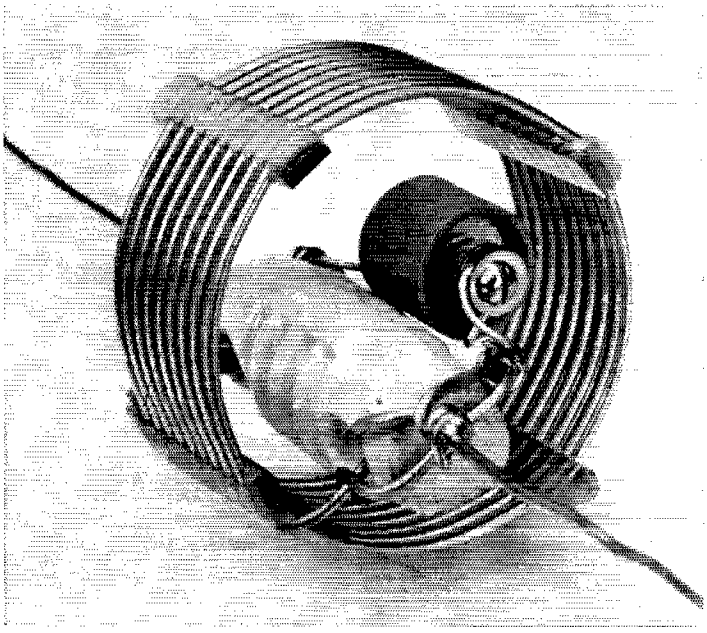

This shows the construction details of one of the traps. Be sure all twisted-wire connections are soldered to insure good electrical contact.

An Easy to Make, Coax-Fed, Multiband Trap Dipole

BY LEWIS G. McCOY,* W1ICP

We often get requests for information on trap dipoles. Here is a simple design that can be used either horizontally or as an inverted V.

IN a recent article [1] we discussed the pros and cons of coax-fed trap dipoles as multiband antennas. As pointed out, there are several advantages in using such an antenna, probably the most important being the fact that coax line can be run near metal objects, or even be buried in the ground without having any appreciable effect on the antenna system.

There are many types of trap dipoles, some using more than two traps to cover the amateur bands from 80 through 10 meters. In this article we will describe a multiband dipole that will cover the Novice bands with only two traps. However, before describing the construction, let's see exactly what a trap dipole is and how it works.

The Trap Dipole — How It Works

If you are going to use coax feed line, the line should be terminated in an impedance the same as, or at least close to, the characteristic impedance of the coax line. Whenever the antenna impedance differs greatly from that of the coax line, and you want to use coax, you should install a matching device at the antenna so that the coax line "sees" an impedance that is the same as the line impedance.

The reason for doing this is to reduce the standing-wave ratio on the coax line. For example, if the antenna impedance is 200 ohms and the coax line impedance is 50 ohms, the s.w.r. will be 200/50, or 4 to 1. This may be more s.w.r. than we care to have, either because of added losses or difficulties in getting the final amplifier in the transmitter to load properly. Therefore, the object is to have an antenna whose impedance is close to that of the coax.

The impedance at the center of a half-wave horizontal antenna will depend on several factors, including height of the antenna above ground, the type of ground under the antenna, and the effect of nearby objects. Probably, if we could

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[1] McCoy, "Antennas and Transmatches," *QST*, Oct., 1964.

take an average, most hams erect their 80-meter half-wave dipoles about 30 feet above the ground. This being the case, the impedance of the antenna will fall somewhere between 40 and 70 ohms, thus either 50- or 75-ohm coaxial cable could be used to feed the antenna and a fairly good match would result. Fig. 1, at A, is an illustration of a half-wave dipole.

Let's assume for a moment that we are using the 80-meter dipole but that we want to tune up the rig on 40 meters. In this case, the dipole would no longer be a single half wave but two half waves fed at their adjacent ends, and the impedance would be somewhere near 4000 ohms, resulting in a mismatch of about 80 to 1! Obviously, we couldn't use our 80-meter half wave dipole as a multiband antenna with the coax feed line.

Back in 1955, *QST* carried an article by W3DZZ[2], describing a "trap" antenna. This article pointed out that it was possible to have a single-wire antenna fed with a single coax line cover the bands 80 through 10 meters and, by making use of traps installed in the antenna, still have a fairly good match to the coax line.

At B, in Fig. 1, is a drawing of a typical system, using 80 meters as the lowest-frequency band. Assuming the antenna at B were being fed with an 80-meter signal, the over-all electrical length would be one-half wavelength and the impedance would be somewhere close to 50 ohms, offering a good match for coax. When the system is fed with a 40-meter signal, the traps act to "divorce" the outer wires from the rest of the antenna, making the system look like a 40-meter half-wave dipole, and again the coax would be fairly well matched. You couldn't do this without traps because the mismatch would be extremely bad on 40 meters, as we pointed out a moment ago.

On the higher bands, 20 through 10 meters, the trap dipole works out to electrical lengths that are close to being odd multiples of half wavelengths. Consequently the center feed point provides an acceptable match for coax line.

It would be unfair if we didn't point out the principal drawback of this type of antenna, particularly for the Novice who operates on 80 meters. As long as the antenna is a multiband job with coax feed, it must be remembered that it will accept harmonics as well as the fundamental. If you are working on 80 meters and have a 40-meter harmonic, there is nothing in the antenna system to prevent the harmonic from being radiated. If we had a single-band dipole such as in Fig. 1 at A for 80 meters, the antenna would be a selective circuit and tend to discourage radiation of a second harmonic. But our multiband antenna won't do this: it will accept the harmonics.

However, it is a simple matter to install a filter in the line to keep harmonics from being radiated. The filter can be a simple device such as the one described in *Understanding Amateur Radio*.[3]

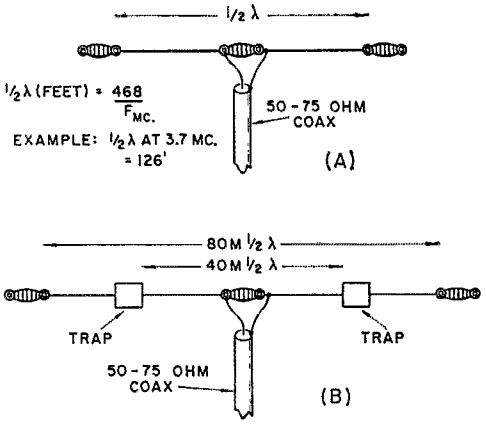


Fig. 1—Shown at A is an example of a coax-fed, half wave dipole. At B is a trap dipole, using either 50- or 75-ohm feed.

Another way to get rid of the harmonic problem is to install a transmatch in the line. A suitable transmatch was described in a recent issue[4] of *QST*.

Making the Trap Dipole

Fig. 2 shows the circuit of the trap dipole. The dimensions given in Fig. 2 will result in an s.w.r. of 2 to 1 or less in the Novice portions of the 80- and 40-meter bands, using either 50- or 75-ohm coaxial cable. We found that on 15 meters the s.w.r. was about 3 to 1 with either type of line. The coils for the two traps are made from Barker & Williamson coil stock, type 3905-1, 2½ inches in diameter, 6 turns per inch. Nine turns are required for each trap. The capacitors used in the traps are Centralab type 850SL-100N. These capacitors will handle 1-kw. input without breaking down.

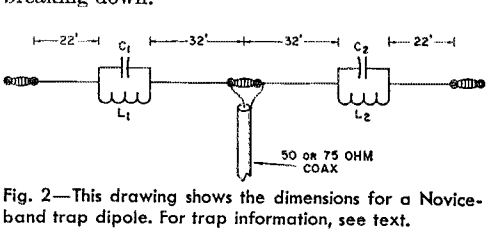


Fig. 2—This drawing shows the dimensions for a Novice-band trap dipole. For trap information, see text.

The photograph of one of the traps will give you a good idea of its construction. Be sure to allow several inches of lead length from the ends of the coil. These ends are fed through the insulator and around into a loop. The antenna wire is also fed through the insulator ends, wrapped back on itself, and then both the ends from the coil and the antenna are soldered together. Use a No. 12 or 14 solid copper wire for the antenna.

Fig. 3 shows the method for connecting the coax cable to the center insulator. Wrapping the coax around the insulator and then clamping the two together will take the strain off the connec-

[2] Buchanan, "The Multimatch Antenna System," *QST*, March, 1955.

[3] *Understanding Amateur Radio*, 1st ed., p. 213.

[4] McCoy, "A Completely Flexible Transmatch for One Watt to 1000," *QST*, June, 1964. Note: On page 40, Fig. 2, both L3 coils should be 32 turns, not 28.

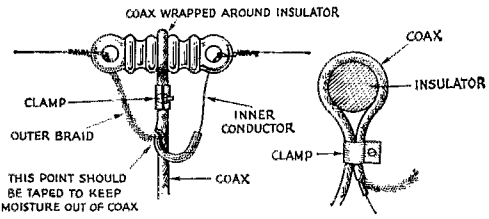


Fig. 3—Method of wrapping the coax feed line around center insulator for additional strength.

tions to the antenna. For power inputs up to 300 watts, either RG-58/U or RG-59/U can be used to feed the antenna. For inputs up to 1 kilowatt, the heavier-duty coax, RG-8/U or RG-11/U, should be used. RG-58/U and RG-8/U are 50-ohm types and the other two are 75 ohms. The Novice should decide before buying his coax which type he'll need because the impedance of the coax used in his installation should be the same as that of his s.w.r. bridges or low-pass filters, if such items are used.

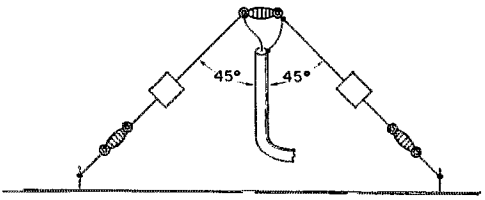


Fig. 4—The trap dipole when used as an inverted V.

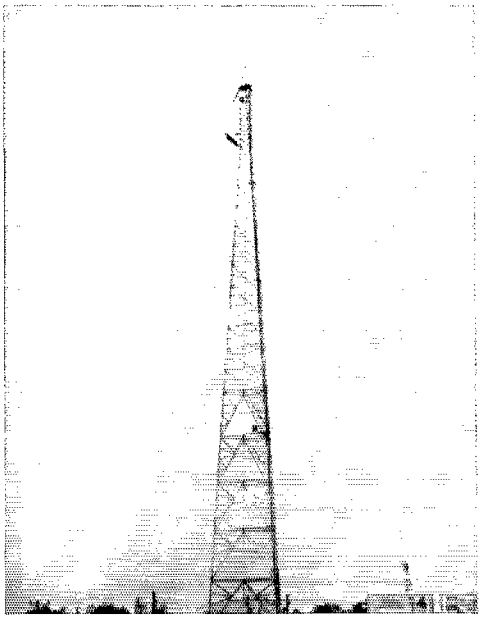
Putting Up the Antenna

There are several possible ways to install the antenna. If you have two support points, the antenna can be stretched out horizontally. If at all possible, get it up at least 30 feet above ground; the higher the better. It may be that you don't have enough room to stretch the antenna out to its full 100-plus feet. If so, you can drop the ends down from the traps, which would mean a straight run of about 65 feet. However, be sure the ends are clear of the ground. We tried the antenna both stretched out full length and with the ends dropped, with no significant difference in signal reports from other stations, either way.

Another way of mounting the antenna is in the form of an inverted V. This type of mounting only requires a single mast or support point. The center insulator is supported on the top of the mast and the ends of the antenna draped down as in Fig. 4. There is no hard and fast rule about the angle of the wires in an inverted V. We show it in the drawing as 90 degrees and we have had good results with such an installation. The best advice would be to try the wires at different angles. You can tie rope or twine to the end insulators and move the ends around to different settings. The antenna *will* radiate and you may be pleasantly surprised with the results.

QST

Strays



W5AI'S two full-size, three-element beams—one for twenty meters and the other for forty—are mounted on top of this 280-foot tower in Corpus Christi, Texas. They're so high, in fact, that you can hardly see them.

WA4OKK, Eugene Yoakum, trained his K-9 corps dog "Mucho" to answer commands by radio, through a small receiver strapped to Mucho's harness, and it is believed that this is the only dog ever trained in such a fashion. Mucho answered several commands over the radio, but he would respond only to Gene's voice. Gene, WA4OKK, was going to show off his dog Mucho at the annual hamfest of the Foundation of Amateur Radio Clubs on Saturday, September 27. But on the morning of the hamfest, tragedy struck; Gene was killed while going to the assistance of a fellow officer.