Besides being a perch for the birds down here, this antenna will help you hear the birds out there.

How To Build A 2 Meter Oscar 10 Antenna

BY RUDOLPH E. SIX*, KA8OBL

Amateurs working Oscar 10 know the receive-end is the weak part of the system. A good set of 2 meter antennas goes a long way towards enjoying the bird and receiving that rare but often weak DX station.

I decided to build my own antenna using Yagi dimensions optimized by the National Bureau of Standards. These antennas were originally described in NBS Technical Note 688 (available from NBS, Technical Information and Publication Division, Washington, DC 20234, order no. 262885 for $8.50). Several articles have been written using the NBS data, notably "Go for the Gain, NBS Style," W1LJ, *QST*, August 1982, and "How to Design Yagi Antennas," W1JR, *Ham Radio*, August 1977, both excellent articles. I am making it simpler yet by including the dimensions for a 146 MHz, 17-element, 3.2-wavelength Oscar 10 antenna. A 3.2 wavelength antenna is approximately 22 feet long, and since two are required for circular polarization, not much time is lost before reality dawns on the average UHFer that this is big. And—hold it—they have to be turned in azimuth and elevation. So we cast an eye up onto our average TV tower and we know we don't stand a prayer.

Well, that was the situation with which I was faced. I have a crank-up, but it is not designed for heavy loads. The only solution was to go lightweight. First I decided to use fibreglass for the boom. Obviously, because it is light, but it is also nonconductive: it does not present a virtual ground to the antenna next to it. Two antennas can be placed closer to each other without mutual interference.

Each antenna was constructed from two fibreglass poles, one 14 feet long with an O.D. of 1.57 inches and an I.D. of 1.4 inches and an 8 foot long pole with an O.D. of 1.25 inches and an I.D. of 1.1 inches. These fibreglass poles were purchased from Sky-Pole Manufacturing Inc. (1922 Placentio Ave., Costa Mesa, CA 92627) and are listed as Item 61, 8 feet long, and vaulting pole 14 feet long. All the elements except the driven element are 3/16 inch rigid aluminum tubing, and the driven element is 5/16 inch rigid copper tubing. Note in fig. 2 the T-Match used with the coaxial ½-wavelength phasing line. The coax is Teflon RG-188. The center conductors are soldered to the matching stubs, and the shields are soldered to a small copper plate held by the ceramic spacers to the bakelite mount. Teflon is ideal because it does not deform or melt with solder temperatures. The mounting plate is attached to the boom with epoxy glue.

The coax feed is terminated with a TNC

Fig. 1– Complete antenna. Distance between the booms is 6 feet. Note coax falling away from reflector.

Fig. 2– T-match. Coax is soldered to ring lug which holds the center rod.

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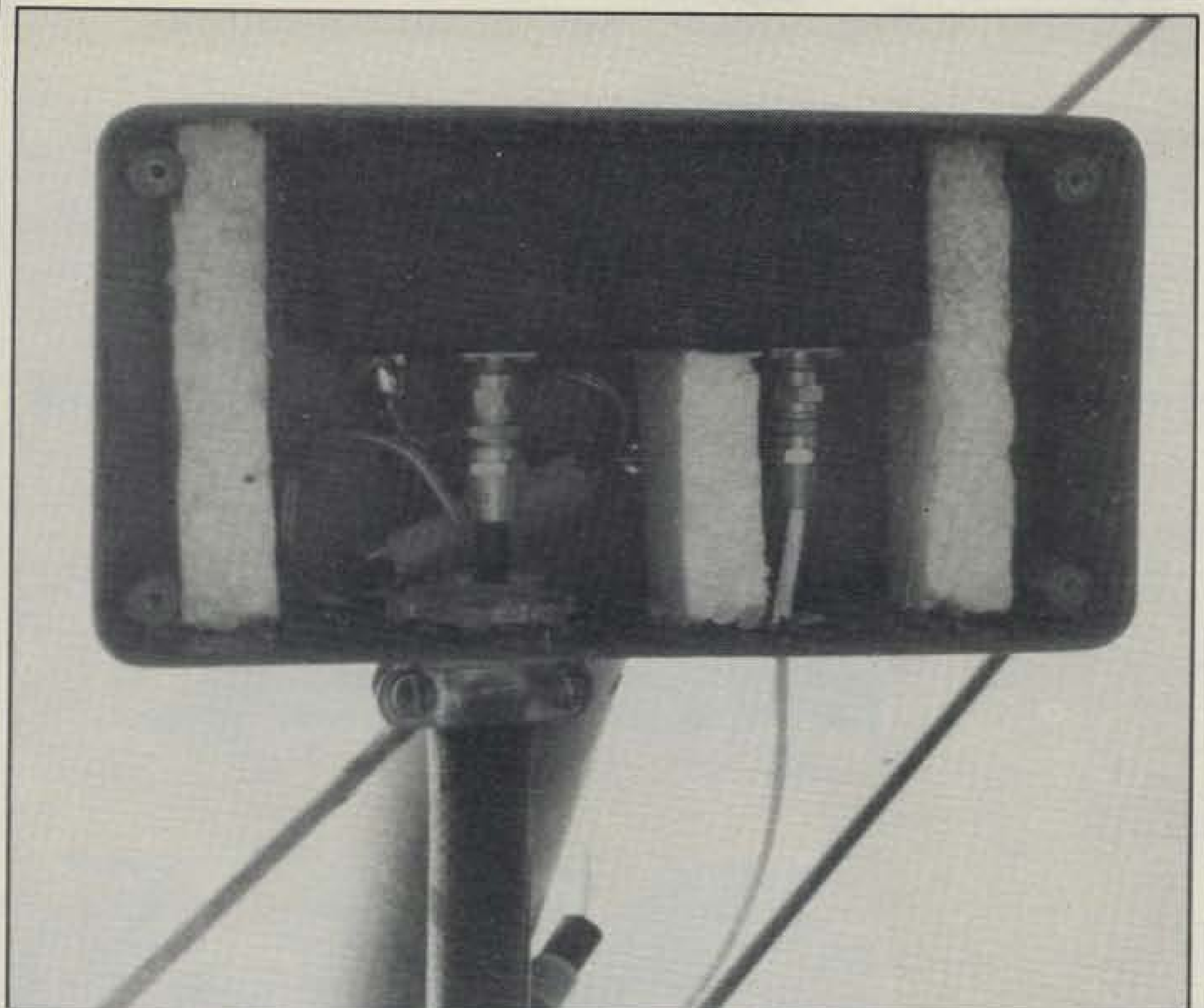
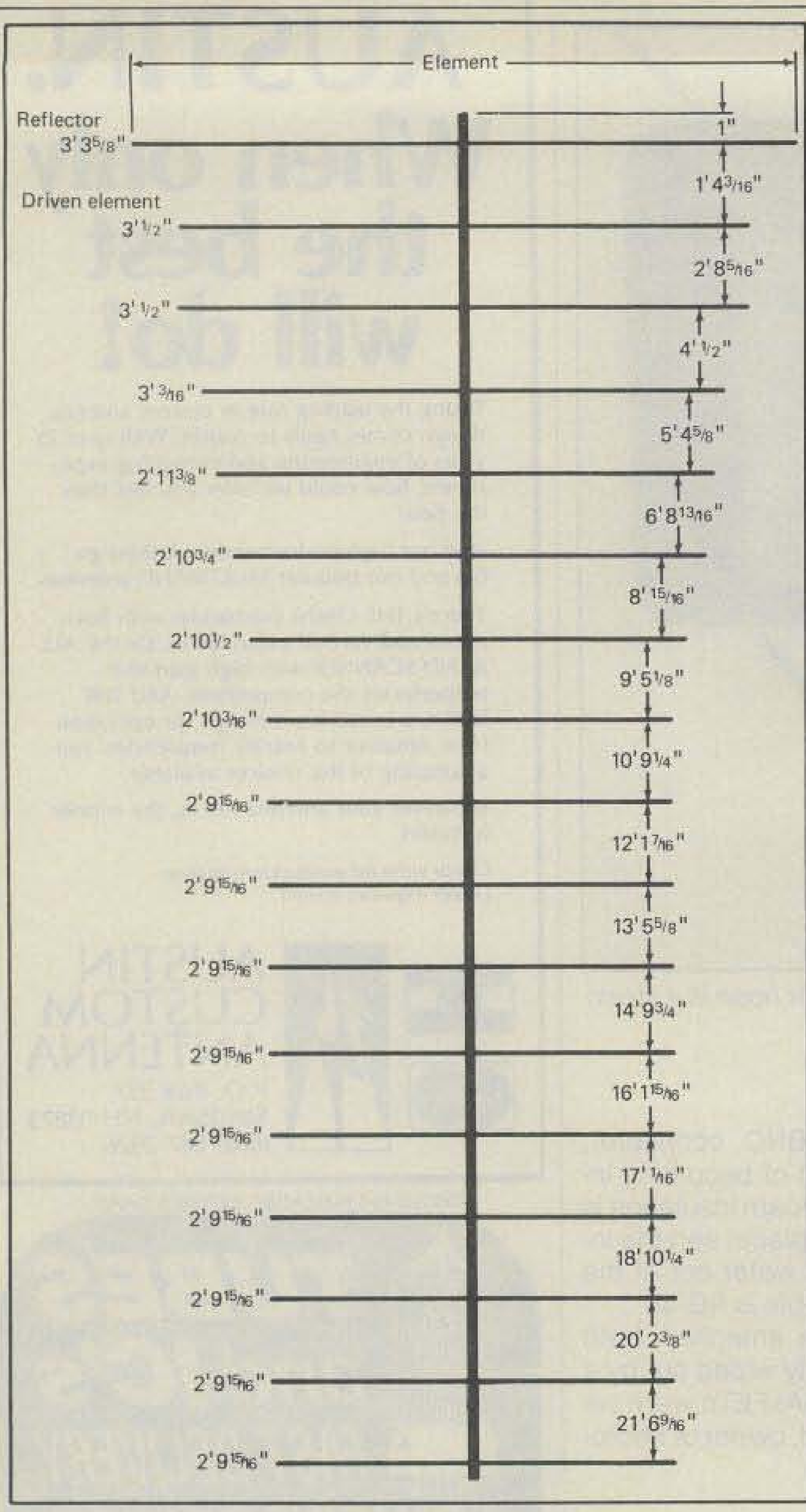


Fig. 3– Amplifier with styrofoam wedges. Electrical clamp with rubber hose is a strain relief for the RG-58 coax.

connector and runs to a small box (Radio Shack 270-223), containing the GAsFET amplifier, mounted behind the reflector at the end of the boom. Fig. 3 shows the amplifier purchased from Microwave Components (11216 Cape Cod, Taylor, MI 48180). (Specify TNC connectors when purchasing.) TNC fittings were selected because of small size and low UHF losses. They make a solid and sealed connection unlike a BNC connector, which has a nasty habit of becoming intermittent. Lightweight foam insulation is used to hold the unit in place, and the inverted mounting keeps water out of the amplifier. The output cable is RG-58.

When I installed the antennas, both amplifiers were promptly wiped out by a lightning storm. Both GAsFETs were replaced by Norman Alred, owner of Micro-

Fig. 4– A simple wooden cradle steadies the antenna during high winds—and also out of the power-line feed.



5 *Fig. 5– The dimensions and spacing of elements.*

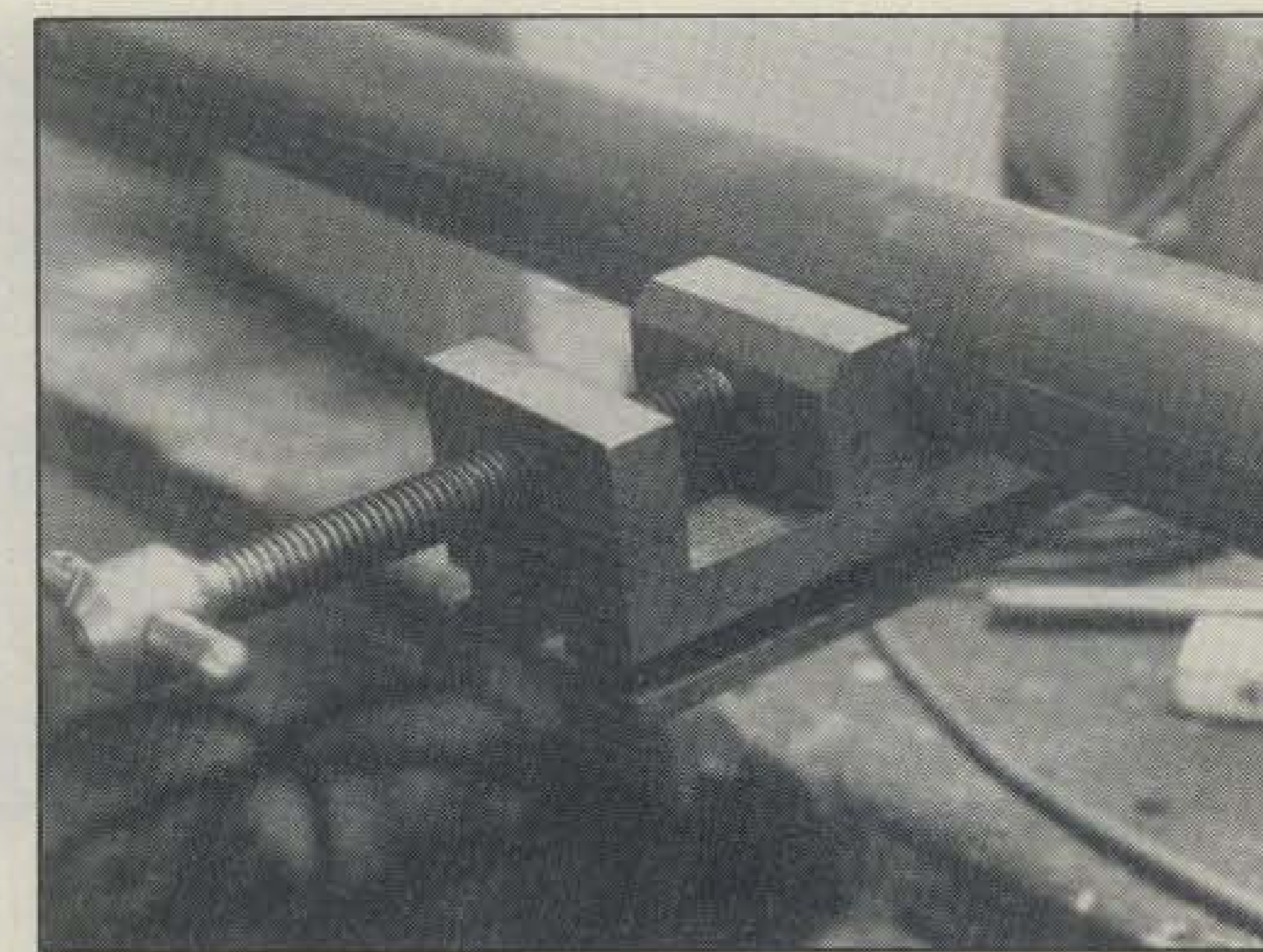


Fig. 6– How to make an accurate mark on both sides of the boom.

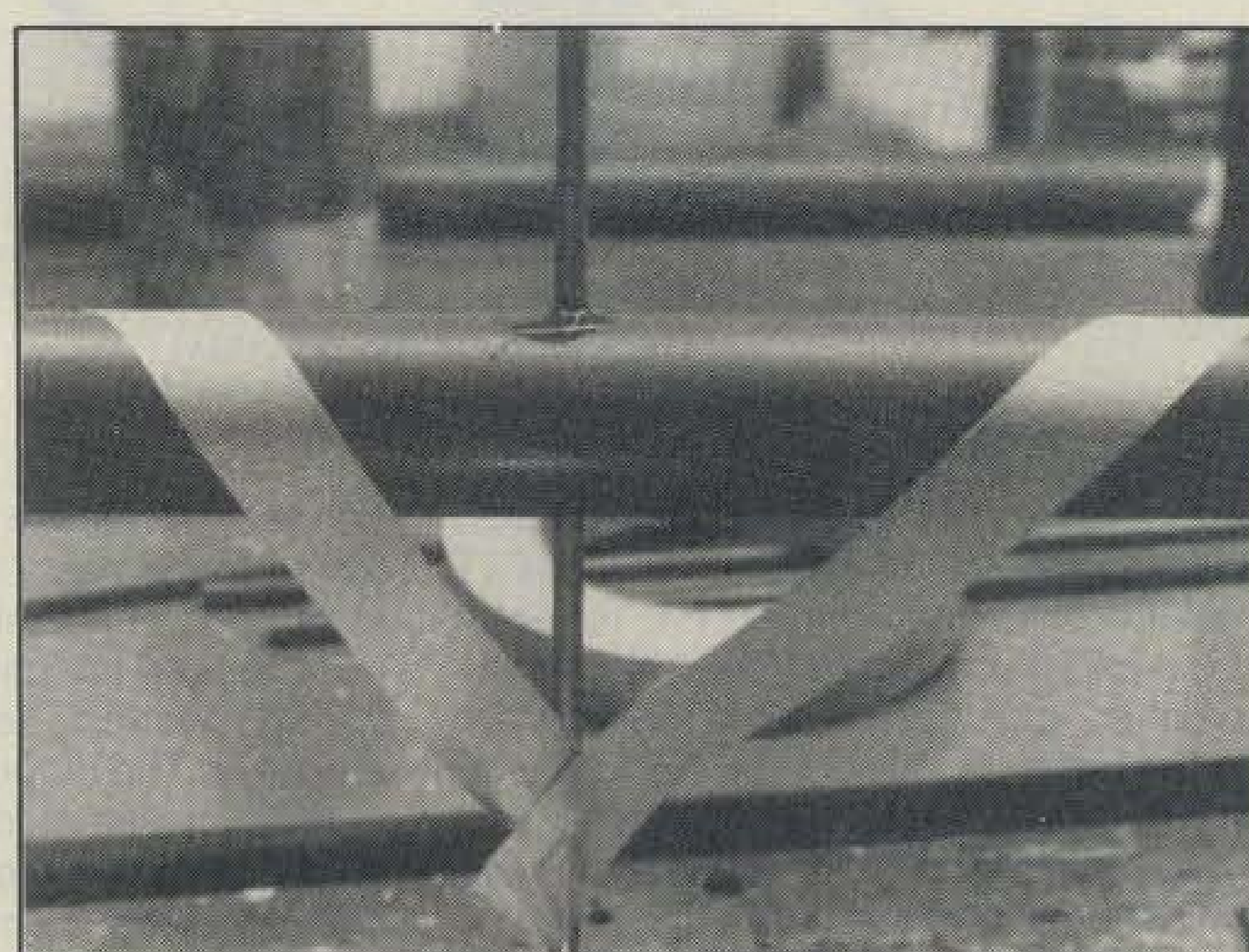


Fig. 7– Installing the elements with epoxy first.

wave Components (see *CQ* October 1985 VHF column). To prevent further trouble a small relay (Radio Shack 275-241) was installed in the amplifier. The n.c. contact keeps a short at the input when power is removed. Lightning has not been a problem since. Norman will build the amplifier with the relay installed. He can also supply the TNC connectors and teflon coax.

As fig. 1 shows, there is little droop of the boom. The cross boom is plastic water pipe with hickory broomsticks as internal stiffeners. The guy wires in the form of an X observed above the cross boom are industrial plastic packing strap, ½ inch wide, and they keep the booms parallel. The rotors were homemade from 1 RPM surplus motors and covered by a plastic garbage can. The can was convenient, although a bit large.

It is usually true that lightweight materials are also more flexible, and this is the case with fibreglass. It does flex, and when horizontal it can store up quite a bit

Fig. 8– A final squirt of foam insulation. It also made the boom 100% draft free.

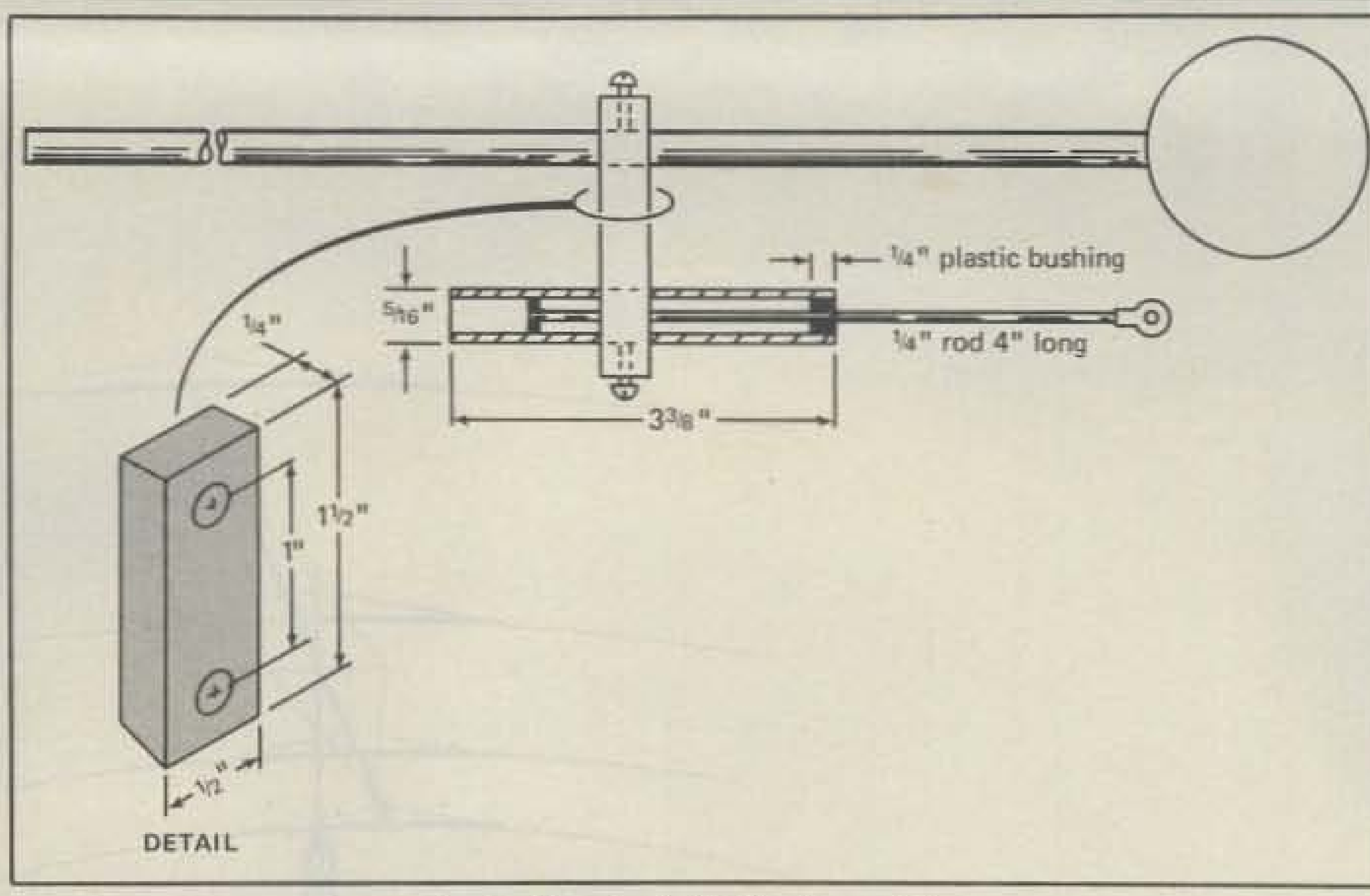


Fig. 9– How to build the T-match.

of inertia in its 22 foot length. I found that the antenna could stand the worst weather if stored vertically with the front of the antenna down, since it is longer. I made a cradle (fig. 4) from plywood for very bad weather and to keep the antenna from the power lines. I tied the antenna to the cradle with rope when we had tornado weather with 60 mph winds this summer. An advantage with satellite operation is that the height is not important. Just a clear view, usually 20 feet, is adequate.

Construction of the Antenna

Fig. 5 shows the dimensions and element spacing of the 17-element NBS Yagi with dimensions modified for 146 MHz operation. The driven-element length has been adjusted for 5/16 diameter tubing and shortened for the T-match. In my article "Homebrewing Antennas With Copper and Brass," *CQ*, April 1985, I describe a method of scribing a straight line on round pipe. This method was again used, but a problem arose with the fibreglass pipe. It does not have a uniform diameter. This was solved by making the hole diameter in the slide block equal to the largest diameter encountered on the fibreglass pole. It was then slid along the boom by keeping it cocked against the sides of the boom. The mark line came out straight. I think it would be very hard to make a straight line on a tapered boom, but if possible, it sure would save on weight.

As shown in fig. 6, a small vise was used to scribe the vertical line on both sides of the boom. This cross mark should be carefully punch-marked, and a small drill should be used initially to make the first hole. Drills have a tendency to wander, and offset drilling shows up rather glaringly when the elements are slid in. Fig. 7 shows an element being glued in place with epoxy cement. The marking tape holds it in place. The epoxy does nothing more than hold the element in place and seal the hole. The real holder is the foam insulation shot through a small hole into the boom. This is the stuff sold in hardware stores for sealing out drafts in homes. A small squirt is adequate, and I did both antennas with one can. The stuff hangs on for dear life, is very light, and is an excellent insulator. It continues to expand for about a half hour, and I would suggest trying it out on a piece of scrap to get the feel of how much is needed to fix the element in place. A shot of foam at both ends also helped seal the boom from moisture.

The dimensions of the T-match are listed in fig. 9. The material is copper or brass including the screws. I adjusted the SWR to 1:1 by making the same changes on both sides of the T-match. Earlier I mentioned that two size poles were used, the lighter one in front. Fig. 10 shows the method and dimensions used for mating the two pipes. Electrical tape was wound over the junction to keep out moisture, and a hose clamp holds them firmly together. I am well satisfied with the result and have been able to copy some rather weak stations. No mechanical problems have developed except for some birds who were determined to make a condo out of the rotor. That garbage can is rather roomy.

Fig. 10– The method of joining two fibreglass pipes.