1st QUAD

BY WILLIAM E. LAFARRA,* W5ZCC

This 10 and 15 meter quad is simply constructed using easily available materials. It is an excellent performer sturdily built, inexpensive and should do well for the blossoming 10 meter band.

If ANYONE has tuned across ten meters the past few months, they would know the sleeping giant is slowly awakening. Anyone having experienced the peak sunspot activity of this band will find it hard to keep away. Not having a ten meter antenna it was only natural for our thoughts to turn in this direction. I am a beam enthusiast and this was my first thought. However, many hams were on the air with quads and the magazine ads were full of commercial jobs. We felt that it would be a good time to try our hand constructing a quad since we had built several beams. We had little or no knowledge of the quad and could not find much good information available. Armed with what we had, we decided to fabricate something that would fit our needs.

It seems such a waste to design a quad for one band. Once the mechanical structure is complete adding other bands is a small problem; however, one for 20 meters does get rather large. Not being interested in 20 meters we settled for 10 and 15 meters. Our 15 meter beam [1] was doing well, and

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[1]LaFarra, W. E., "Constructing An Inexpensive 15 Meter Beam," *CQ*, July 1960, p. 40.

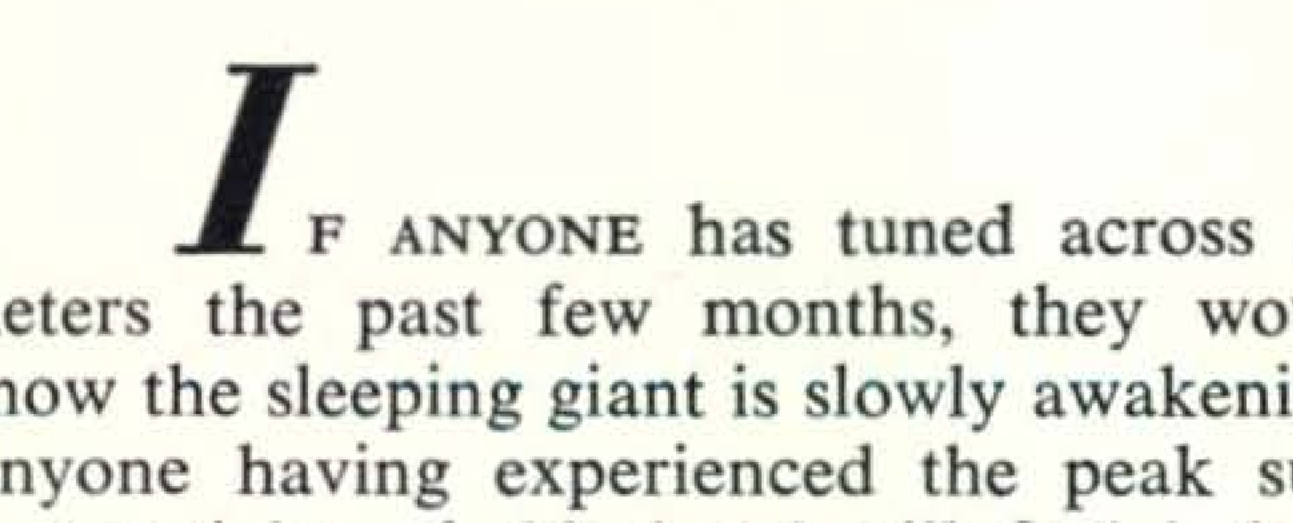


Fig. 1—The 18" × 48" × ⅜" plywood board is cut into the two boom ends 18" × 18" and the remainder of the board provides the eight triangular boards for reinforcing as shown in the photographs. One of the remaining plywood sections is used to reinforce the boom-mast junction as shown in fig. 5.

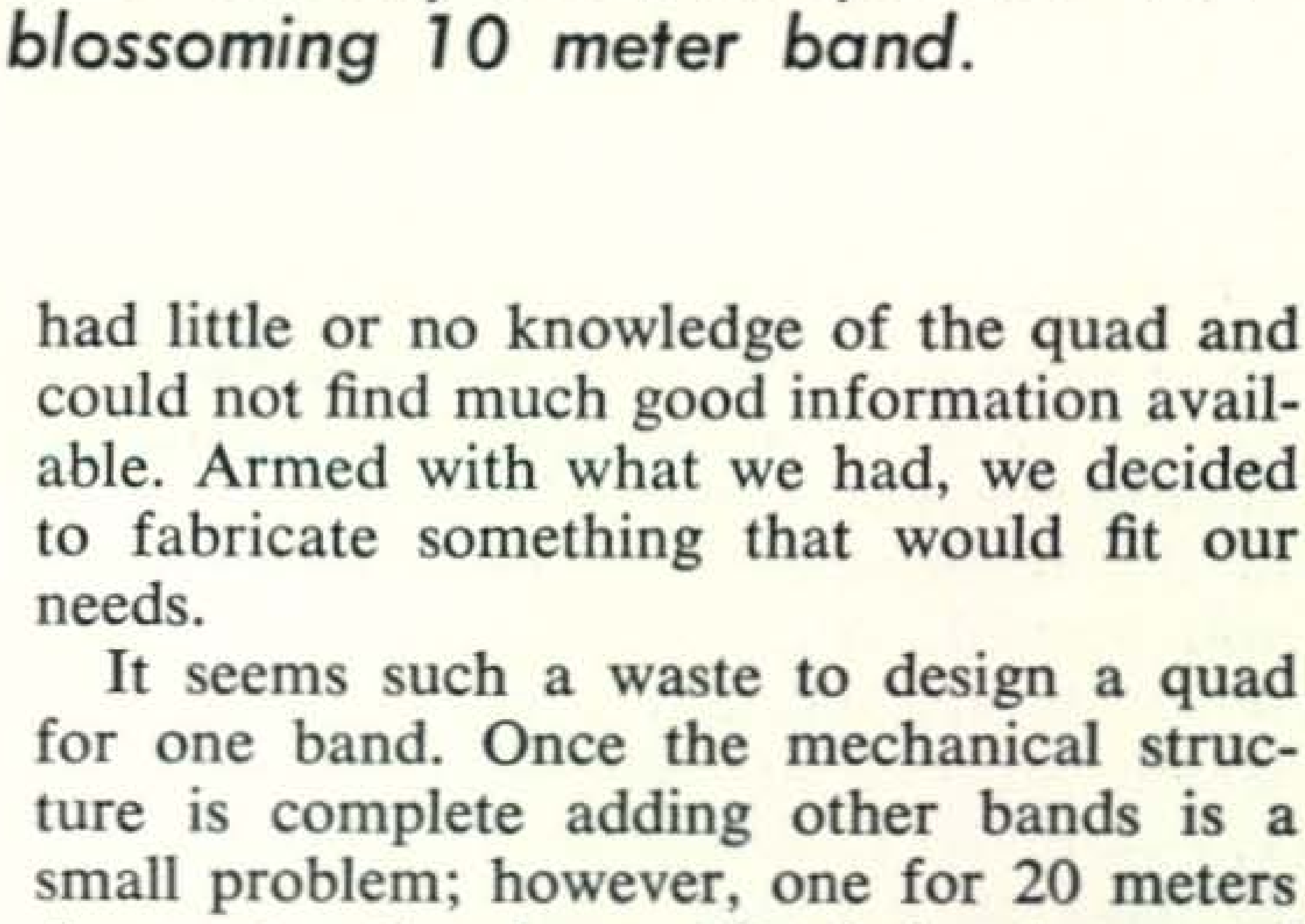


Fig. 2—View of boom end showing how triangular pieces are placed to reinforce the endplate.

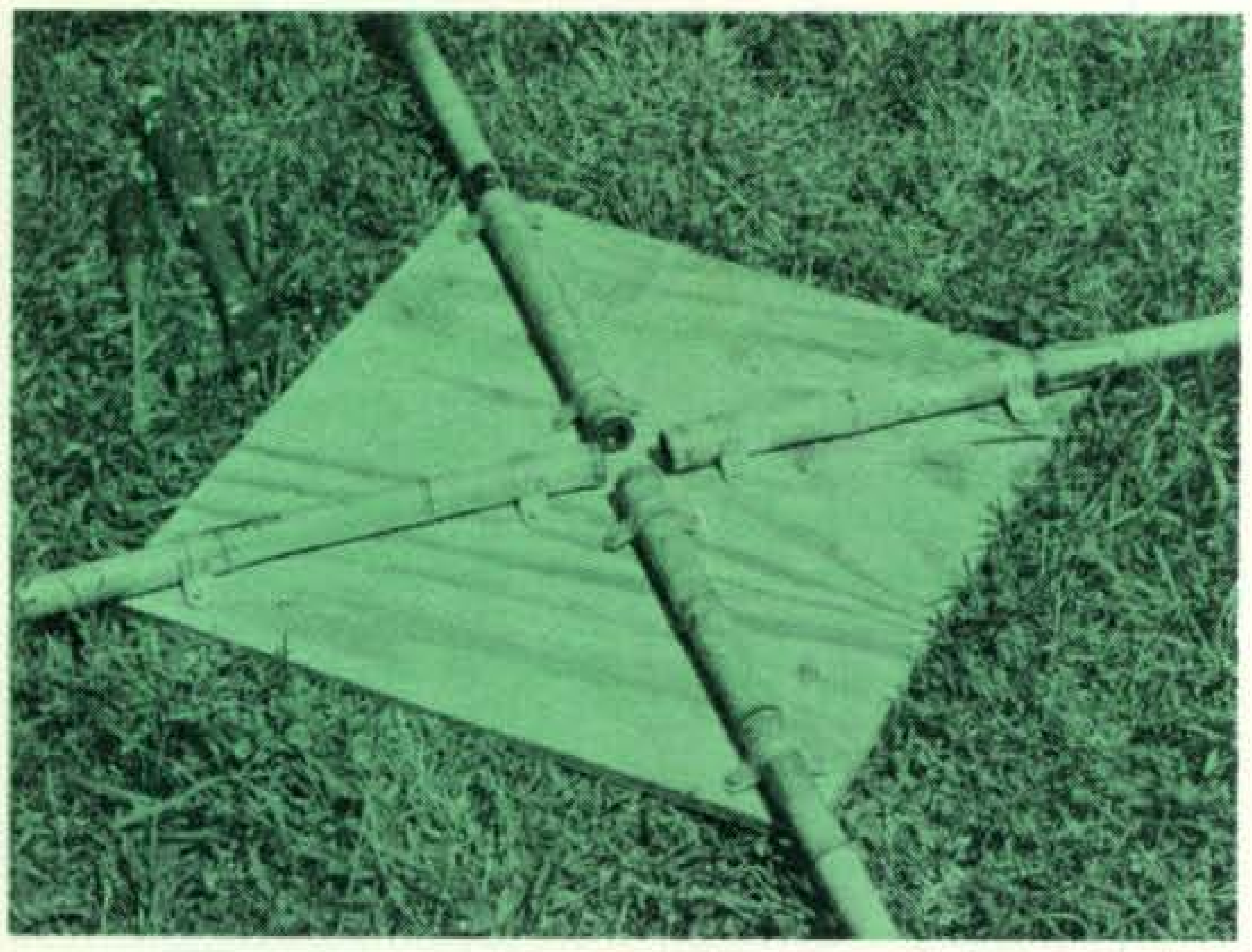


Fig. 3—The bamboo cane poles are mounted on the 18" × 18" plywood end plates using ¾" conduit clamps.

this would give us an opportunity to work the beam and quad against each other under practically the same conditions. Switching back and forth between the two would allow us to form our own opinion as many fallacies have been circulated for both.

For material I decided to try all wood construction even though we felt that weather and elements would be against it. Surely it would last 6 years which should carry us through this sunspot cycle. We went to the local sporting goods store and examined the 12-15 foot fishing poles for 50¢ or $1.00, depending on how good a pole you wanted. What we needed was a pole relatively straight and strong for a 9 foot length. Most of the poles we purchased were 13, 14 or 15 feet long, and we bought nine to have an extra in case of an accident. Ducking questions to what I had in mind, I managed to purchase all nine for $4.00 cash. Next stop was the local lumber yard

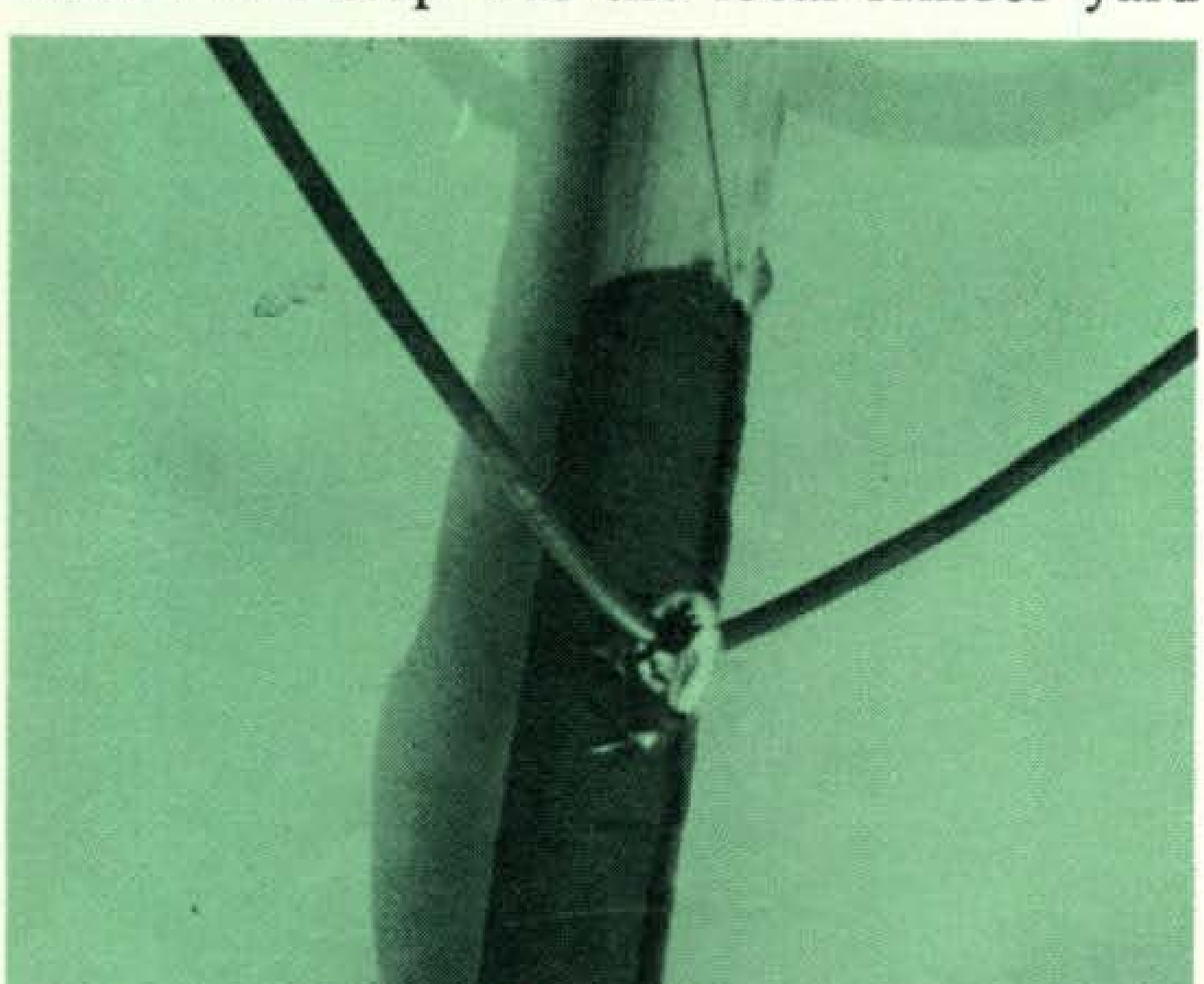


Fig. 4—Hook eyes are screwed into the bamboo pole and taped to help keep out moisture.

for two lengths of 2" × 2" and two lengths of 1" × 2", all 8 feet long; also a piece of ⅜" plywood 4' × 18", a box of 1" #9 wood screws, 16 screen door hook eyes, and ½ gallon of vinyl plastic paint.

Construction

Once all the wood material was cut to specifications (see fig. 1) it was placed in a location that would not be disturbed and at every opportunity a coat of plastic paint was applied. Outdoor latex house paint ought to do well also. After several coats had been applied, the boom and upright support was assembled. The small triangle sections were fastened to the boom ends as shown in fig. 2. The 18" square plywood pieces were laid out flat, and the cane poles, cut to 9' lengths, were fastened using ¾ inch conduit clamps (fig. 3).

Mark the positions for each of the hook-eyes on the bamboo poles and screw them in. For 15 meters they will be 8' from the center of the plywood board and 6' 2" for 10 meters. After screwing in the eyes wrap the pole with tape (fig. 4) to keep out moisture.

Element Length

The length of each element is determined by the formula:

$$L = \frac{250}{f_{mc}}$$

For 21.3 mc the length will be 46' 11" or 11' 8¾" on each side.

For 28.6 mc the element length will be 34' 11" or 8' 8¾" per side.

Assembly

The end plates with the cane poles are secured to the boom ends. Standing the boom on one end and using a step ladder will

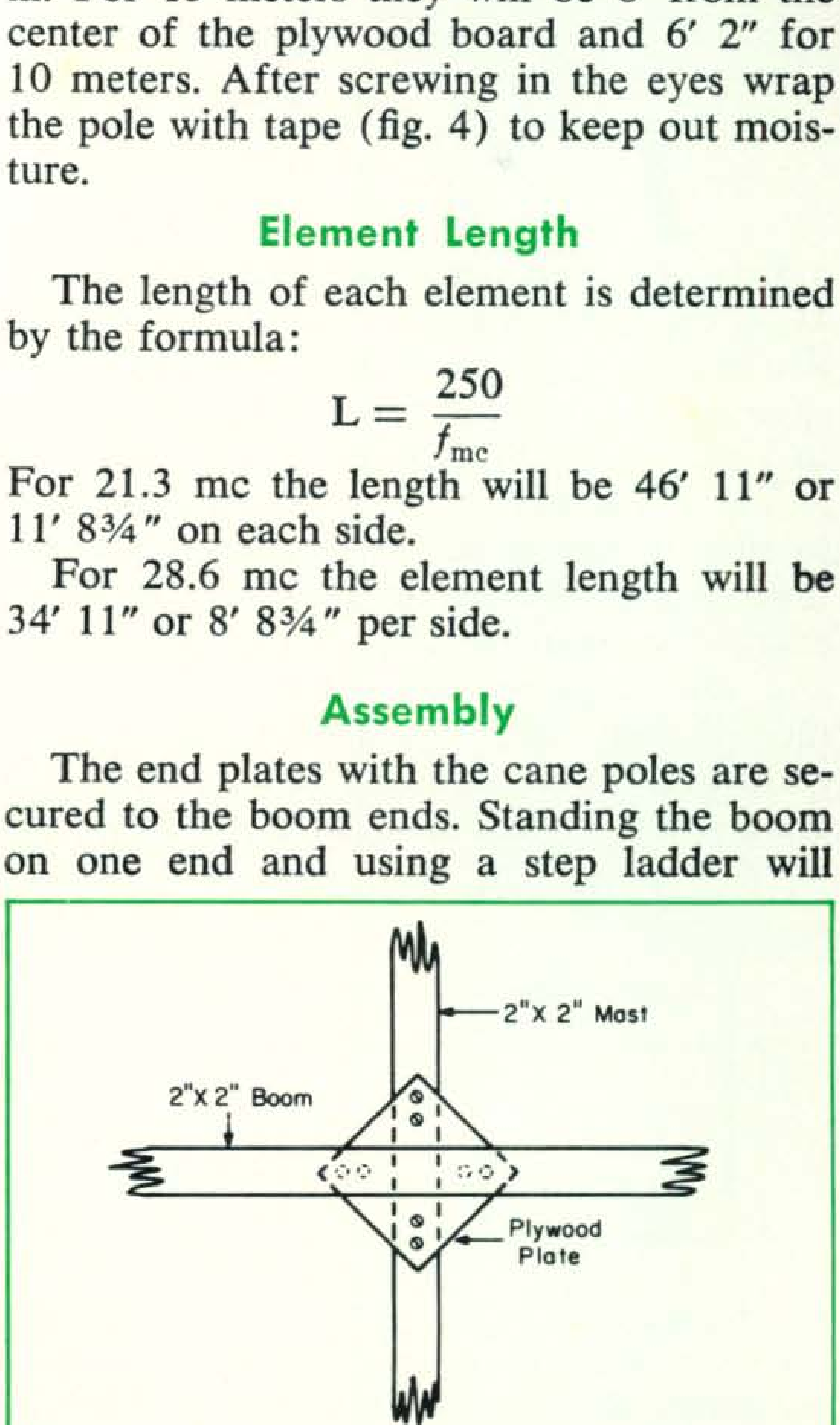


Fig. 5—A piece of ⅜" plywood is placed, as shown above, between the boom and the mast to reinforce the joint.

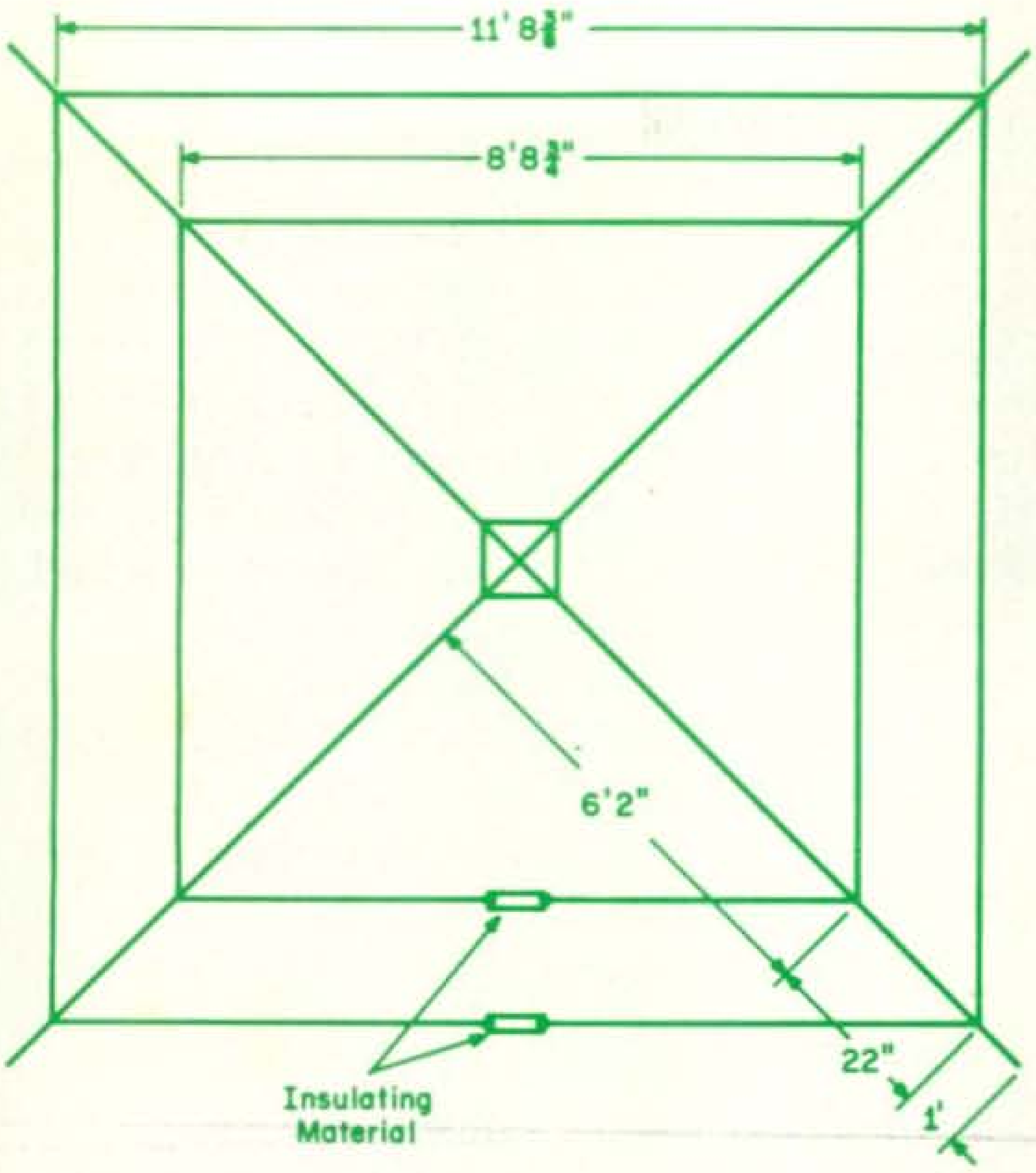


Fig. 6—End view and dimensions of the driven elements or reector. The ends are terminated on the 1" × 2" lengths secured to the 2" × 2" upright. The driven element is fed through baluns (shown in fig. 8) and the reflectors are tuned with stub as shown in fig. 7.

simplify this little chore. With a helping hand from the XYL (W5BHA) the same procedure was repeated for the other side.

The boom was mounted to the upright support, the second 8' length of 2 × 2, using a plywood plate for reinforcement as shown in fig. 5.

Secure the two 8' lengths of 1" × 2" as shown in the accompanying photographs, one at the proper level to tie up the 10 meter ends and the other for the 15 meter ends. String the driven elements as shown in fig. 6. Leave several feet on each end in the event it is necessary to adjust the length when tuning the elements later.

Stubs

The tuning stubs for each of the reflectors

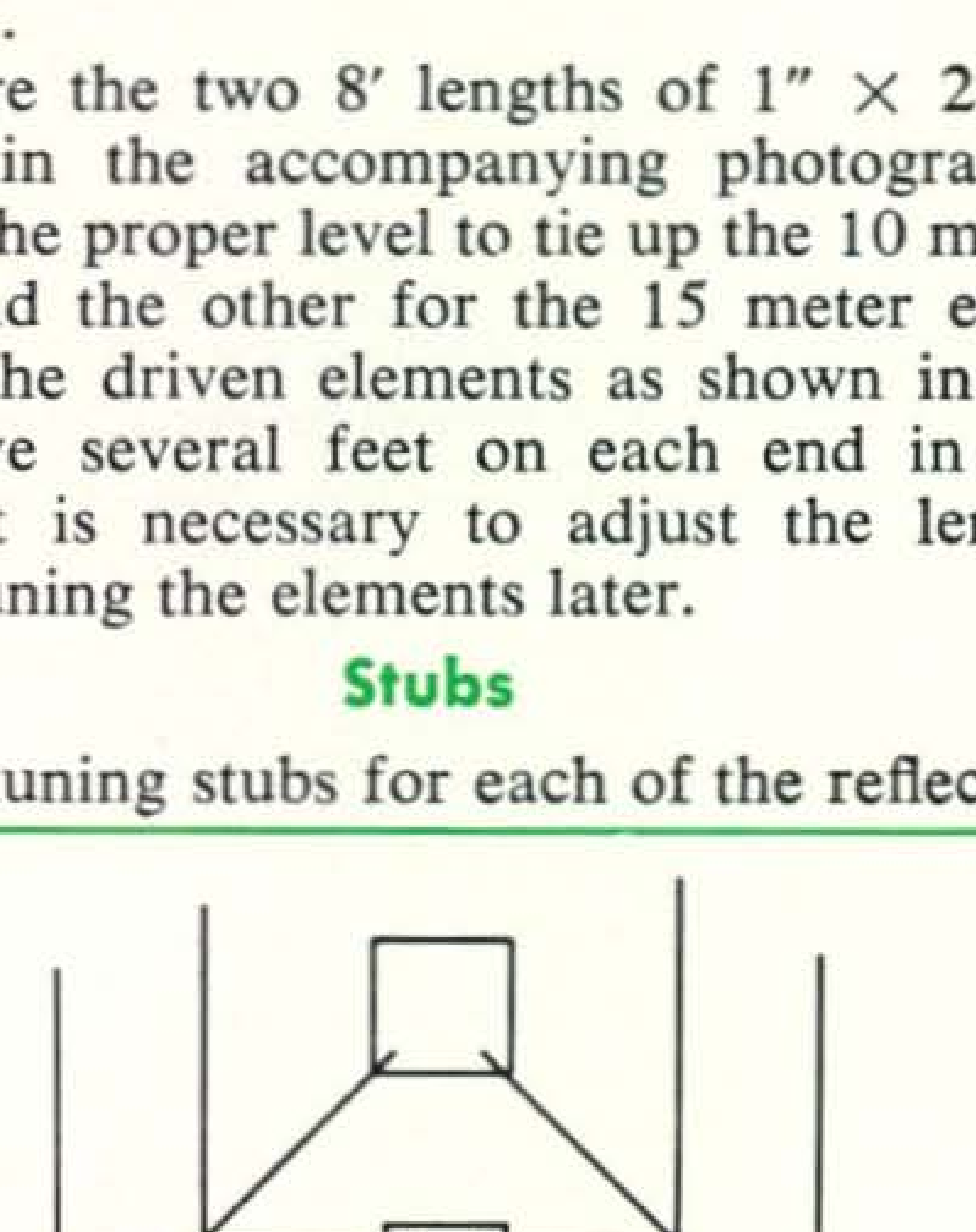


Fig. 7—Stub construction for the reflector.

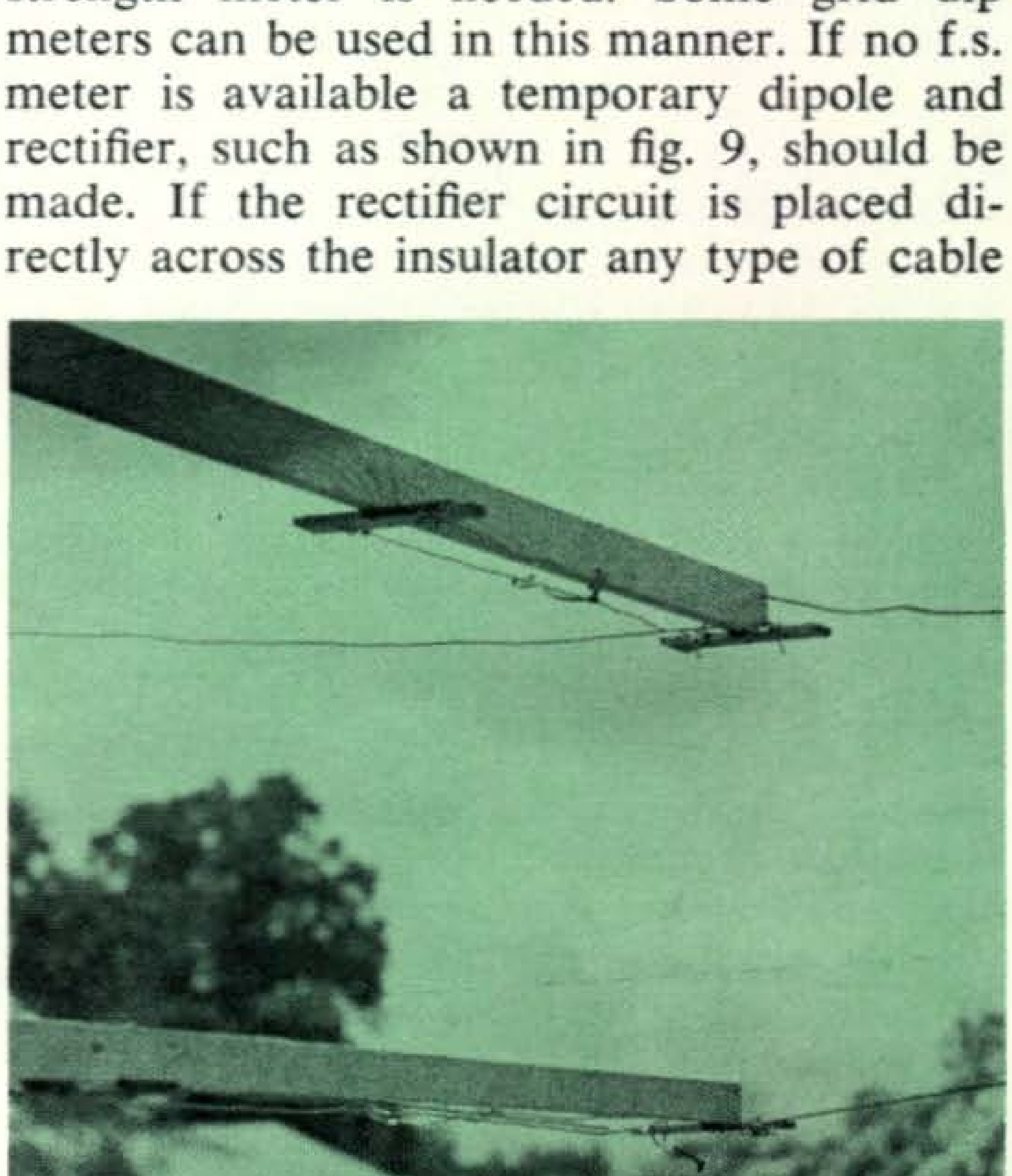
was constructed by mounting 3" blocks of insulating material at the end of both the 1" × 2" lengths. On the 15 meter reflector 1" × 2", the insulators are spaced 3' and for the 10 meter 1" × 2", the insulators can be spaced 2' apart. The reflector elements are extended, using #14 wire, as shown in fig. 7 and the photographs. Using a length of wire, short out the stub about 2' back on the 15 meters stub and 1' back on the 10 meter stub.

Tuning

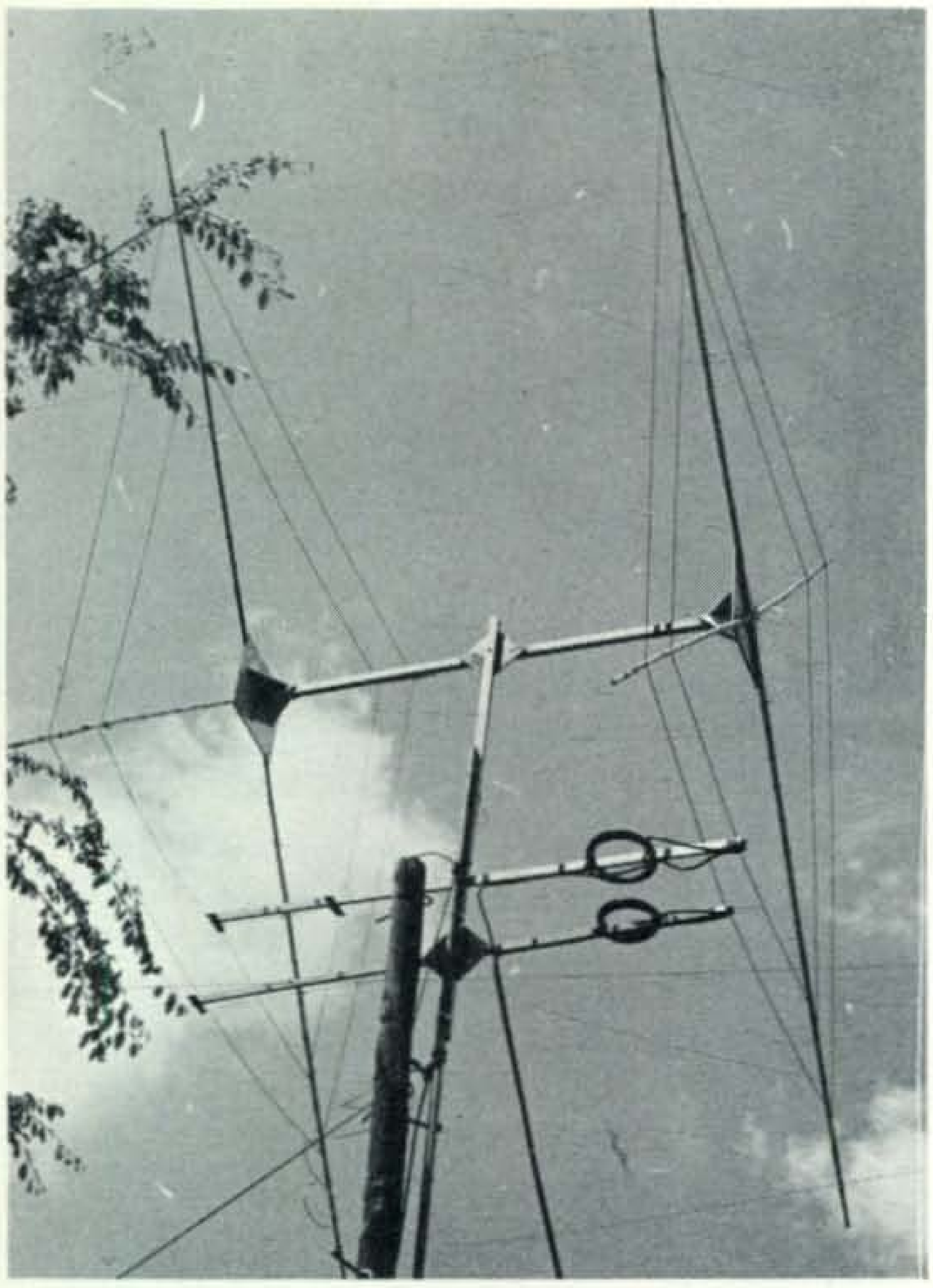
The unit is now ready to be mounted in a location where the bottom wires and stubs can be reached from a step ladder for further manipulation and tuning.

When tuning the antenna the correct starting point is to grid dip the driven elements to the desired freqeuncy. This is done by coupling the g.d.o. to a short placed across the driven element and dipping the meter. The g.d.o. frequency should be checked against the station receiver to insure accuracy. If the frequency is higher than desired, lengthen the element. If the frequency is lower shorten the wire but only a few inches at a time. By relocating the screw eyes the slack can be taken up without putting the antenna too far out of square.

To tune the reflector elements a field strength meter is needed. Some grid dip meters can be used in this manner. If no f.s. meter is available a temporary dipole and rectifier, such as shown in fig. 9, should be made. If the rectifier circuit is placed directly across the insulator any type of cable



Close-up view of the tuning stubs on the rear of the 1" × 2" supports.



A worm's eye view of the 10-15 meter quad shows the general construction of the mast, boom and end plates. Also seen are the 1″ × 2″ supports with the baluns neatly coiled at the end and the two coax feedlines. The insulators can be seen on the reflector ends of the 1″ × 2″ booms. Close-up view of the baluns mounted on the 1″ × 2″ supports.

can be used between the meter and rectifier circuit. Zip cord or twisted pair will work as well as 300 ohm ribbon line or coax.

Place the dipole some distance behind the quad and extend the cable so that the meter is close to the base of the antenna. By doing this you will be able to adjust the stub length and see the effect upon the signal radiated from the back of the antenna.

Feed the antenna with a low powered signal at the desired frequency and shift the short across the stub. When the correct point is reached the meter will register a sharp dip. If a dip cannot be found it is because the reflector element is too long or too short and it will have to be adjusted until a dip can be found along the length of the stub.

Both the 10 and 15 meter reflectors are adjusted in this manner, for best front to back ratio. The short would appear in the same place if the reflectors were adjusted for maximum forward gain (with the tuning dipole in front of the antenna) but the adjustment is so broad that the peak is difficult to find.

Baluns

Once the antenna is tuned the impedances at the feed points can be measured with an Antennascope [2] if desired. With an 8′ boom we have 0.17 wavelength spacing on 15 meters and 0.23 wavelength spacing on 10 meters. Most quads have closer spacing and lower impedances. With 0.1 wavelength spacing the input impedance is close to 70 ohms and 0.25 wavelengths will produce a somewhat higher impedance with the gain remaining the same for either spacing.

With narrow spacing the driven element could be fed directly with 52 or 72 ohm coax and achieve a good or reasonable impedance match. The quad, however, is a balanced antenna and should not be fed directly with coax, which is unbalanced, but rather through a balun. This helps to maintain a correct radiation pattern.

The use of 8′ spacing between the elements raised the impedance of the driven elements so that for 10 meters we measured 160 ohms and for 15 meters, 140 ohms. A balun of the type shown in fig. 8 offers a 4:1 impedance transformation as well as balanced to unbalanced matching and so for 10 meters the coax feed sees 40 ohms and on 15 meters 35 ohms. With 52 ohm coax this provides an s.w.r. of 1.3:1 and 1.48:1, respectively. As the quad is a broad band type of antenna the s.w.f. holds through the band.

The balun lengths are determined from the formula:

[2]Scherer, W. M., "Antennascope-54," *CQ*, Part I June 1954, p. 23, Part II, July p. 17.
Geisser, D. T., "The Instrument Deluxe," *CQ*, October 1962, p. 47.

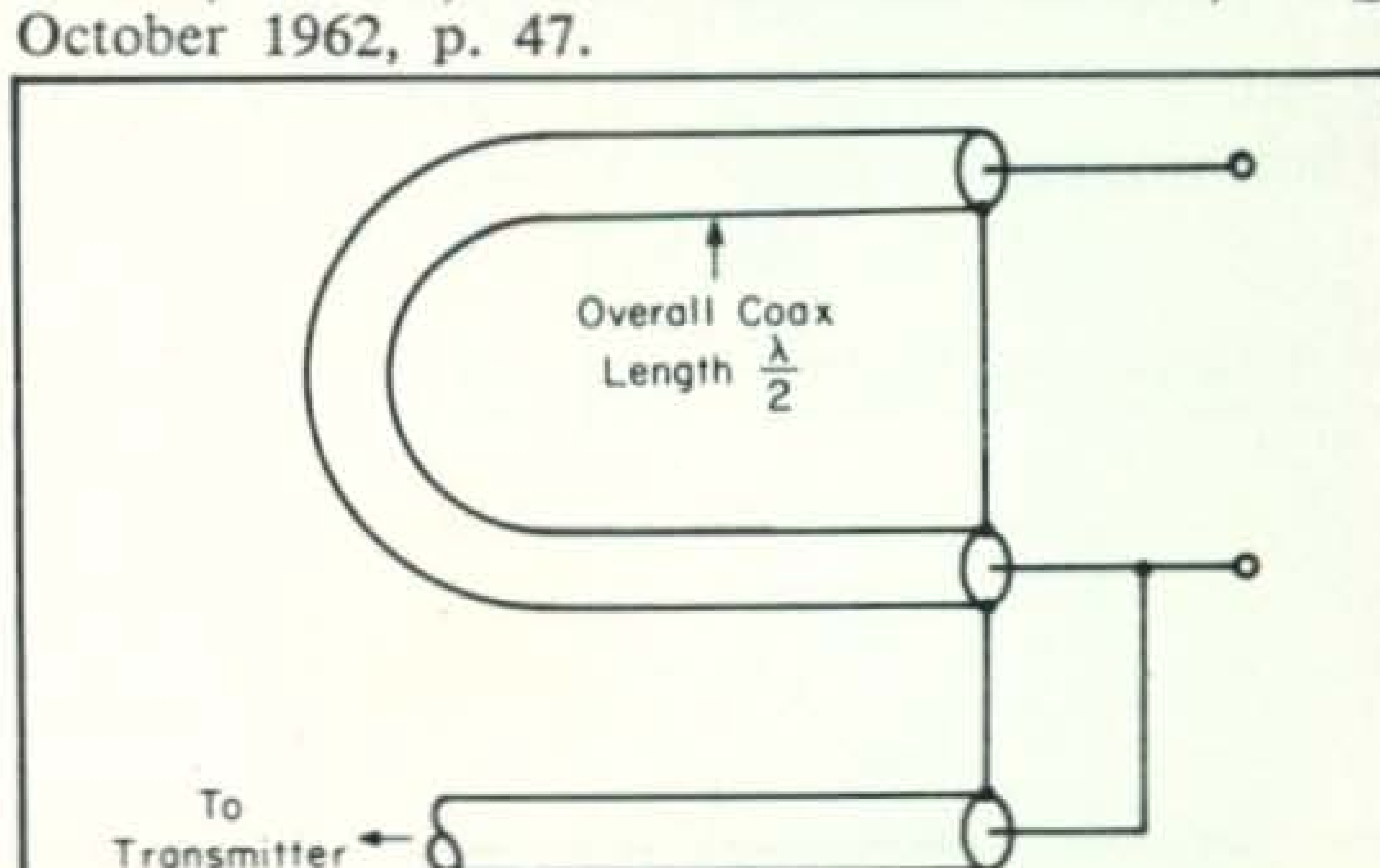


Fig. 8—Coax balun used to feed the symmetrical quad driven elements provides a 4:1 impedance transformation as well as a balanced to unbalanced match. The baluns should be ½ wavelength long for each operating frequency.

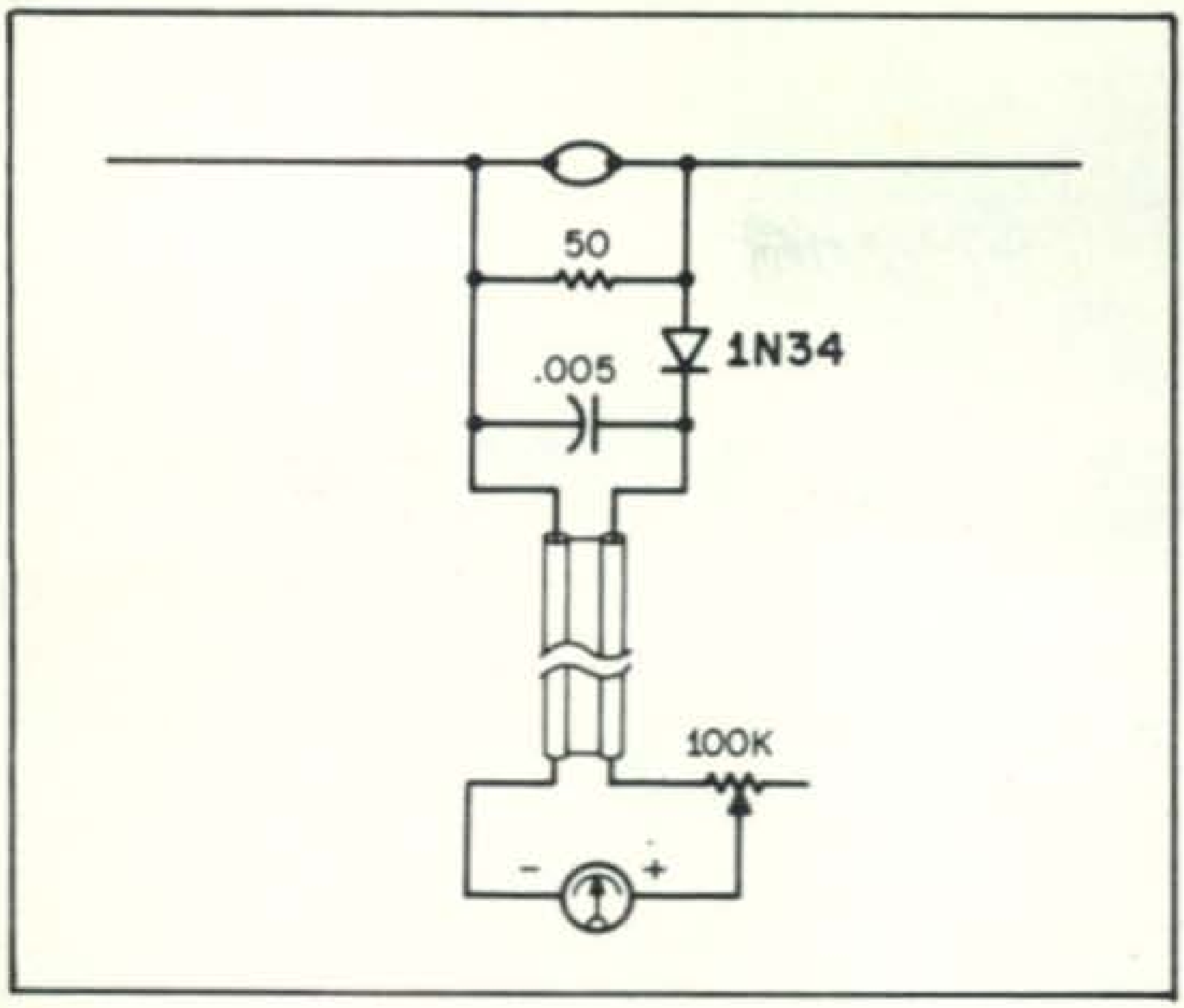


Fig. 9—Set up of a temporary dipole for tuning the reflectors. If the rectifiers and components are placed at the antenna insulator the connecting cable can be zip cord or any other type of wire. The meter should have a range of 0-50 or 0-100 microamperes.

$$L = \frac{340.8}{F_{mc}}$$

For the frequencies used the 15 meter length will be 16′ and the ten meter length 12′. The sections should be coiled and mounted on their respective 1″ × 2″ supports. When constructing the baluns be sure that the outer braids are securely connected to each other and that the open ends of the coaxial cable are taped to make them impervious to water.

Results

After tuning the quad was hoisted to its permanent mounting. As for the results we can only say it was fantastic. Our first contact was VK3BW when the 10 meter band was virtually dead. CX8DV called in and gave us 10 over 9 in Uruguay.

On 15 meters our first contact was with F5RV, Rudy, in Nice, France, who gave us 5-7 to 8. We then contacted G3PIC, Jim, near South Hampton who also gave us an S 8 and a good comparison with the 3 element beam located at practically the same height. Jim reported 1½ S units difference in signal strength and so it was, down the log; the quad ran about one S unit better. All reports were gotten running the S line barefooted.

While testing my quad the weather decided to try it out too. It withstood two spring storms of tornadic winds which uprooted 55-year-old oak trees and knocked down power lines in this vicinity. This gave us a chance to vouch for its strength and stability. ■

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