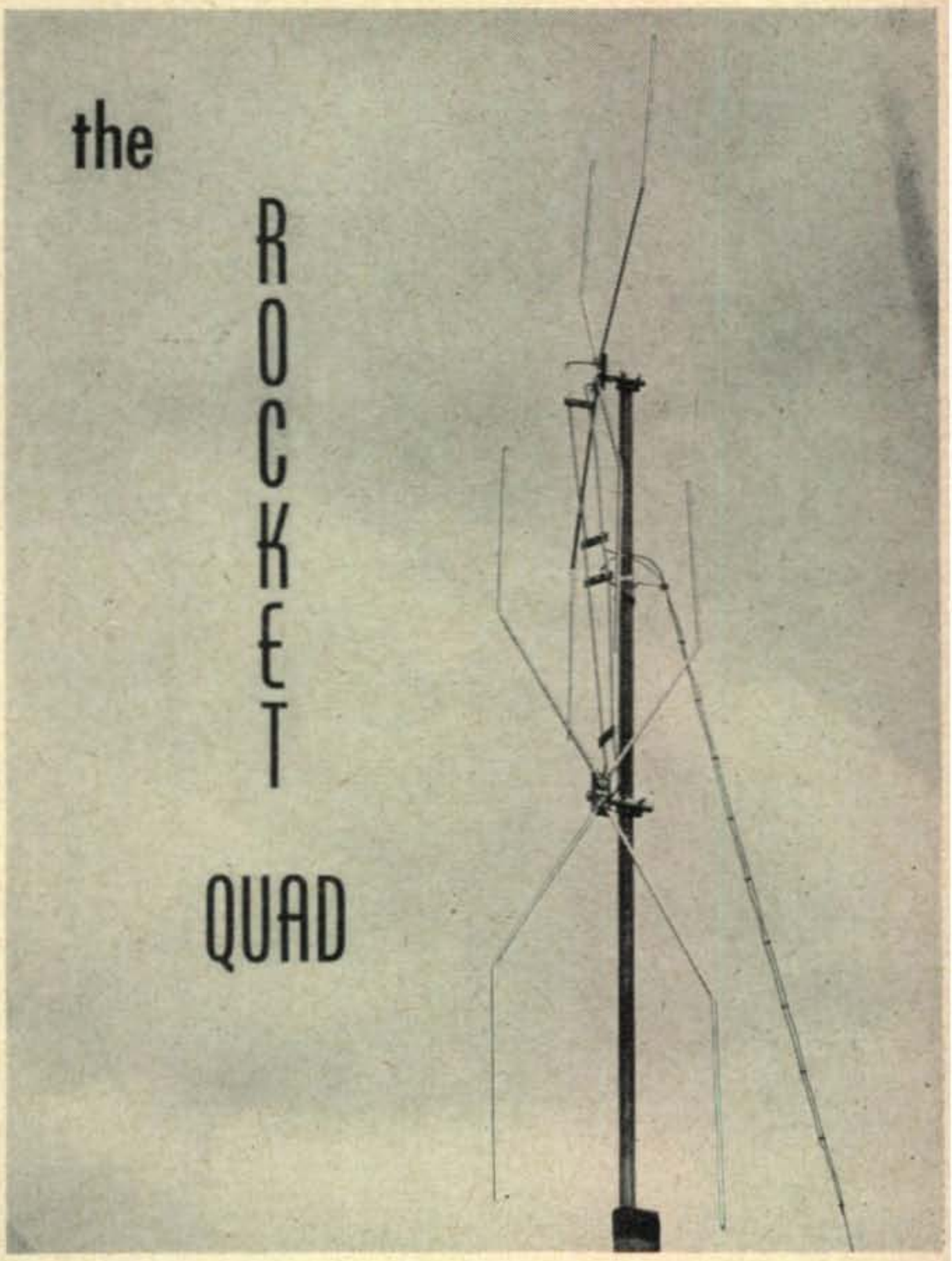
Developing a New Two-Meter Vertically Polarized Radiator



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I must confess to being a member of the fraternity devoted to the use of vertical polarization on 144-Mc. I also believe there should be considerable interest in omni-directional vertical antennas for CD, CAP, mobile net control and Novice stations in our big northeastern and Southern Californian cities. For many of these locations a beam will simply not work as conveniently as a good vertical radiator that exhibits gain in the horizontal pattern.

The two-meter band is fairly wide. This calls for an antenna design that will not create too large a mismatch as we operate from one end of the band to the other. Even though it is a vertically polarized non-directional radiator it should have some effective gain. Taking all these factors into consideration I have developed a vertical antenna which has been called the "Quadrapole" because it physically appears to have four elements but yet remains a simple dipole.

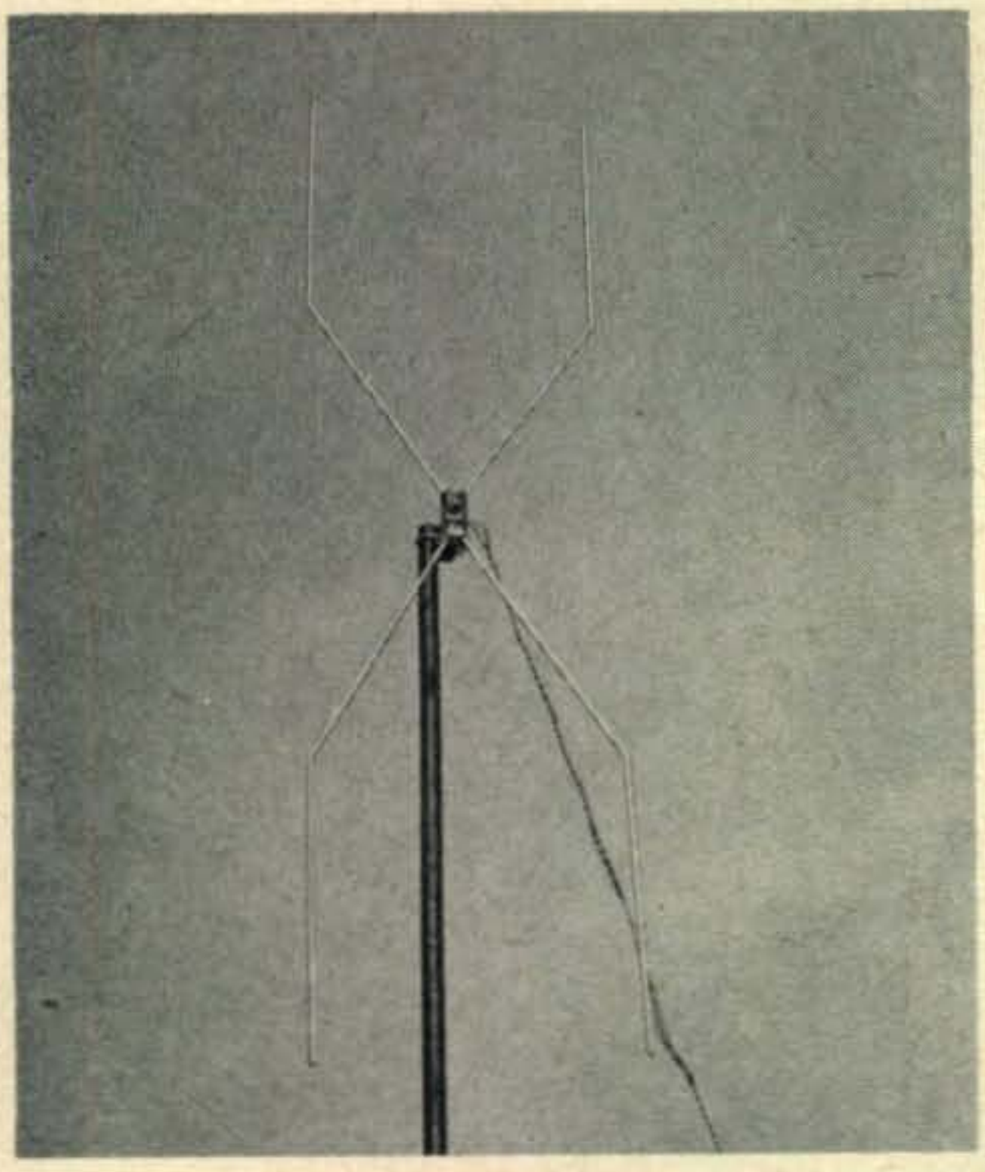
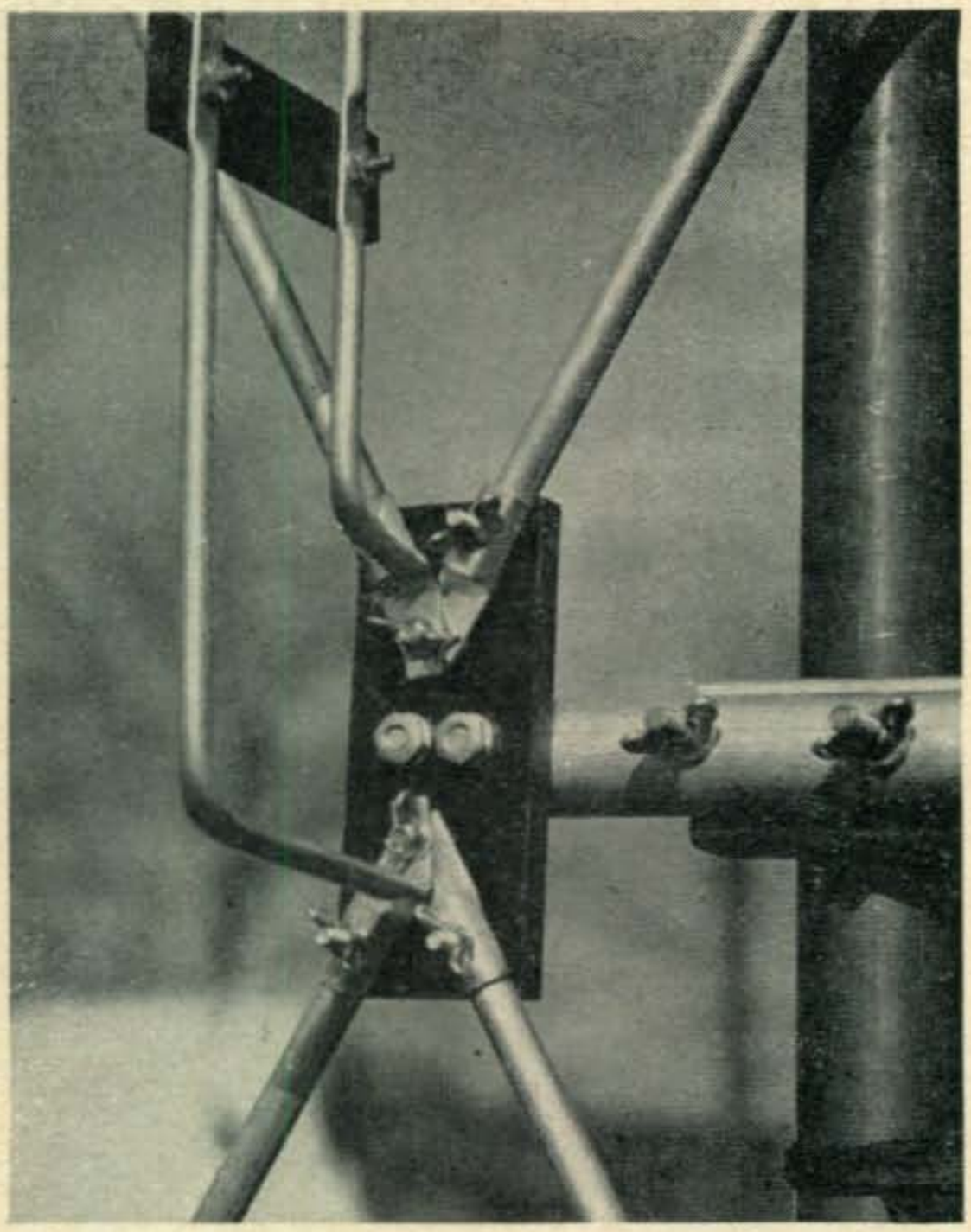


Fig. 1. The basic "Quadrapole" consists of four rods that are 40 inches in length. The separation of the "horns" of each dipole is 20 inches and the bend occurs at a distance of 20 inches from the apex. A one inch separation spaces the dipole elements at the apex. This antenna is fed with 300-ohm lead. Possibly to secure optimum results the feedline should be taken off at a right angle to the plane of the dipole for a distance of about 20 inches. This would prevent an unbalanced line.

The basic *Quadrapole* is broad-banded with a conservative 3 db. gain. Its design may be regarded as an adaptation of the conical dipole, except that the outer ends of the elements are bent parallel to each other. A photograph of the antenna is shown in *Fig. 1*.

Subdividing each part of the dipole, hence increasing the width of element, has several distinct advantages. The overall *Q* of the radiator is reduced and a good match can be secured to a 300-ohm twin-lead feedline.* This means that the *Quadrapole* has a good VSWR

* From a purely theoretical viewpoint this now becomes a "dispersed" antenna which might improve communication effectiveness. This would be particularly true in an area with a great number of vertical-plane reflecting surfaces that set up standing-wave-in-space patterns. This dipole in having a finite width would wash out deep nulls. Such nulls pronouncedly affect single-wire vertical radiators since conceivably they might lie in the null zone. In addition there is probably some horizontally polarized pickup.—**Editor.**



In this version of the Rocket Quad a matching section has been made of tubing.

and may be used over a fairly wide band. The gain of the *Quadrapole* is due to the additional length in each half of the dipole elements.

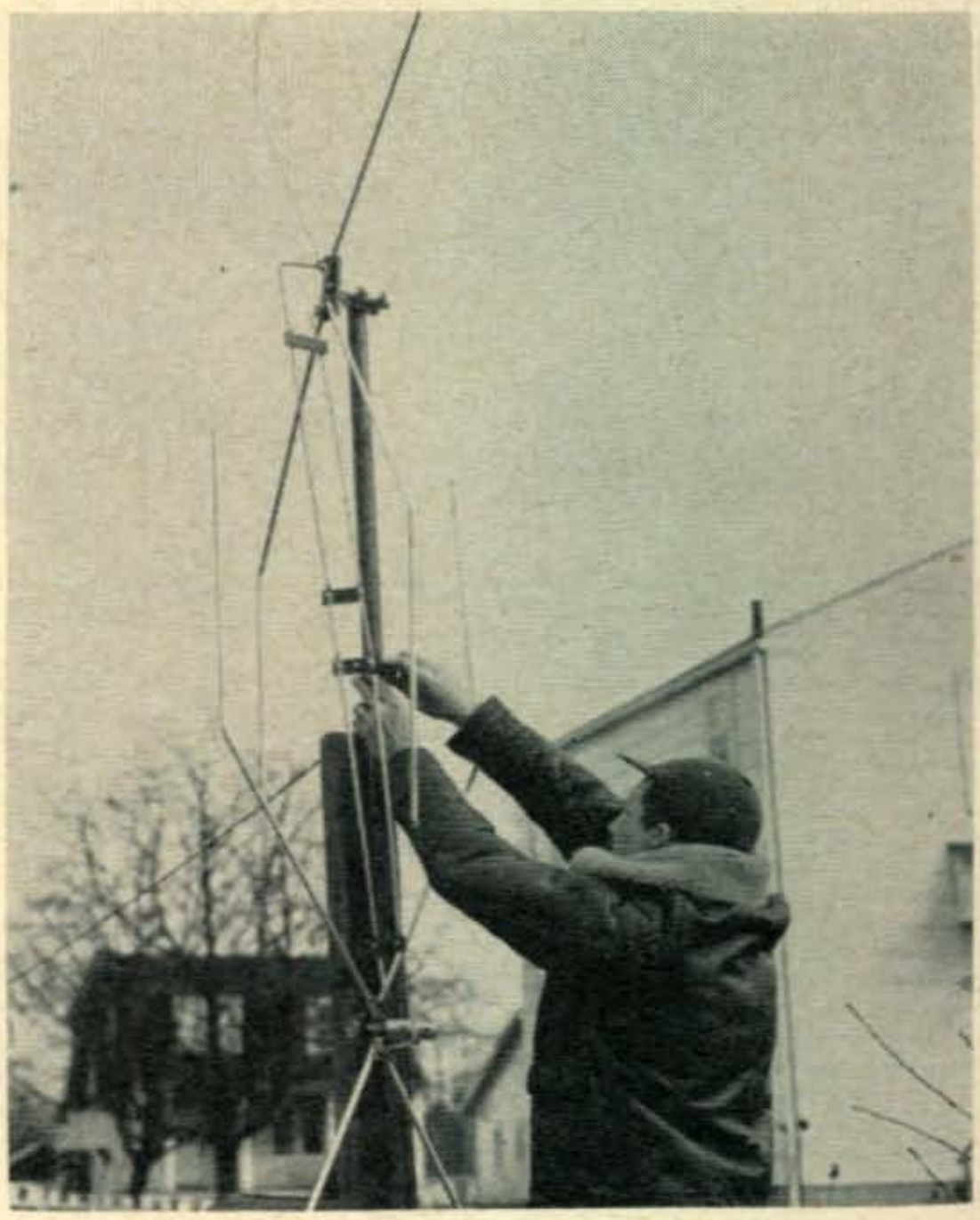
The first 144-Mc. operator to check out a *Quadrapole* was Harold Lang, W2BTA, at Syosset, Long Island, N.Y. He fed it directly with 300-ohm twin-lead and measured a VSWR of 1.2:1 which made the *Quadrapole* look like 250 ohms to the feedline. W2BTA then constructed a balun[1] and fed the radiator with RG-8/U 53-ohm coaxial cable. This resulted in a VSWR of lower than 1.1:1. Several weeks later the same antenna was constructed by Frank Lester, W2AMJ. At his QTH a VSWR of 1.2:1 was measured using the same balun and co-ax line combination. This value of mismatch would result in only about 0.15 db. loss which may be considered negligible.

To obtain higher gain, it was proposed that two quadrapoles might be stacked vertically. Several physical arrangements were tried and eventually resulted in the model shown in the accompanying photograph. The two *Quadrapoles* are mounted one above the other at a compromise spacing of 0.65 wavelength. The planes of the two *Quadrapoles* are oriented at right angles. This configuration has been nicknamed the "Rocket Quad."

Although the gain of the array is increased by this stacking it is not quite up to the theoretical maximum of 3 db. Field strength measurements did show that the *Rocket Quad* was somewhat less directional (horizontal pattern) than the simple *Quadrapole*. Significantly, these tests were made with the antennas mounted on a bamboo pole; later tests with a metal pole showed the patterns slightly affected.

The spacing between the dipoles in the *Rocket Quad* is selected in order to provide a suitable matching section. On all bands it is made of #14 wire with a 2″ spacing. It must be emphasized that the *Rocket Quad* must be fed at the center of the phasing harness and the feedline should be brought out at least one-quarter wave away from the axis of the array. The VSWR of the *Rocket Quad* fed with the co-ax and balun arrangement mentioned above should measure less than 1.5:1. Those constructors desiring a closer match might find it advisable to experiment with the spacing between dipoles and the physical dimensions of the phasing section.

In summary, the *Quadrapole* and the *Rocket Quad* are omni-directional antennas featuring measurable gain over that of the ground plane and coaxial antennas commonly used at these frequencies. The mechanical design is remarkably simple and need not be cut and pruned like the coaxial to secure a good match. A Table listing the dimensions for the three important v.h.f. bands is shown. In some locations it may demonstrate remarkable anti-fading characteristics due to the "width" of each dipole element.



W2SPV puts the finishing touches on his Rocket Quad. A 300-ohm feedline is used. The line was supplied by W2AJG of Saxton Products and is one of their new developments in open wire lines.

1. Smith, "Balun—Theory and Design," CQ, Feb., 1952, p. 24.