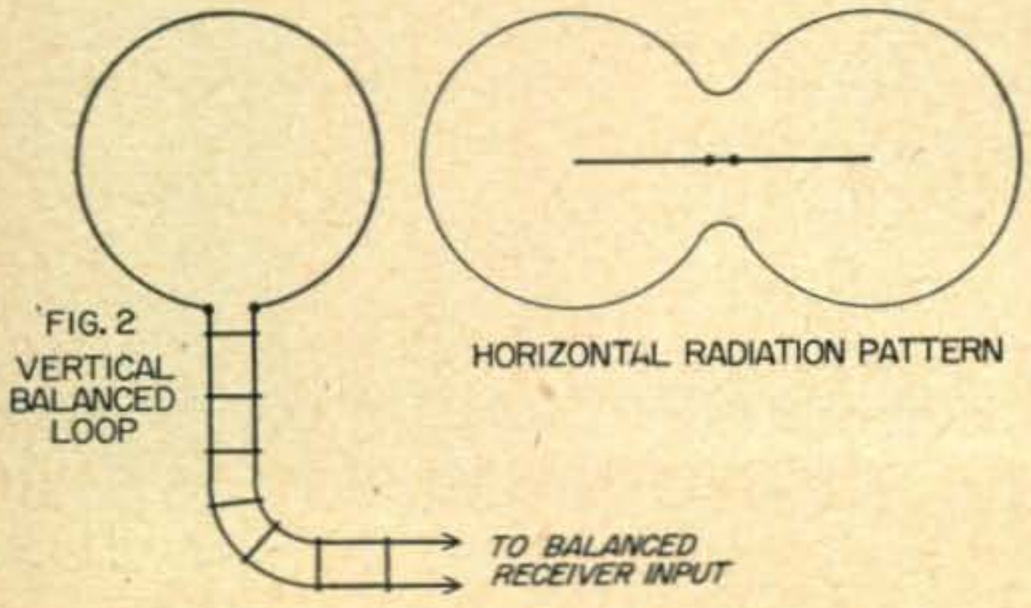


FIG. 2

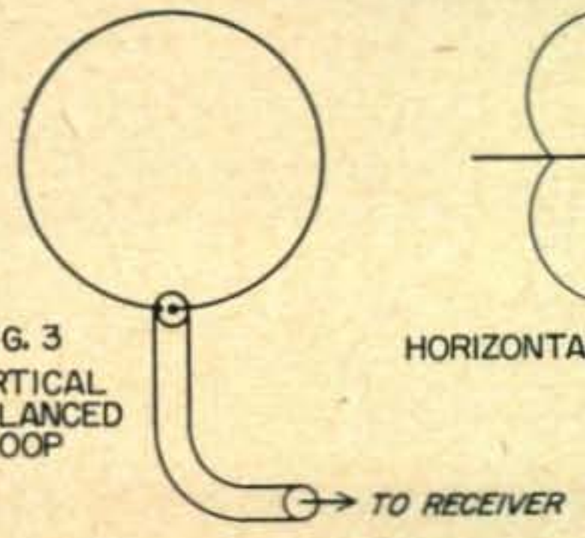
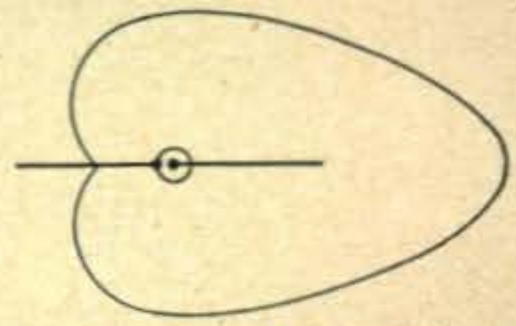
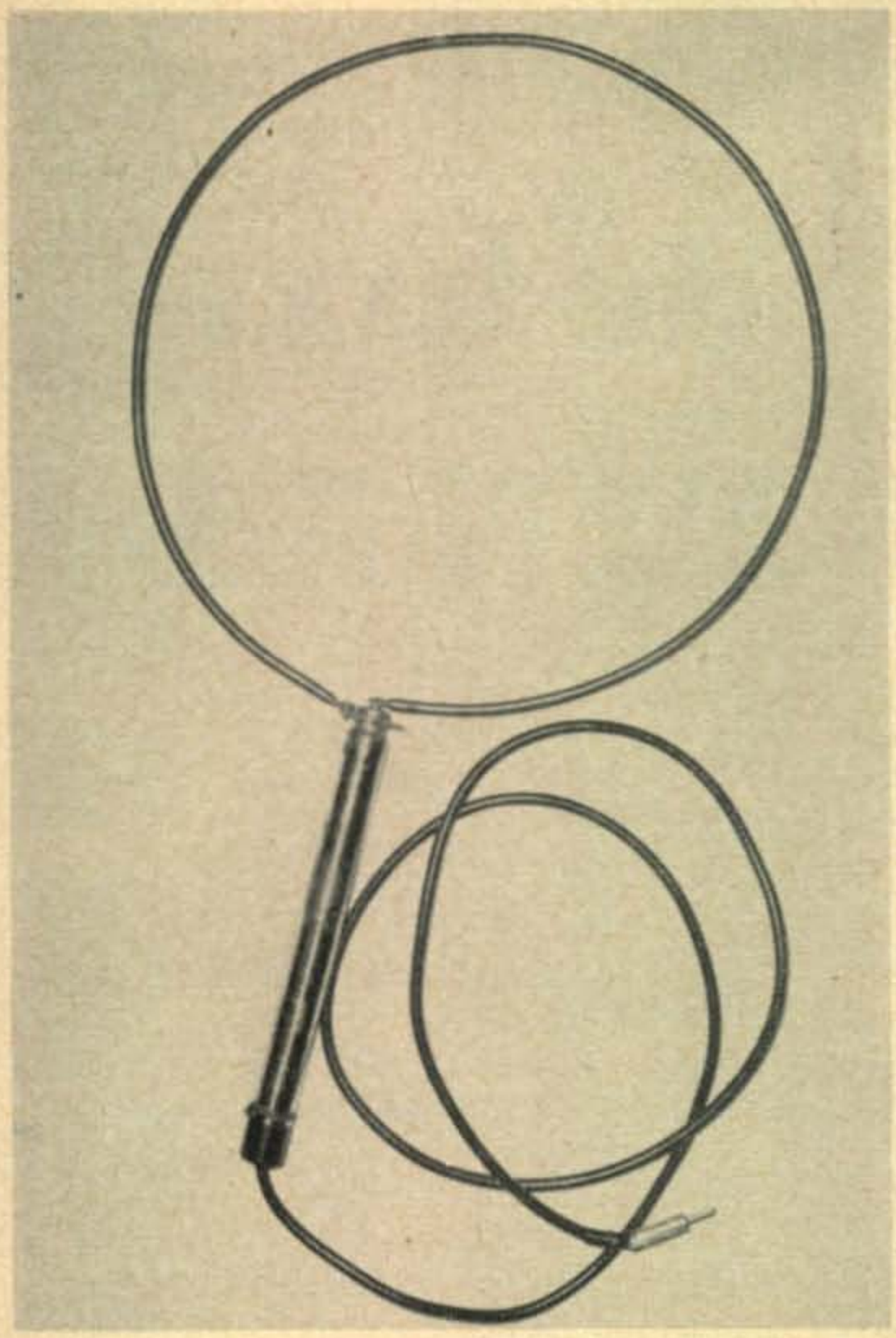


FIG. 3





with the hand near the loop for technical as well as practical reasons. With the loop held out the window, the receiver is tuned to the desired signal. Rotating the loop causes the signal to vary. Maximum signal is in the plane of the loop, in the direction of the ungrounded end of the loop. Minimum signal is in the same plane but in the reverse direction, the direction of the grounded loop end.

When the received signal is weak, maximum signal is used for direction finding. When the signal becomes strong the sharper minimum signal, or *null* side may be used.

The signal received via the loop is about 25 percent of that received by the standard whip. Usually the signals are sufficiently close and strong at the start so that this is no disadvantage.

Theory of Operation

Let's consider a folded monopole (half of a dipole) about 20 inches high attached to the center and outer conductors of a coaxial line connected to a receiver. *See Fig. 1.* With the monopole held vertically, this simply becomes a vertical folded type of antenna and signals will be received equally well in all directions. Its horizontal radiation pattern is said to be nondirectional or circular.

Next, suppose we take this same folded monopole, pull the sides apart, and form it into a circular loop. Connect it now to a balanced line to a receiver. Now hold this loop in a vertical plane. If the loop is rotated, as signal received will vary with two areas of maximum signal and two points of minimum signal. It's horizontal radiation pattern describes a figure "8". This radiation pattern is explained in nearly all radio text books. Refer to *Fig. 2.*

Now let us connect this loop to the original coaxial transmission line and receiver. We still have the folded monopole antenna and, in addition, this folded antenna is also an unbalanced loop (by use of unbalanced line). The basic figure "8" radiation pattern of the loop is still there but it is combined with the circular radiation pattern of folded monopole. The amplitude and phase of the two induced voltages are just so naturally proportioned that a cardioid pattern results. The folded monopole part serves as the "sense" antenna while the loop part performs its normal directional function. When the loop consists of a single turn and is connected in an unbalanced manner the phase and amplitude relationships of the voltages are just right for the single max and single min. See *Fig. 3.*

There are just two words of caution. First, there must not be any antenna effect in the coaxial line such as resulting from standing waves in the line. After all, the antenna is almost entirely inductive with but little resistance and there is no approach at an impedance match. Such antenna effect on the line can be nullified by either grounding the coax at the loop by means of a short wire to the car or by hand grounding, in effect, by holding the loop handle in your hand. Second, all vertical antennas on the car must be lowered or tied down close to the car body. Such antennas pick additional sense voltage and by parasitic action reflect them into the loop. In such a case the phase and amplitude of the sense voltage is changed to the point that maximum and minimum signal directions are unpredictable.

When working on the null direction in hilly terrain or in the vicinity of metal objects the null may be difficult to ascertain because of multiple signal-direction paths caused by reflections.

This dependable loop has but a single maximum signal direction and a single minimum. The max is about 30 degrees wide and the min is about 5 degrees wide. As you chase down upon the hidden station at shorter and shorter range you will find these bearings advantageously sharp.

W6WYA was first licensed in 1935 as W4DOT. Designer of the popular "28-9" and "28-28" transmitters, Roy is strictly a 10-meter man. He prefers designing and construction to operating, the fruits of such effort appearing now for the fourth time in the pages of this magazine. EE graduate of N. C. State College (1940), he served as a radar officer during WW II, and is now a senior Electronics Engineer at the Navy Electronics Lab, San Diego; is EC for the San Diego AREC; XYL Deane is K6BPK, jr. op Roger, age 9, is KN6IHN. Home Address: 2052 Venice St., San Diego 7, Calif.

Michigan Hamfest

Sunday, July 30th, at Warren Dunes State Park, 15 miles south of St. Joseph, Michigan, on U. S. Highway 12—Annual Picnic and Hamfest of the Blossomland Amateur Radio Association. Bring your family, a basket lunch, and swimming gear; also usable radio equipment for swap and shop. Ten-meter transmitter hunt. No admission charge to the park or picnic. Registration fee $1.00 in advance or $1.25 at the park. Please make reservation in advance through R. T. Hatch, W8JFW, 3225 Cleveland, St. Joseph, Michigan.

Maryland EPN Picnic

July 24th, at Gambrill State Park, Frederick, Maryland. the Maryland Emergency Phone Net will hold its annual picnic, 10 a.m. til ??p.m. Prizes, auction, soft drinks, Bingo for the ladies, children admitted free, adults 50¢. Get tickets from Ken Teeple, W3PSP, Baltimore, Md. Mobileers look for HQ stations on 3820 kc, 29520 kc, & 145.68 Mc.

Hawaiian ARC Convention

First prize of a Viking Ranger, plus many other prizes, sweet breads, technical talks, a trip around the island of Hawaii and a side trip to Puna with her recent backyard volcano promise to make the Hamfest of the Hilo Amateur Radio Club well worth attending. The date: July 2-3-4. Write P. O. Box 1659, Hilo, Hawaii.