The Powerful Grounded Antenna

—thrives on poor soil

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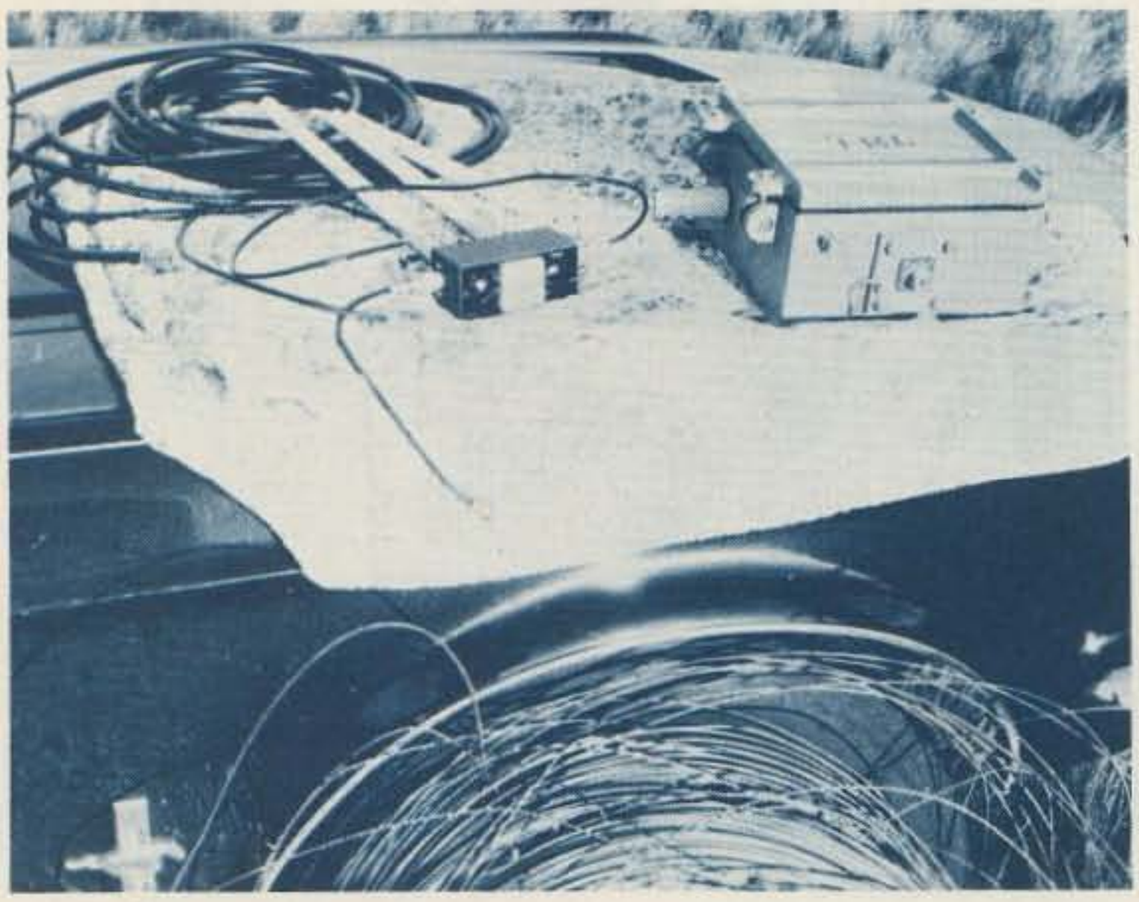
The Beverage, or wave antenna,[1] has been around for a long time and, over the past several decades, has been employed by commercial, military, and, to a lesser extent, radio amateur users.[2] The Beverage is basically a specialized antenna system which is normally utilized at low frequencies or on the lower part of the high-frequency spectrum.

The Beverage belongs to the family of longwire antennas and can be considered a cousin of antennas such as the longwire, V-beam, rhombic, and fishbone. The characteristic that makes the Beverage different from its "cousins" is the way that it operates. These differences become apparent when one considers its unusual wave-generating properties, rather than its physical makeup.

At first glance, the Beverage seems to be nothing more than a longwire with a resistor at the far end. (See Fig. 1.) Examination of its electrical properties reveals that this longwire-type antenna can be excited or fed the same way as any other antenna with a similar feedpoint impedance. So what we have here is an antenna that looks similar to and can be driven like any other array of similar physical and electrical properties.

So far so good, but Mr. H. H. Beverage and a couple of his colleagues modified the antenna to operate in a manner quite different from the normal longwire. Let's have a further look at this antenna to see just how different it really is.

First, the antenna, positioned horizontally over the ground on Earth, transmits not a horizontal wave, but a vertical wave.[3] Secondly, this antenna does not rely on good earth conductivity for efficient operation, as do other antennas, but quite the opposite. In other words, the poorer the earth's conductivity, the better the Beverage works. For example, dry, sandy, or rocky earth under the antenna produces good results, and, conversely, moist or swampy ground or sea water produces poor results. The theory of operation of the Beverage antenna is that the wave traveling down the antenna wire moves faster (further) in a given time frame than the wave in the earth under the antenna,[4] causing the wave front to tilt forward toward the terminated end. This wave tilt produces a low vertical angle or radiation, which, of course, enhances its DX capability. When the antenna is used for both transmission and recep-



Some of the bits and pieces for the Beverage.

Installing the 1 kW broadband balun on the feed pole. The first two poles of my rhombic are used to support the beverage. The remaining poles are 20' long.

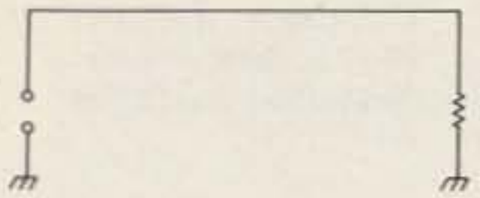


Fig. 1.

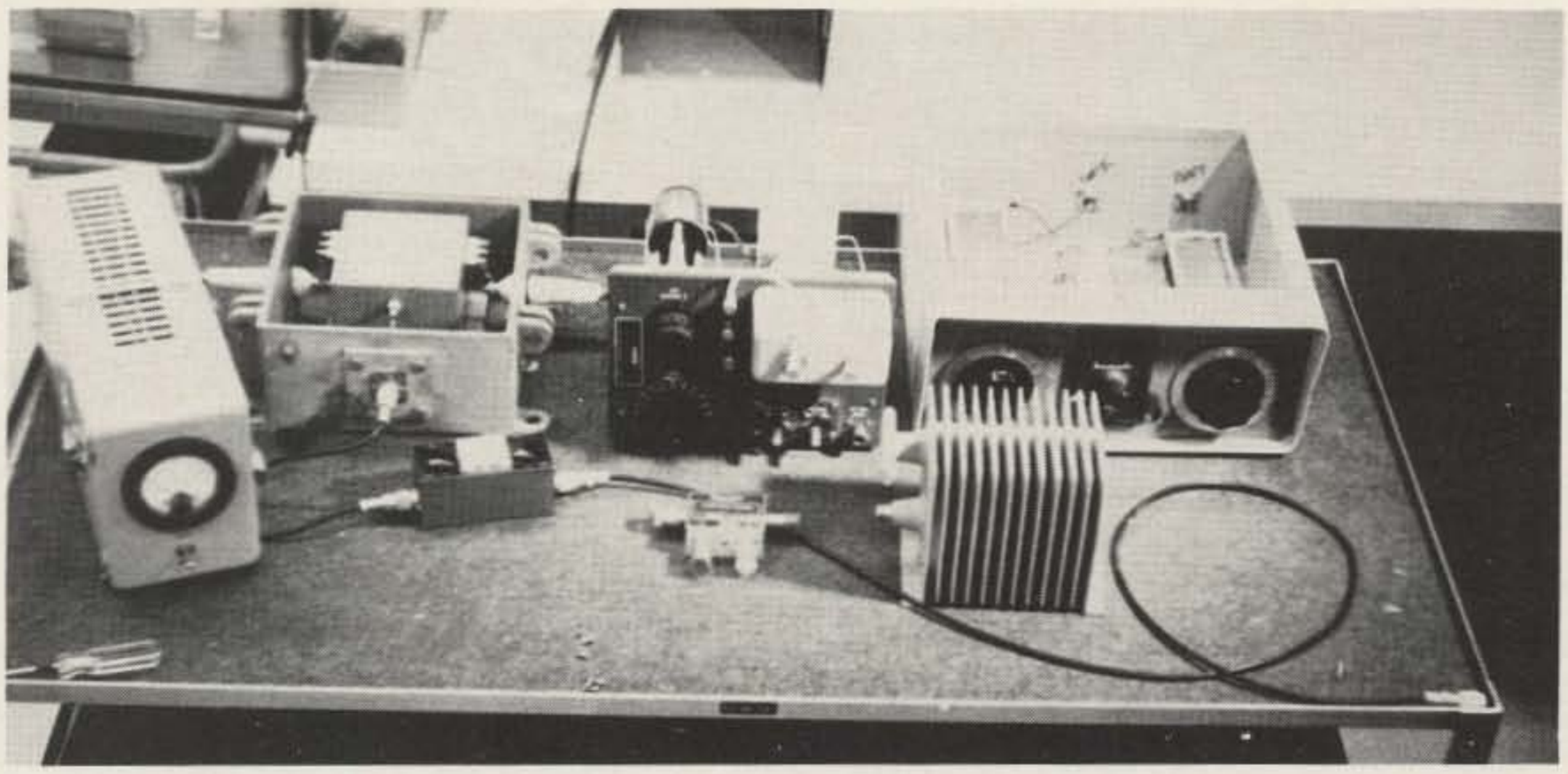
tion, the low vertical angle is, as might be expected, fully reciprocal.

Amateurs using the Beverage on the low-frequency bands, such as 160, 80, and even on 40 meters, have found the antenna's low vertical wave angle very beneficial in bringing in low-angle DX signals and, at the same time, attenuating the "local" or high-angle interference. (See Fig. 2.)

The Beverage will give good performance with a length as short as one wavelength. As with the standard longwire, V-beam, or rhombic, the more wavelengths, the greater the gain, up to a point. That is to say that extremely long Beverage antennas exhibit a drop-off in gain. The best height for the antenna is from about 12 feet (3.7 meters) to 15 feet (4.6 meters) above ground. Below 12 feet, the gain falls off rapidly, and above 15 feet, there is little increase in gain.

The characteristic impedance of the single-wire antenna is approximately 500 Ohms. Two- or three-wire models can be employed, with a corresponding reduction in antenna impedance. Inasmuch as the antenna is terminated with a noninductive resistor of a value equal to the characteristic impedance, it is nonresonant and therefore is efficient over a very wide frequency range. The terminating resistor need dissipate only about one-third of the power fed to the antenna. The antenna can be fed in a number of ways, some of which are shown in Fig. 3.

How well does the Beverage perform? It does unusually well when operating on the lower frequencies. For example, a four-wavelength Beverage, operating on 80 meters, outperformed a Doublet 200 feet (60 meters) above ground, when I operated them in a recent DX contest. For the city-dwelling amateur,[5] the length of even a one-wavelength Beverage may prove a bit of a squeeze, but there may well be some ways to overcome this problem, such as the "loan" of some extra space by a friendly neighbor. Put up a Beverage if you can; it is a fine antenna. ■



Left to right, front row — wattmeter, vswr meter, wattmeter coupler, and dummy load. Second row — balun, commercial single-wire tuner, and home-built transmatch.

References

1. H.H. Beverage, C.W. Rice, and E.W. Kellogg, "The Wave Antenna," *Trans. A.I.E.E.*, Vol. 42, pp. 215-266.
2. *The ARRL Handbook*, 13th Edition, Chapter 16, p. 294.
3. The wave front is actually elliptical because a small amount of the horizontal component is out of phase.
4. Not just the surface soil, but also the earth to a considerable depth under the antenna contributes to the conductivity.
5. My Colorado QTH is urban, but the Wyoming QTH is 5,000 acres, allowing almost anything in the way of antennas and towers.

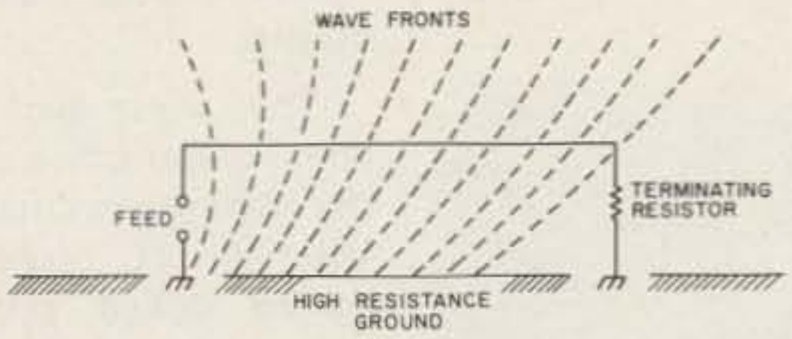


Fig. 2.

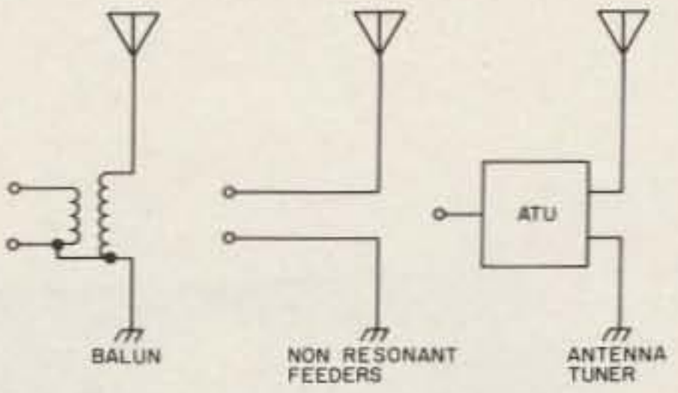


Fig. 3.

LETTERS

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batteries run down, and you may be sure it will be the same as the one I now have. No GE, even if free. I have written to *QST* on this, but have no knowledge that they ever passed it on. I am now using a Radio Shack 22-010 transistorized signal tracer. To use one, set it on rf, hold the clip on the lead about two inches below the left nipple, and hold the case firmly against the left ear, so as to get a good ground connection.

It is always a great pleasure to have a very good result from any product, and I want to say I am most happy with the Medtronic, and with their prompt answer to any question I have asked them.

Charles R. Green K4KBH
Englewood FL

SUPPORTING A SLEEPER

One of our members, Don Sleeper W1ONK, who has a future retirement home in Dennis, has appealed to the courts after losing his appeal to the Regional Historic Commission to keep his 68' Rohn 25G fold-over tower on that property.

Labeling it "visual pollution," the Old King's Highway Historic District Committee, on August 11, 1977, ordered the removal of the tower despite the fact that it fully complied with the Dennis zoning bylaw. When Sleeper asserted his constitutional rights to maintain his antenna in pursuit of his hobby, the Historic Commission ruled: "There is no such right where the structure involved is as grossly inappropriate as that under consideration."

Sleeper's appeal to the courts is a test of the authority of the local committee and the Regional Historic Commission. Losing the appeal could establish a detrimental precedent on the "appropriateness" of amateur towers in historic districts.

To date, the ARRL Legal Kit has been most helpful, and there is a

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