George Cousins VEITG
Box 18, RR 2
Lower Sackville, Nova Scotia

A Broad Band 80 Meter Vertical

Tired of narrow band antennas that have to be retuned when you change from CW to SSB? Here's an antenna that covers the whole 3.5 to 4.0 MHz band without any adjustments.

Being an advocate of DX and contests, most of my operating time is spent on 20, 15 or 10 meters, but there is the odd time that the urge hits me to try 80 and 40, especially during an all-band type of contest. Unfortunately the usual type of array which one finds on 20 meters and higher is in most cases impractical on the low bands because of size and cost. In order to get the necessary low angle of radiation so necessary for DX, the most logical type of antenna to choose is the vertical, but even this becomes a bit formidable when one gets down to 3.5 megahertz.

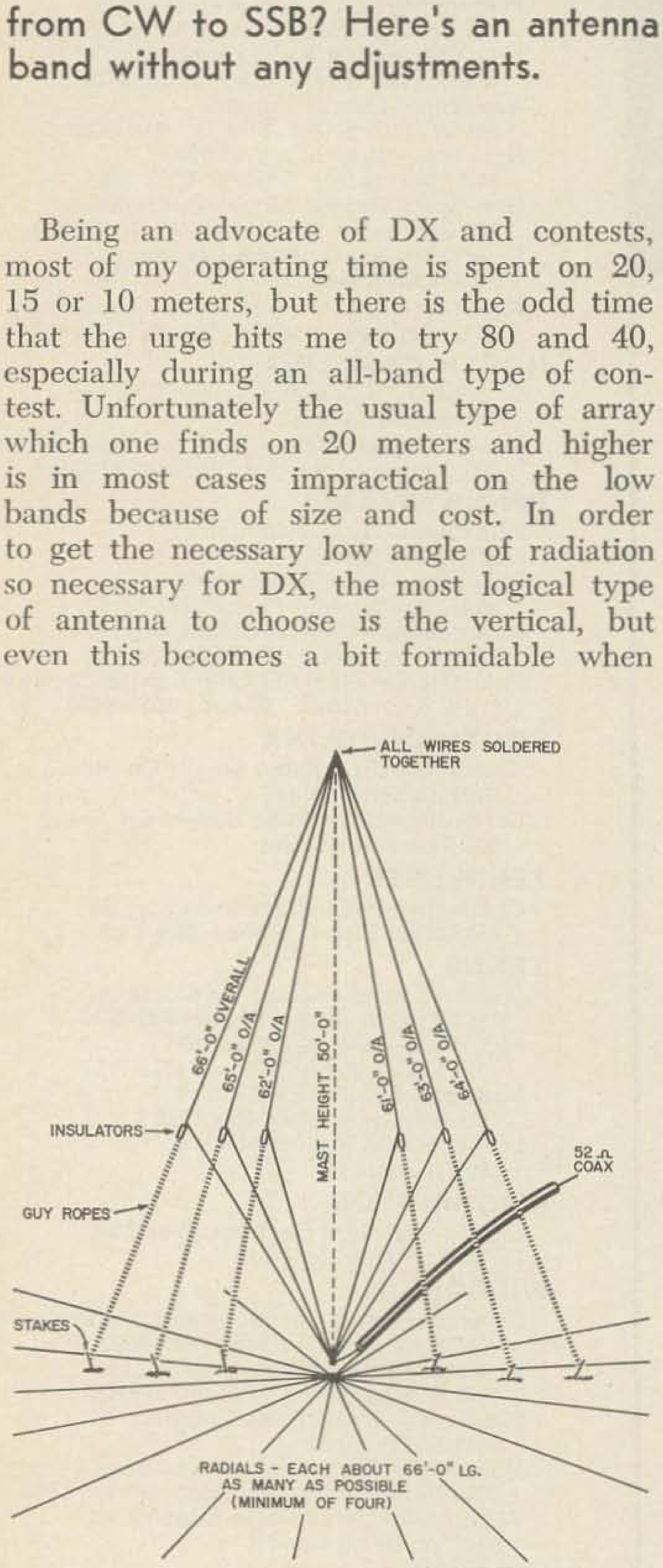

Fig. 1. Basic configuration of VEITG's broadband 80 meter vertical. The idea is old, but it works well.

My old reliable antenna for 80 was the familiar inverted V, or drooping dipole, which has served me well in many different places. The same goes for 40, but having finally landed in a fairly permanent QTH it seemed the time had arrived for a more serious effort.

As far as 80 was concerned, the major requirements of the antenna were:

1. Simplicity and ease of construction.
2. Low cost.
3. Low angle of radiation for DX work.
4. Broad band of operation to cover both 3.5 CW and 3.7 to 3.8 SSB.
5. Coax feed.

Considerable thought was given to the usual ground plane type of array, but considering the heights involved, this was discarded in favour of the vertical quarter wave with radials on the ground. As will be seen, the actual result was quite a departure from the usual single vertical radiator. **Fig. 1** shows the complete design of the antenna in its final form. The main support of the antenna is a 50 foot wooden A frame. Six lengths of wire are cut. The longest is 66 feet, and each other wire is one foot less, with the shortest being 61 feet. The upper ends of the wires are well soldered in parallel, and are mounted to the top of the A frame by whatever means is convenient. In my case I used a stainless steel strap which encircled the top of the mast, and to which a large cable clamp was bolted. The wires were then soldered to the clamp.

At a point about two-thirds down the length of the wires, an insulator is fastened, and by using ropes or other suitable strong lines, the six wires not only act as radiators but also as guy wires. Note from **Fig. 2**, that the wires are merely looped through the holes in one end of the insulators and then carry on down to the base of the A frame. At this point, all six wires are again soldered together and fastened to the mast by the use of a stand-off insulator. Now when the guy ropes are pulled tight, the antenna becomes a conical shaped multi-element vertical. Because each wire is a different length, and each length is resonant at some point in the 80 meter band (¼ wave) the antenna as a whole is broadly resonant over most of the band. In my own case, I was only interested in operating up to about 3.8, but the antenna performs very well right up to 4.0 MHz.

The vertical structure is really very simple to build, as the wires are actually nothing more than insulated guy wires for the A frame. The construction of the frame will be covered in a moment, but first let's finish the antenna. The only way to really get the most out of the array is to have as good a ground radial system as possible. There is probably only one rule-of-thumb on radials: the more, the better. Being very cost-conscious, I found the cheapest source of copper wire for the radials was the nearest motor-repair shop. There is undoubtedly such a shop somewhere near every small town in the country, and of course in a city there will be quite a few. You'll find that in most cases you can get old motor coils either free or for a nominal charge-usually based on the junk value of copper per pound. Another excellent source of such wire is an old line transformer or distribution transformer which your local utility may have removed from service. In a farming area, electric fence wire is fine.

The method of laying the wire must be

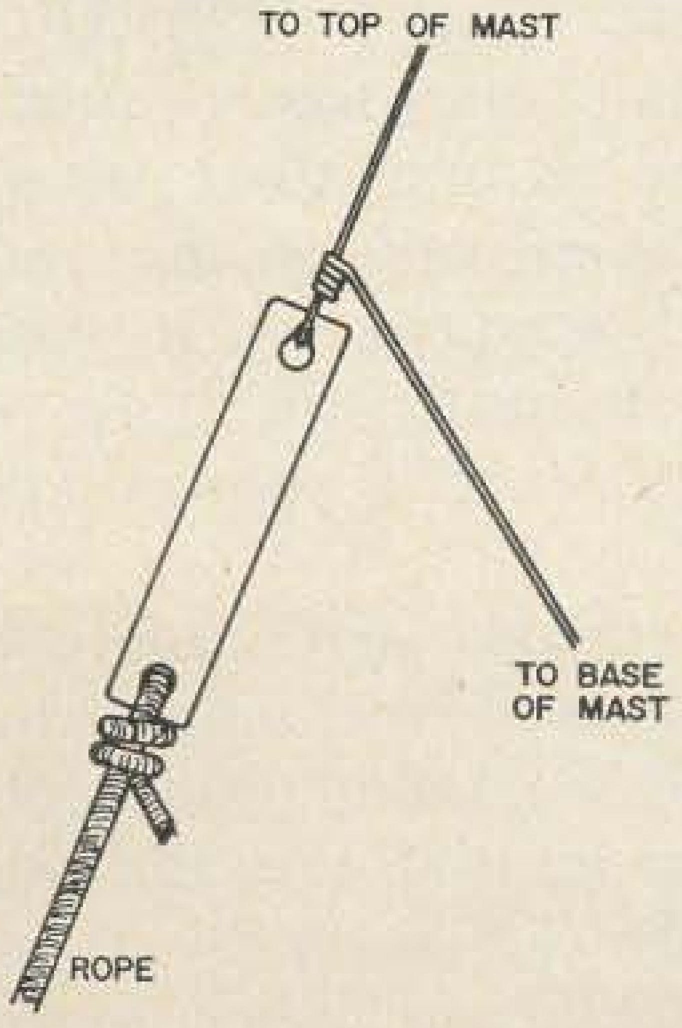

Fig. 2. Details of the insulators in the antenna.

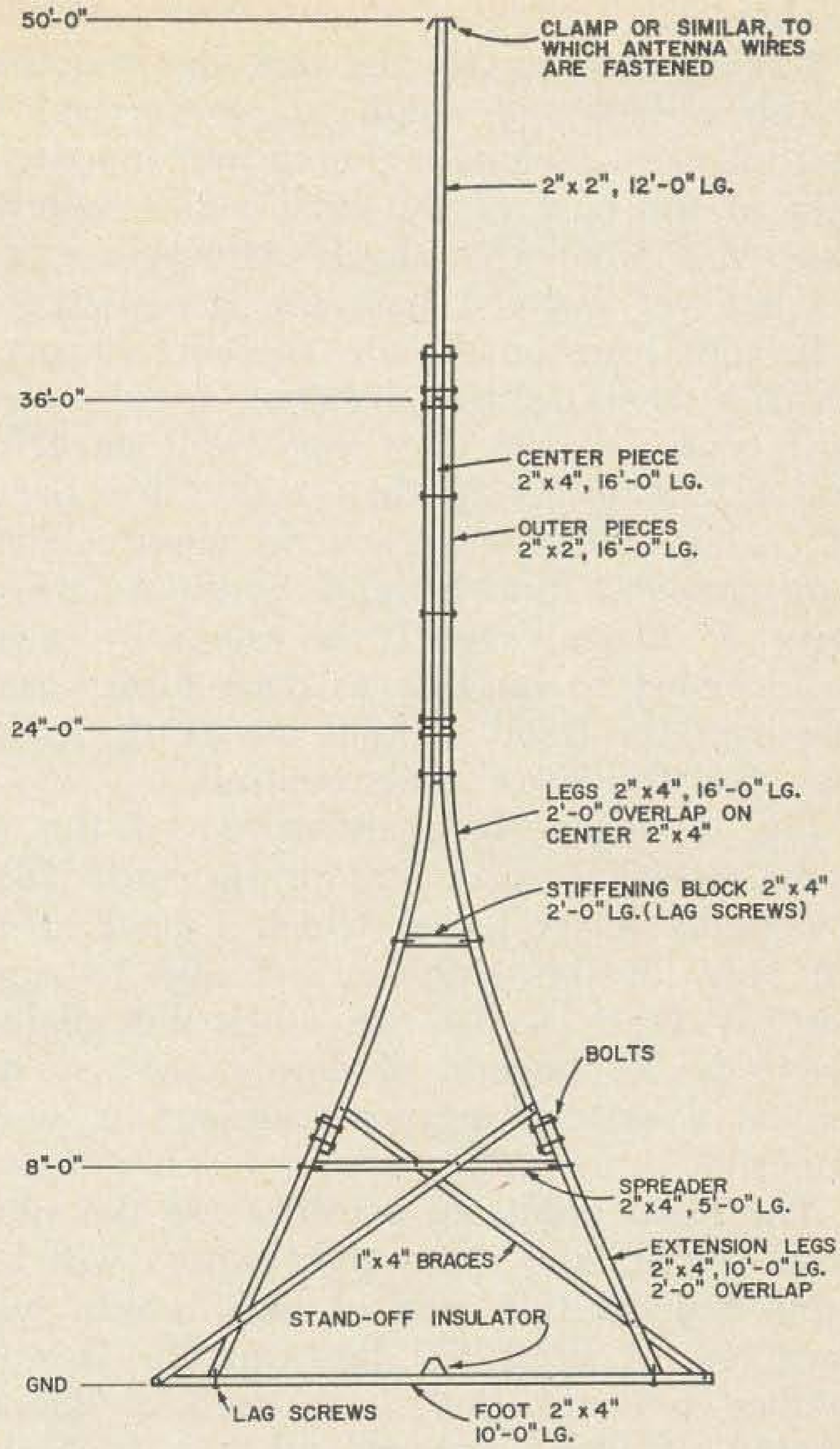

Fig. 3. Construction of the 50 ft. wooden mast for the vertical. Don't use a metal mast.

determined by your own geography. In grassland or sod, it's easy to cut a slit in the sod and tamp the wire down out of sight. In rocky terrain, it may be necessary to either dig out a path or merely lay the wire on the ground and cover it with some loose dirt or sand. The wires need not be in a straight line; almost any configuration will work.

You will find that laying the radials is the biggest and hardest part of the array, but doing a good job here will really pay off on the air.

In the case of my own antenna, I used RG-8 coax, 52 ohm, which matched the thing very well without the use of any other devices. The SWR over the band was about 1.3 to 1.8, which is certainly good enough. Undoubtedly the match could be made more perfect at some frequencies, or a tuning unit could be used to adjust the antenna as one moved across the band. However, the best feature of the antenna as it stands is one's ability to move around the band at will, and without any extra tuning encumbrance.

Making note of the fact that the antenna is also a half-wave high at 40 meters, I have plans to include a tuning unit mounted right at the base of the mast and remotely controlled from the shack. However, this has not yet evolved past the paper stage.

In actual use on the air, the antenna performs as well as the inverted V on short haul contacts, and does very well on DX. Best DX (considering their rarity) has been ZD7 and VS9, but very good reports have been received from Europe, South America, parts of Africa, etc. It is especially nice in a contest to be able to dash hither and yon over the band without constantly grabbing for the plate tank controls!

Fig. 3 shows the construction of the A frame, which is very straight-forward. This is actually an A frame which I have used not only for this antenna, but also to support at times a 40 meter ground plane, inverted v's, one end of dipoles, etc. so its use as a general purpose support is very extensive.

The main points to consider are the ultimate height, and the weight which will be supported. In this area of high winds, ice, sleet, etc. I used the best quality 2 x 4 lumber I could find, and used a liberal coating of wood primer and two coats of exterior house paint. Since the longest lumber I could find was 16 feet, I used extension pieces on the bottom. At the top, I used two lengths of 2 x 2 to both steady the upper piece of 2 x 4 and also to act as a bracket into which the top section of 2 x 2 was inserted. Since the radiators are acting as guys fastened right at the top, the 2 x 2 is plenty strong enough. Depending upon your local weather conditions, you may or may not require the use of a second set of guys about half way up the tower.

When the A frame is laid out for raising, the wide base will make it an easy task for three people. In fact, if you can secure your guys at right angles and have the use of a small block and tackle, with a tree or similar anchor, you can raise the mast all by yourself.

Because of slight flexing and "working" that takes place in a high wind, I would suggest using only bolts in the mast; nails have a habit of working out at the most unlikely and least desirable times. The guy ropes need not be expensive; I use synthetic cord used to make deep-sea fishing nets, and it works very well.

As a last comment, I hung a 40 meter inverted V right at the top of the mast, and found that this upset the SWR considerably on the vertical, pushing it up to about 2.5 all over the band. This can be taken out by a little tuning at the base, but is probably best avoided by simply not hanging anything else on top. After all you have gone to the trouble of making a pretty good antenna so why spoil it?

. . . VE1TC

Temporary Knobs and Tuning Tools

When working with gear have you ever come across a control you couldn't adjust? It may be inaccessible (as inside an *if* can), or odd shaped, or both. Tools fitting some of these shafts aren't even in the catalogue let alone on your workbench. Fortunately there is a quick, cheap, easy solution to the problem—the ubiquitous ballpoint pen.

Here's the trick. Take the plastic outer barrel of the (presumably) empty ballpoint and remove any metal molded to it. This can be done with a match or a cigarette lighter used as a cutting torch. In the same way melt the barrel till the end is almost the same size as the shaft to be turned. Do this so the barrel will still fit into the space available. Now *slowly* heat the end until the plastic is just softened. Quickly push over the shaft and let it cool. You will have no trouble removing the pen in a few seconds after it has hardened completely. If done carefully, this process can be repeated several times until a good fit is obtained.

You now have an insulated tool of surprising durability. I have used the same pen barrel to tune a T23/ARC5 for five years. Another one has turned the moth-eaten splined tuning shaft of a Q-5'er all around the passband of my receiver since Christmas. I suppose as it wears out I'll just reheat it until the cost of matches approaches that of a surplus knob, or vice versa.

You can squeeze even more out of this. A tapered barrel can be treated on each end to make a combination tool. Other applications are limited only by ballpoint sizes, and probably not even by that, using the amateur's last resort . . . ingenuity.

. . . Thomas Kuffel K0YPB