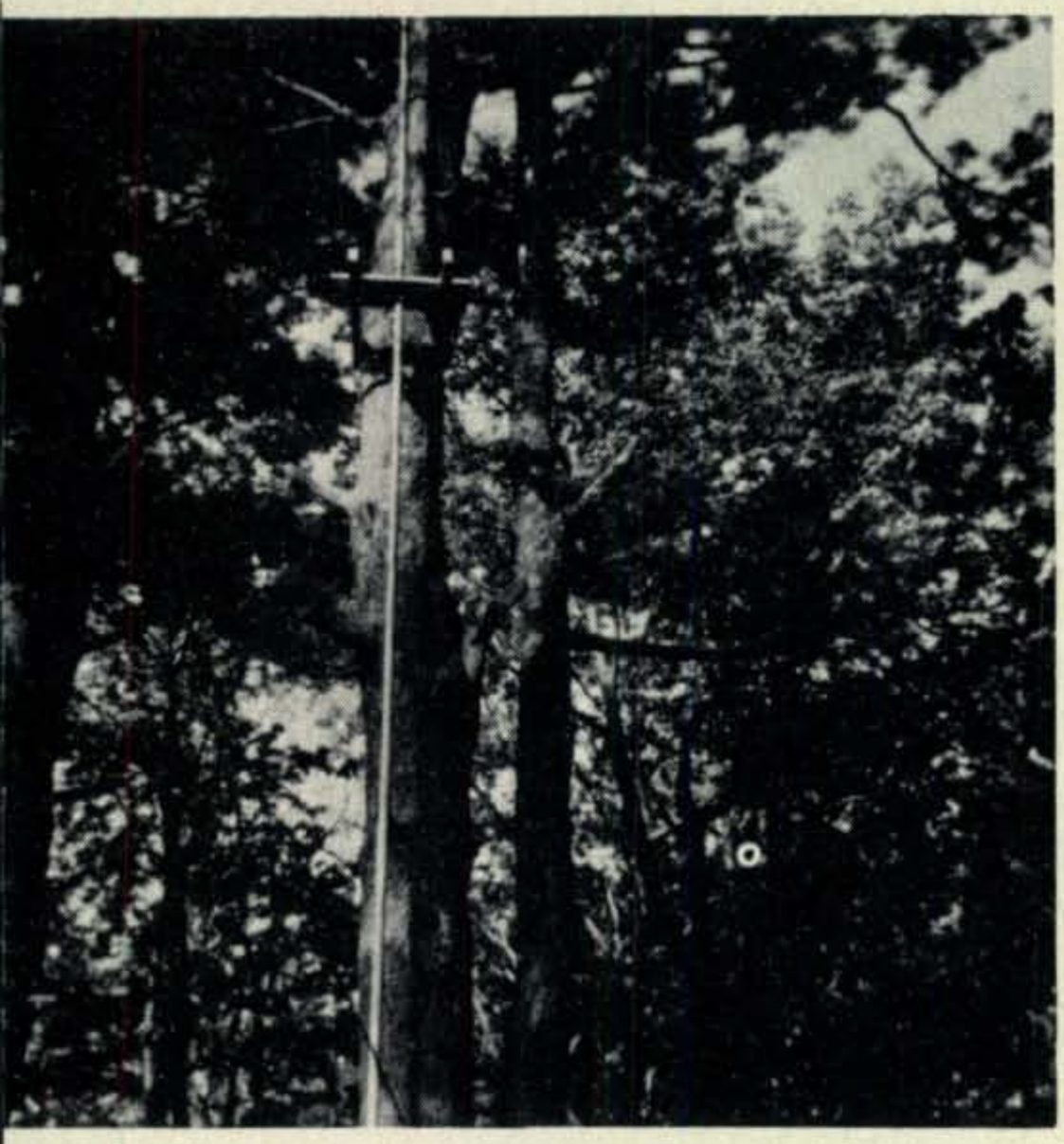

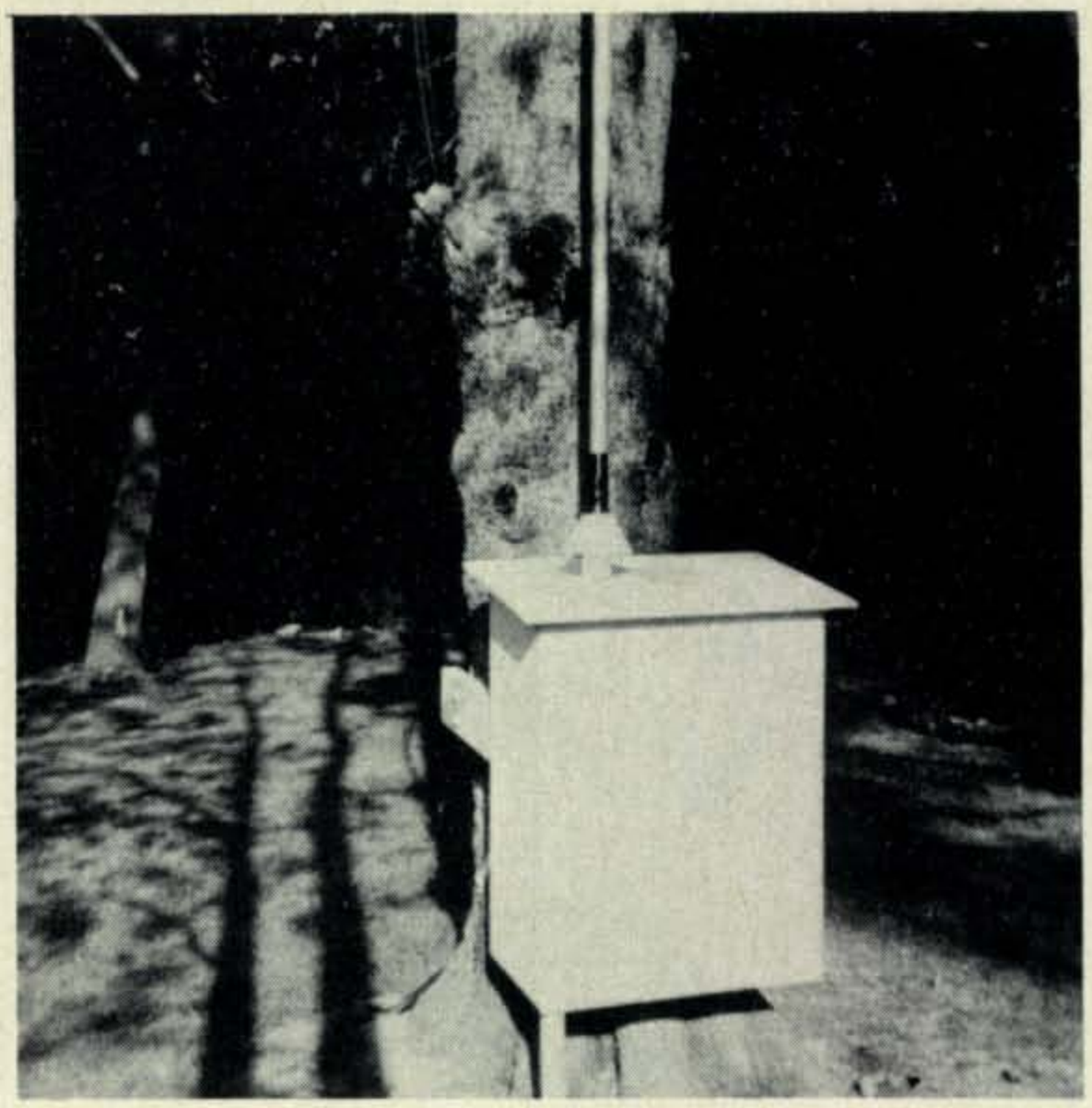

Fig. 1—Two views of the tree mounted antenna installation at W1RIL. This type of structure is inexpensive and gets the antenna up where it belongs, quickly.

Natural Towers

BY KEN SCHOFIELD,* W1RIL

The use of a tall pine or fir tree is an inexpensive way of getting the antenna up where it will do the most good. In this type of installation, described below, the antenna rotator motor is housed at the base of the tree tower providing quick access for simple servicing.

COMMERCIAL towers suitable for amateur antenna installations, be it for a single 10 meter beam, a 10/15/20 Christmas tree or a large trap antenna, can be a relatively expensive item, sometimes equalling the cost of the transmitting/receiving equipment, and often times exceeding it.

This article presents a method of mounting, installing and rotating an antenna array in a tower provided by nature, a tree, in this particular case, a pine tree as shown in Fig. 1. Many of our ham brethren living in new housing developments or in cities, won't find those natural towers in their back yards, but those of us who are fortunate, can make economical use of what nature has provided. The tree mounted system described here, not including the antenna array, rotator or selsyn systems, can be constructed for approximately $25.00.

Location & Selection

On occasion more than one tree is available and a choice must be made as to which is most convenient relative to location from a feedline/control line standpoint and also from the standpoint of the clearance of powerlines, other tree limbs, *etc.* The tree selected should be healthy and structurally sound, with a good solid trunk and as straight as possible. Pine and fir usually fill these requirements nicely, although some other types are also suitable.

Preparation

The top of the tree should be cut off at a

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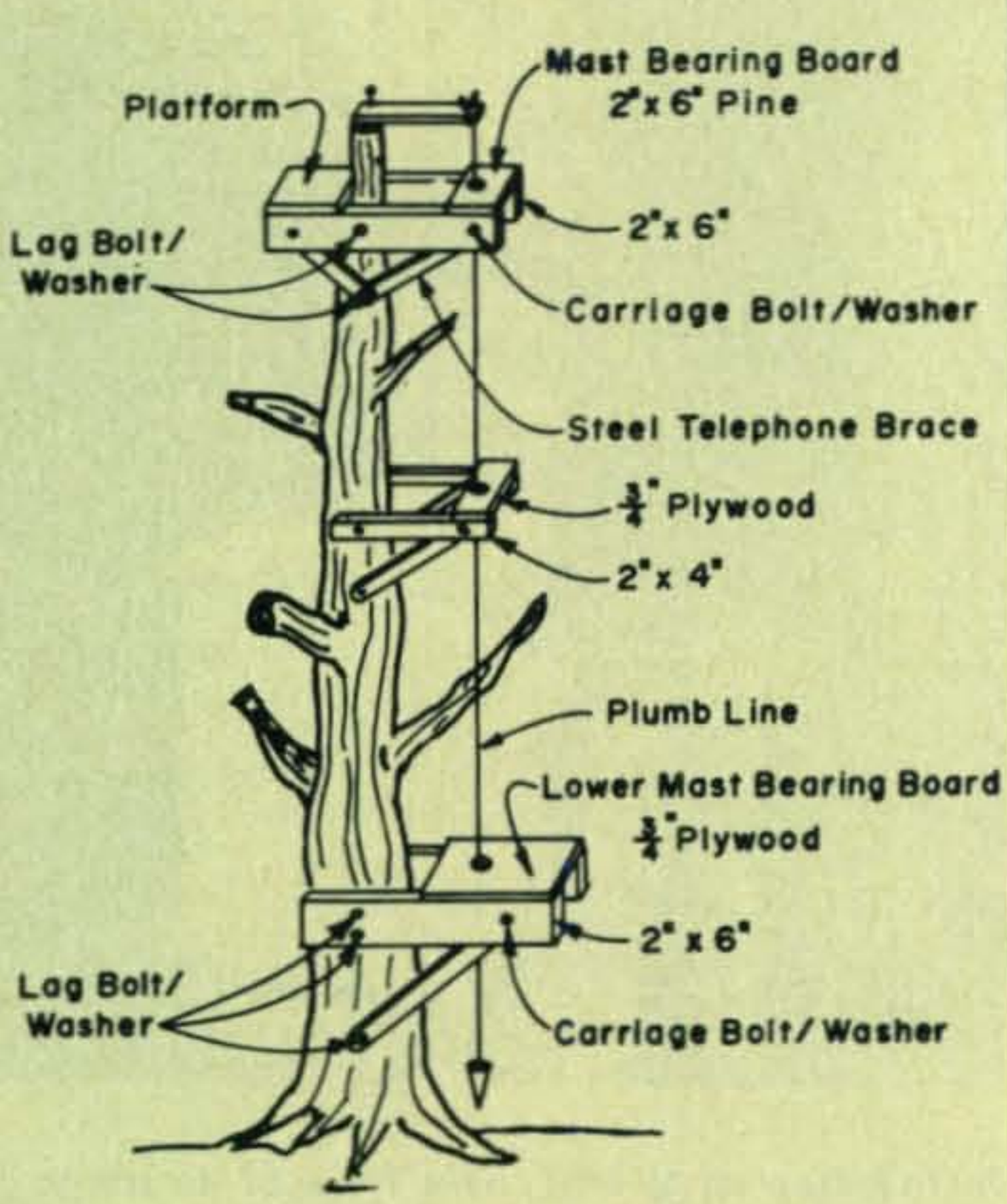

Fig. 2—Construction and mounting details of the mast bracket assemblies. The number needed depends on the tree height. The steel support braces are crossarms from telephone poles, and are 3/16" thick, 1 3/16" wide. The ones used at W1RIL are 28" long but other lengths are available.

point where the main trunk is a good 4 to 5 inches in diameter. A sealer is applied to prevent water from rotting the exposed wood where the cut was made. XYL's are inclined to become a little irrational at this point, but I have been assured by experts that topping is not injurious to the tree; in fact the loss of the top will increase limb growth and the tree will actually become fuller to make up the loss.

A few branches are next removed from the top of the trunk below the cut area, leaving the bare trunk extending from the top of the tree approximately 1½ to 2 feet. Attach a plumb line to a small board nailed across the top so that the line will be about fourteen inches from the side of the trunk at the top and extending downward toward the ground. Pick an area where the line will fall between 12 and 14 inches away from the trunk at the base of the tree. A little branch trimming may be necessary down the side of the tree to allow clearance for the plumb line and later for the masting.

Wind Load

If a 2 or 6 or 10 meter beam only, is to be installed, no further trimming will be necessary because the top and branches already removed would have constituted a wind load on the tree in excess of the imposed load of this type of array. If a 10/15/20 Christmas tree or a trap antenna is to be installed, it is advisable to thin out a few more branches to compensate for the additional wind load imposed by the larger array. No definite figures are available; your own judgement is advised, bearing in mind, one limb from a pine tree with all its side branches and needles represents a fairly large wind load. With this in mind, excessive thinning to a point that would be injurious to the tree is not necessary. During the thinning process, make a path up through the tree branches on the opposite side from the plumb line. This will be used later to transport the antenna parts to the top, for assembly.

Mast Bracket Installation

Figure 2 illustrates the mast bracket assemblies. The number needed will be determined by the height of the tree utilized. For a 50 foot height four are adequate, one at the top, two of the smaller type spaced in the middle, and one at the bottom. These are bolted to the tree trunk prior to the installation of the bearing boards, using lag bolts and washers, along the sides of the plumb line at the top and bottom of the tree. After these are leveled and the metal arms attached to the trunk, the two smaller center supports are added. After all the brackets are installed, the bearing boards are attached making certain that the plumb line runs through the center of each mast hole in each bearing board from top to bottom. The top bracket has an overhang on the opposite side from the mast for mounting a platform. Inch and a quarter inside diameter steel water pipe, connected together with standard couplings, was used for the mast material.

Thrust Bearing, Rotator, Selsyn Cabinet

Figure 3 shows the thrust bearing located at the bottom of the mast assembly. Use of more than one thrust bearing is not recommended as equal distribution of vertical thrust on more than one bearing is not easy to come by. The bearing location is a matter of choice, top or bottom, bottom being preferred however, where it can be installed in the weatherproof cabinet housing the rotator and selsyn systems.

Once the brackets, mast and thrust bearing are installed, the rotator and selsyn assemblies are attached, per fig. 3, in the weatherproof

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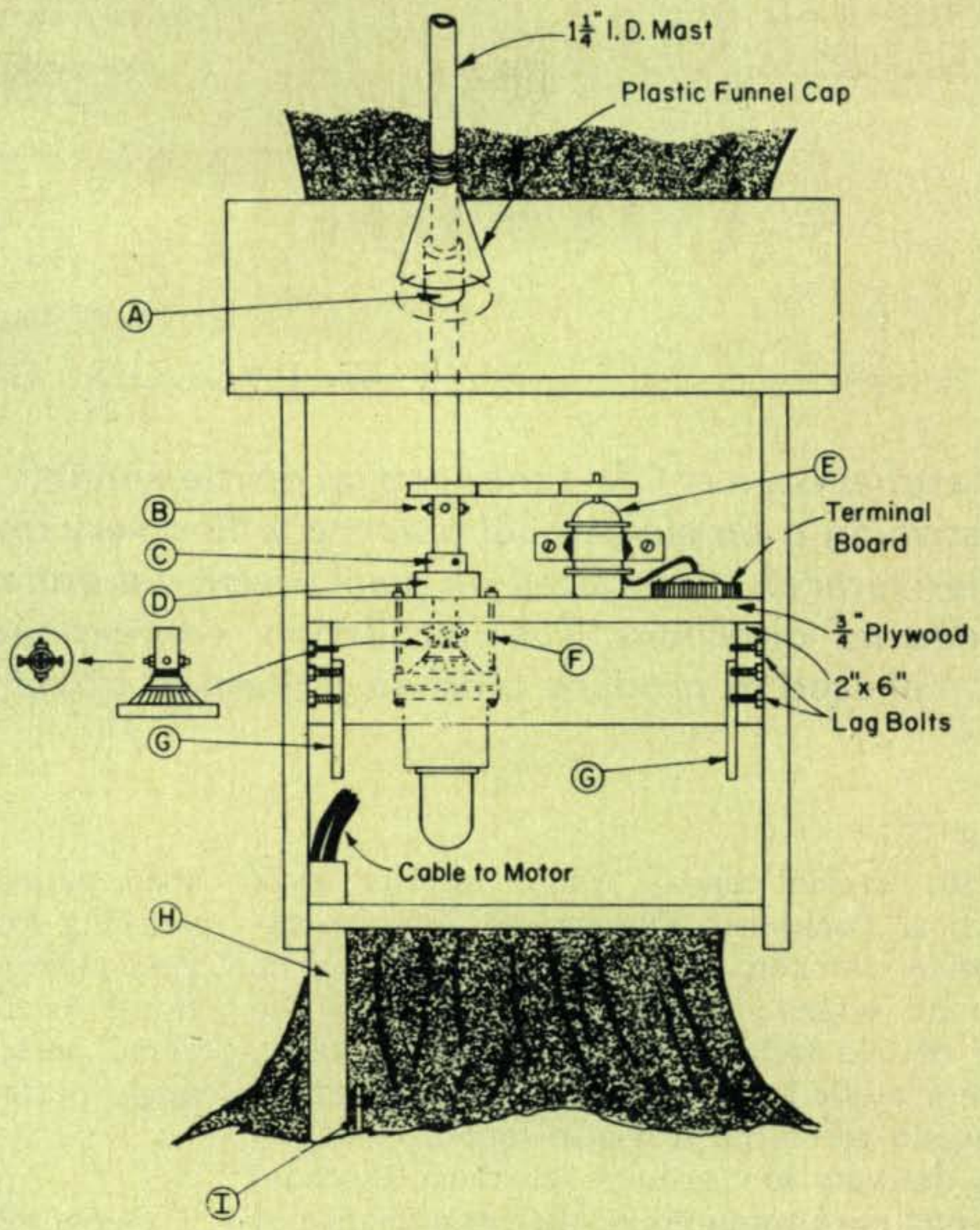

Fig. 3—Details of the motor-selsyn cabinet built around the lower mast bracket assembly. The points of interest are: **A)** Feedthrough flange; **B)** Pin and lock drive from motor to mast; **C)** Collar, Boston Gear #SC162; **D)** Bearing, Boston Gear 600 series; **E)** Selsyn transmitter, **F)** Rotator motor spacers, as required; **G)** Lower crossarm braces protruding through back of cabinet; **H)** Entrance conduit; **I)** Ground rod. The inset shows the motor-to-mast coupling details.

cabinet built around the lower mast bracket. The selsyn can be geared to the mast so that one turn of the mast produces one turn of the selsyn shaft or a pulley drive arrangement can be fashioned. The relative positions of the motor and selsyn are shown in fig. 3. To keep the cabinet water tight a funnel cap assembly is used. The inside of the feedthrough flange is stuffed with a piece of urea-foam to discourage insects, particularly of the winged stinger carrying type, from homesteading in the cabinet. The cover is attached with brass wood screws. Lightning protection is provided by running a #8 solid copper wire to a ground rod located under the cabinet, driven 6 to 8 feet into the ground next to the entrance conduit. The upper end of the ground wire is securely fastened to the gear case of the rotator.

Antenna Assembly

Needless to say, unless you have over thinned the tree branches, the antenna cannot be assembled on the ground and hoisted up the tree to the top. It is pulled up through the clearing made previously on the opposite side from the mast, a piece at a time, usually boom first, and assembled at the top. The small platform aids in assembly and allows adequate footing for the assembler. A word of caution at this point—*don't* step back to admire your work. Once assembled, the array is fastened to the mast, and feed line connected and you are ready for S.W.R. measurements and testing.

Cost is not the only advantage gained by using a natural tower. Once installed, the antenna is almost invisible from the ground as it is obscured by the tree branches. Also maintenance is minute as compared to a man made structure.

The installation as pictured in fig. 1 has been up for 5 years utilizing a 15 meter optimum spaced yagi, 4 years with a 20 foot boom and 1 year with a 30 foot boom. The 10 meter beam was a recent addition. It has withstood winds in excess of 65 M.P.H. and radial ice loading of 3/4 inch without so much as a problem. Anyone know of a high QTH, with a 200 foot pine, located 50 feet behind the house, in Central Mass? □

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