A 17 Element Long Tom 2 Meter Beam

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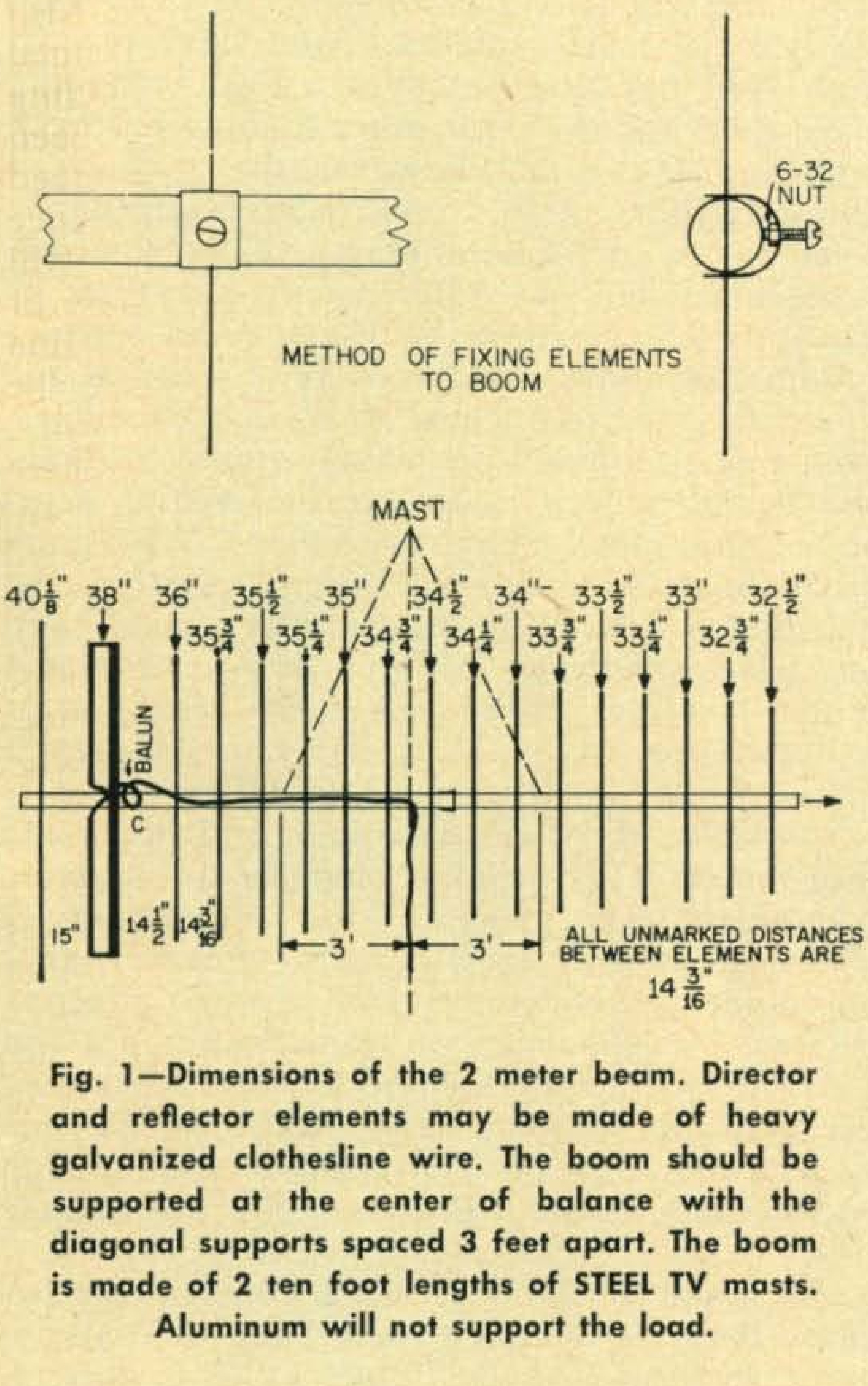

Fig. 1—Dimensions of the 2 meter beam. Director and reflector elements may be made of heavy galvanized clothesline wire. The boom should be supported at the center of balance with the diagonal supports spaced 3 feet apart. The boom is made of 2 ten foot lengths of STEEL TV masts. Aluminum will not support the load.

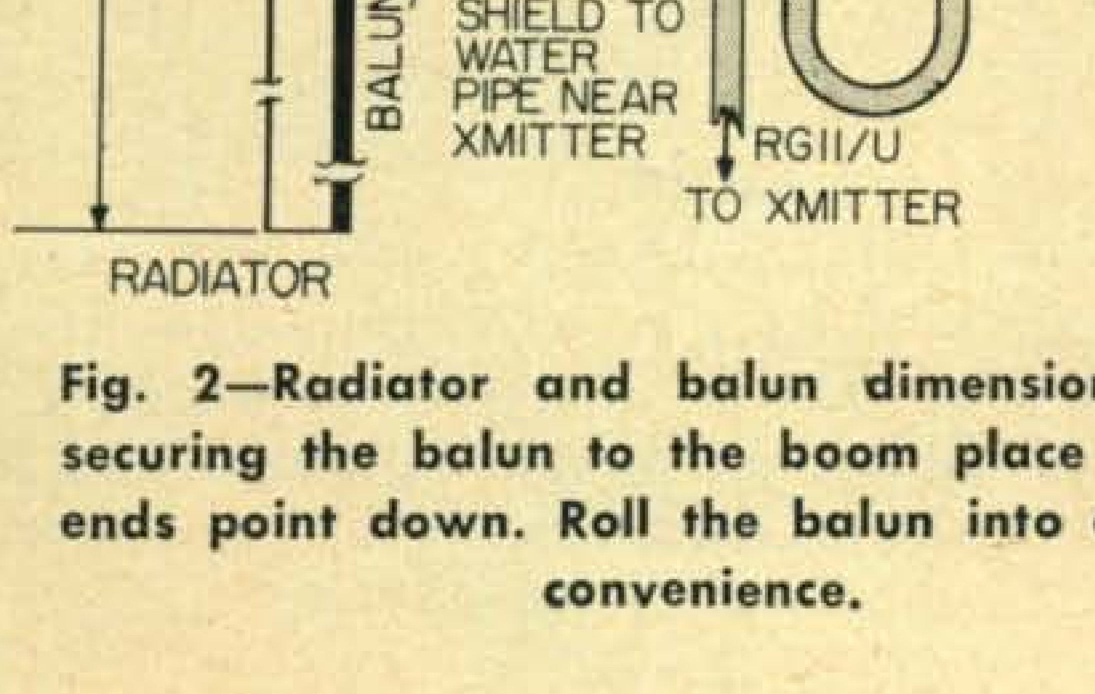

Fig. 2—Radiator and balun dimensions. When securing the balun to the boom place the coax ends point down. Roll the balun into a coil for convenience.

As an ardent 2 meter enthusiast whose contact with *vhf* dates back more than twenty years, I wanted an antenna sufficiently directive to "get me over the hump" at the home QTH in Long Beach, California where Signal Hill and Wrigley Heights tower above me. This discourages 2 meter contacts like an infuriated wife. The wife I could pacify, but governing authorities would take a dim view of my removing such valuable real estate as Signal Hill and Wrigley Heights. The obvious answer was an antenna with extremely good gain. Being of indirect Scotch descent, I didn't wish to encourage the XYL's wrath by spending a fortune on one of the commercially available beams.

Design

After starting with a copy of the VHF handbook and perusing a number of other references, I made a tentative design consisting of two *steel* TV masts, each 10′ long, which were spliced together at the swedge. The prototype was mounted about 10′ above the top of the roof so that with a small ladder I could cut and prune to my heart's delight. Much credit must be given to the Southern California hams who gave me hundreds of comparative reports as I hacked away at my Frankenstein.

After about six months of cutting, pruning, and starting from scratch repeatedly, I finally arrived at what I consider the most satisfactory combination of compromises possible. The result is shown in fig. 1. Approximate antenna gain is 17 *db*.

Construction

The reflector and directors are made of plain galvanized clothesline wire. A 50′ roll is sufficient, but before attempting to cut into proper lengths, it is suggested that one end be tied to your car FRAME and the other end to a sturdy tree. Stretch the wire slightly. This will eliminate the tiresome necessity of straightening each element.

The radiator can be made of a piece of ¾″ conduit bolted to the boom. The balance of the radiator is made of standard TV tubing connected to a regular TV antenna insulator. (See fig. 1.)

The balun is constructed as shown in fig. 2.

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that they were victims of a hoax. They thought sure *CQ* was sponsoring it but I assured them that my last two issues of *CQ* had no reference to any contest for these dates.

Further research in *QST* for April showed that on page 128 there appeared an announcement of the Eleventh New Hampshire QSO Party. The rules of this contest proved that they could not possibly apply to activities of my fellow hams on the dates of the announced contest since the New Hampshire signals were not coming through on 6 meters.

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17 ELEMENTS [*from page 34*]

When mounting the balun, make certain both ends of the balun point slightly downward so that rain (not in California, of course) will not make a hose of your coax. RG8U can be used, but RG11U gives a better match.

Performance

The performance of this little gem was so exciting that I decided I wanted the same thing for my /6 QTH high in the San Bernardino mountains. However here I wanted both horizontal *and* vertical polarization. Since wind velocities on the top of this 5800 foot hill sometimes reach 100 *mph*, it was necessary to use somewhat heavier construction materials but both horizontal and vertical antennas (each fed by a separate coax) were mounted on the same boom about 1" behind the other. No cross polarization has been observed.

On both the 17 element and the 34 element flip-flop, our standing wave ratio was less than 2:1 at worst and reached 1:1 at TWO places in the band. (See fig. 3.) As to why this should be is a mystery to the author except that a shorter

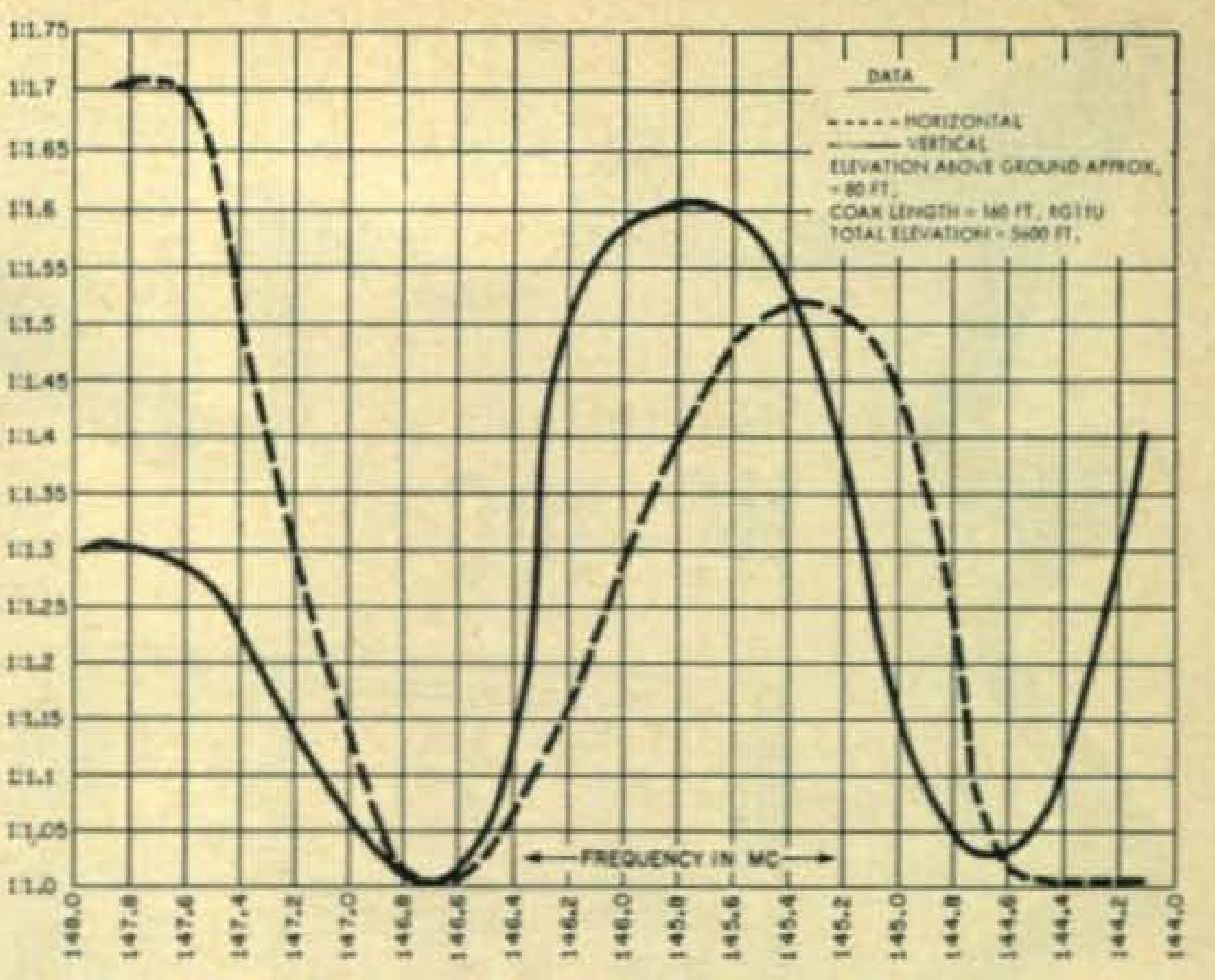

Fig. 3—SWR curves for the 34 element flip-flop beam discussed in the text. The vertical curve (the solid line) is identical to that of the 17 element beam at the home QTH.

than usual balun was employed as noted in fig. 1. Note how the *swr* graph forms a nearly perfect "W". The *swr* was read on two bridges —both sets of readings were very close but the author prefers the bridge shown in the November 1958 issue of *CQ* which uses but one diode.

Even though the elevation at the front curb of the home QTH is but 22½ feet above sea level with an uphill chunk of real estate in every direction, we find ourselves able to communicate with almost all the stations our better situated friends can contact.

Time required to build the 17 element beam is about 4 hours and costs less than $5.00. The 34 element will take a little longer and may cost as much as $15.00. ■

QUADFAX [*from page 33*]

to be due to two factors, one of which is the lower angle of radiation obtained with a quad at relatively low heights. With a quad only ⅜ wave length above ground the vertical lobe is at about 30° whereas a yagi antenna lobe would be at a considerably higher angle. The Quad will perform quite well even at a quarter wave height above ground whereas, verticals, yagis and dipoles are quite poor at this elevation. The second factor which may account for claims of 10 *db* gain is the space diversity effect produced by the upper and lower wires. Under many radio propagation conditions this effect is quite an asset. You have no doubt heard of radio amateurs who have raised and lowered their antennas to obtain maximum signal strength under various propagation conditions. The Quad antenna in effect does this automatically over a quarter wave height.

There is much variance in articles and even in radio handbooks regarding the length of the Quad wires and the spacing between the radiator and the reflector. The length around the square has, however, been found to be quite nearly a free space wave length which is given in feet by 984 divided by the design frequency in megacycles. The spacing between the wire squares may vary from about 0.1 wave length to 0.25 wave length without appreciably affecting the gain. These spacings, however, result in a considerable change in the feed point impedance. A spacing of $\frac{1}{10}$ produces about 50 ohms, $\frac{15}{100}$ about 90 ohms, and $\frac{1}{4}$ about 120 ohms with the 75 ohms impedance occurring near $\frac{13}{100}$ spacing at heights of from ⅜ to ½ wave length above ground.

Feed

Since the Quad is a symmetrical antenna it should be fed with a balanced line to produce the expected antenna pattern. It can be fed directly with coaxial cable with good results but the pattern will be slightly distorted. With coaxial cable feed the use of a bazooka or other unbalance to balance device such as the gamma match is recommended.

The Quad antenna is quite broad band as far as the amateur is concerned. The use of broad-