A 5/8 Wave Vertical for 2

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This 5/8 wavelength vertical antenna is ideal for mobile or fixed operation and particularly for nets and local ragchewing.

WITH all the descriptions and pictures of multi-element v.h.f. beam antennas seen in the various amateur journals, some amateurs forget that the simple vertical v.h.f. antenna still has definite advantages for certain types of operation. A vertical antenna, for example, is much simpler to install and far less conspicuous on an automobile than a horizontal antenna. Also the omni-directional radiation pattern of the vertical antenna is highly desirable in local v.h.f., CD, emergency and ragchewing nets where none of the stations are very far apart, but who are scattered in every direction of the compass. Under these conditions, a beam is often a disadvantage, because, in no matter which direction it is turned, you can't hear all the stations in the net.

What we really need is to retain the advantages of a vertical for local work, and, at the same time, achieve a little antenna gain—without too many complications. Actually, there is an antenna that meets these specifications. It is the 5/8 wavelength vertical. Although it is 2½ times as long as a ¼ wavelength antenna, the 5/8 wavelength antenna has a power gain of almost 3 db, and the resulting length (four feet on 2 meters) is easily accommodated on the v.h.f. bands. Equally important, the antenna is simple to build, as indicated in fig. 1.

Theory of Operation

Touching briefly on the operation of the 5/8 wave antenna, as a short vertical antenna is increased in length, its radiated power is concentrated more and more at angles approaching the horizon. But, as the length exceeds ½ wavelength, a secondary lobe of high-angle radiation develops in the radiation pattern. In spite of this, the low-angle radiation from the antenna continues to increase until a length of 5/8 wavelengths is reached. Beyond this length, however, the low-angle radiation decreases, and the high-angle radiation increases. Thus a 5/8 wavelength vertical antenna gives the maximum low-angle radiation possible in a simple vertical antenna.

Because 5/8 wavelengths is a non-resonant length, a small inductance is connected in series with the antenna to increase its effective electrical length to ¾ wavelengths (without changing its radiation pattern). With the addition of the loading coil, the 5/8 wavelength antenna sketched in fig. 1 has a feedpoint resistance of approximately 50 ohms, a close match for 50 ohm coaxial cable.

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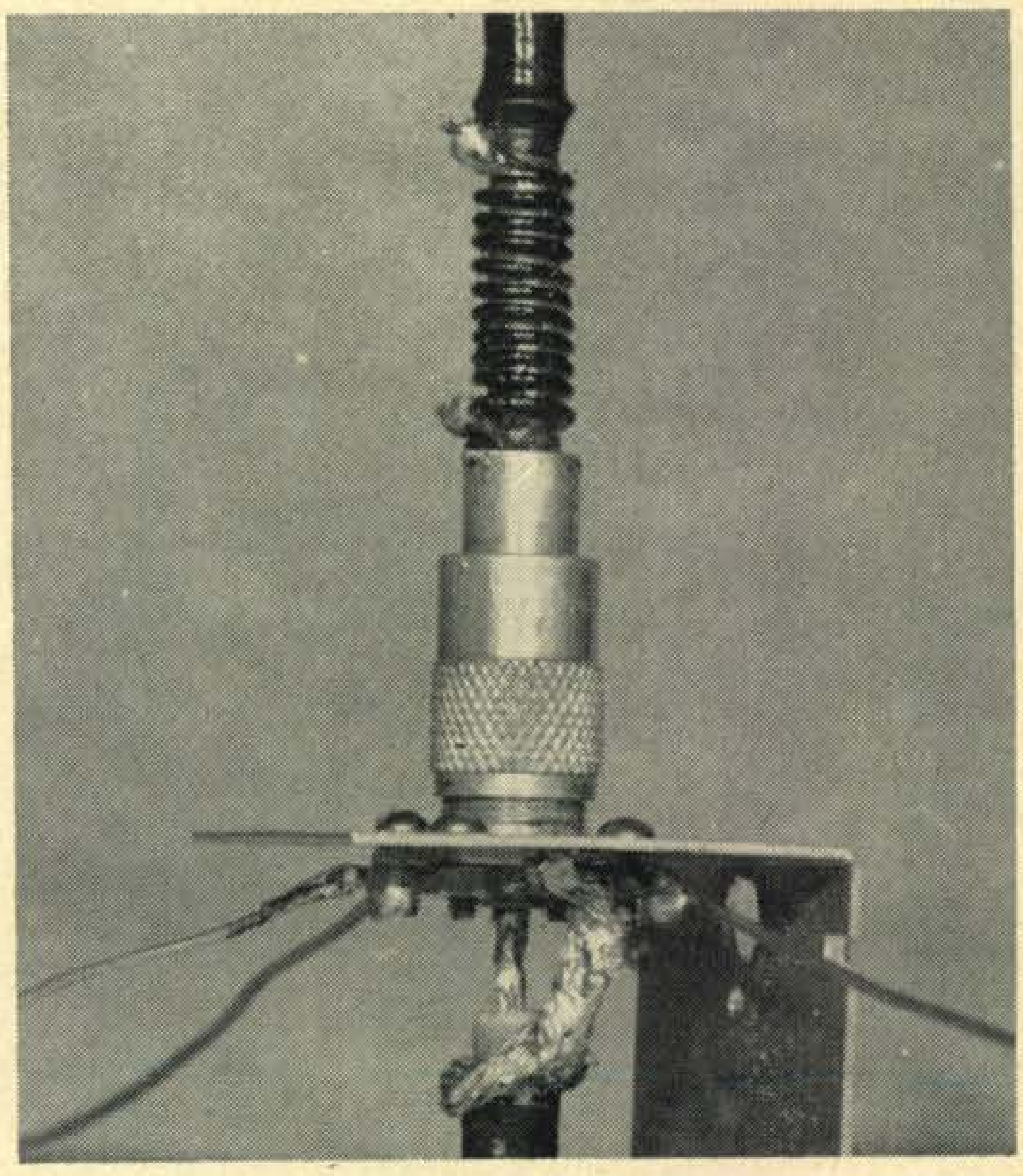

Close-up view of the base section of the 2 meter antenna showing the loading coil and ground plane assembly for fixed station operation. Connections to the coax line were left untaped to show the details. Tape these connections and the connector for weather protection.

Construction

To construct the antenna, obtain an inexpensive fiberglass fishing rod at least four feet long and approximately ¼" in diameter at the large end. Such rods are often available for less than $2.00 during special sales at sporting-good and department stores. Detatch the rod from its handle, and remove the ferrules from the rod. On some rods, the ferrules are fastened to the rod with wrappings of cord and are easily removed completely; on others, they are crimped in place. If yours is of the latter type, it may be better to clip off as much as possible of the ferrules, and smooth off the remaining rough edges with a file. Then, measuring from the large end, cut the rod to a length of 48".

Drill a 3/32" hole through one side of the rod an inch from the large end, and thread a length

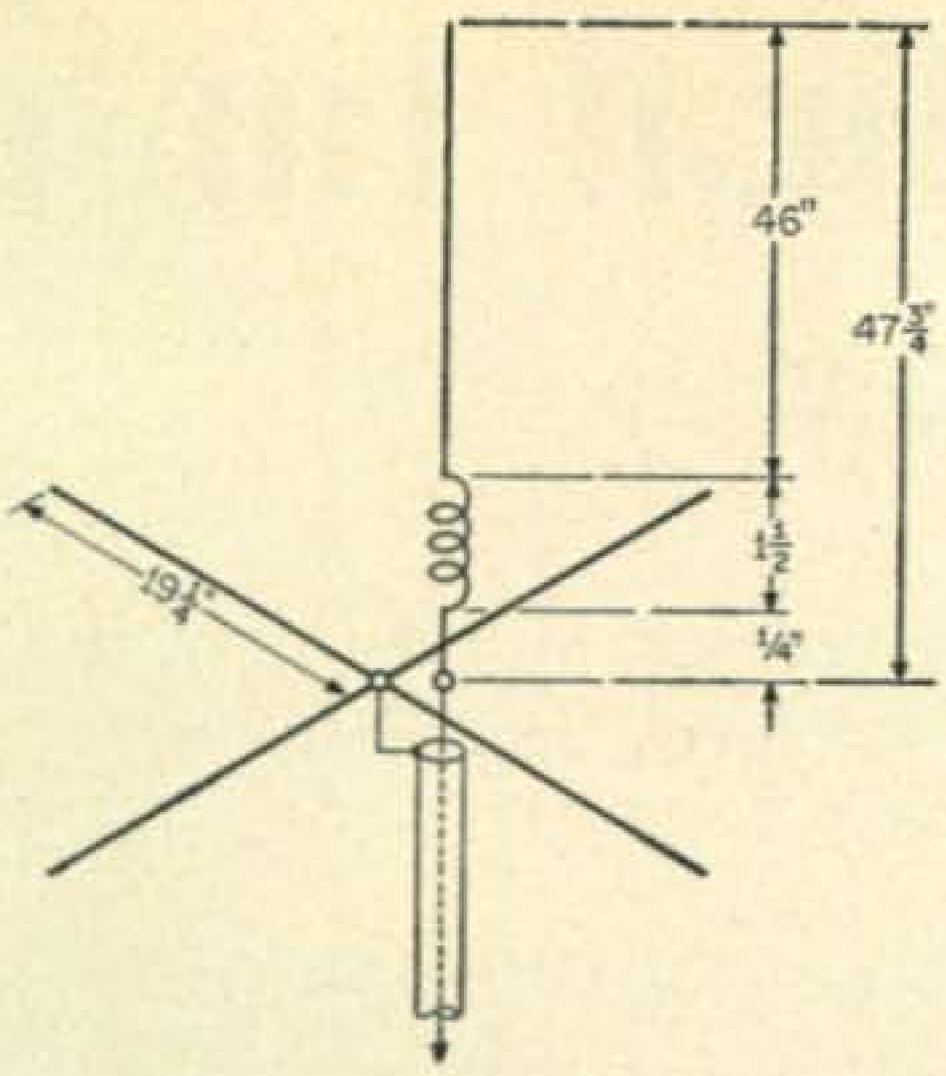

Fig. 1—Construction details for the 2 meter ⅝ wavelength antenna. The antenna base is a PL-259 coaxial connector on an SO-239 with four #10 copper wire radials, 19¼" long, attached. The loading coil has 11 turns of #14 wire wrapped around the 48" x ¼" fibreglass rod.

of #14 bare copper wire through the hole and out the bottom of the rod (which is usually hollow at this point). Allow about an inch of the wire to protrude at each end. Next, place a PL-259 type coaxial connector over the end of the rod, threading the #14 wire through its center contact. Cement the connector in place with epoxy-resin or similar adhesive. After the cement has set, solder the wire to the connector.

Remove the outer vinyl coating from a four-foot length of RG-58/U or similar coaxial cable, and slide the shield braid off the cable on to the fiberglass rod. Push the braid down to within about two inches of the bottom of the rod. Next wrap a turn and a half of #14 wire around the shield braid 1½" above the previously-installed wire. Allow about an inch of the wire to protrude at right angles to the rod and parallel to the first wire. Solder the wire to the braid and trim off the excess braid below the wire. Next, tightly wrap the shield braid with plastic electrical tape. Finally, space wind an 11 turn coil of #14 wire in the 1½" space between the two protruding wires on the rod, terminating the ends of the coil at these wires.

Installing the Antenna

For a mobile installation, mount a standard, chassis-type coaxial connector on the automobile fender, roof, or trunk, *etc.*, and screw the antenna to it. The photograph gives hints for constructing a ground-plane base for using the antenna in a fixed-station installation.

The four ¼ wavelength radials (19¼" long) shown in the picture are constructed of #12 wire; but, for increased rigidity and improved appearance, #10 or larger wire is recommended. Suitable wire in various gauges can be obtained in the form of plastic-covered house wire from electric-supply and mail-order houses. Remove the plastic coating before using the wire, of course. You can also obtain heavy duty solder lugs for mounting the radials from the same sources. Of course, 50-ohm coaxial cable is used to feed the antenna.

Adjustment

Connect an s.w.r. bridge in the feedline between the transmitter and the antenna, and vary the spacing between turns in the antenna loading coil for minimum feedline s.w.r., which was just over 1¼:1 in this installation. Depending on the actual diameter of the fiberglass rod used and other variables, it may be necessary to add a turn to or subtract a turn from the loading coil to obtain minimum s.w.r. After the coil is adjusted, solder its ends to the protruding leads, trim off the excess wire, and coat the coil with low-loss dope to weather-proof it and to hold the turns in place.

In a ground-plane installation, the position of the radials will affect the s.w.r. obtained. As a suggestion, start with them slanting downward from the base of the antenna about 30 degrees. Then, after the antenna coil is adjusted for minimum s.w.r., try bending the radials up and down for a possible further slight reduction in s.w.r.

Additional Construction Notes

If you can find a shop where fishing rods are repaired, you may be able to obtain a fishing-rod "blank" for much less than the cost of a complete rod. Also look around for a broken rod from which the 48" length can be salvaged. Incidentally, adjustment of the coil will compensate for slight differences in rod length, but don't exceed the specified length.

Results

Experience shows that replacing a ¼ wave vertical with the ⅝ wave type definitely increases transmitting range somewhat, but the greatest improvement is apparent on reception, especially when the antenna is low. ■

"After you pick the target for tonight—supper's ready."