SUPPORTING THE TUNED DOUBLET

BY PAUL C. AMIS, *W7RGL

This article is a sequel to W7RGL's opus on the virtues of the tuned doublet antenna in a previous issue.[1] He now tells how to assemble and install this, or any other flat top wire antenna, so that it will stay up.

HAVING extolled the virtues of a tuned doublet antenna in a previous article[1], the author thought some of you might have decided to have a go at it. Therefore, the problem of erecting it in the air and keeping it there becomes one of prime importance. Probably the most satisfactory antenna support is a pair of permanent poles, but most of us are not so blessed. Trees are quite commonly used, but precautions against them swinging in the wind must be reckoned with. Houses and outbuildings are satisfactory but their placement may leave much to be desired and their height may not be sufficient. However, like all things, it isn't what you want that makes you fat; it's what you get (or have on hand). With a Tuned Doublet and antenna coupler, the antenna height is compensated for, and all that is left is a method of keeping the wire in the air where it can be useful, not coiled on the ground after the first storm.

Before we delve into this subject of antenna wire installation hardware, a visit to some commercial or military antenna site would be most instructional. You will note that these non-amateur concerns hang wire as if they meant it to stay up a long time—which they do. No hair-wire hardware, or lamp-wick supporting lines for them. Strain insulators are massive, metal hardware is stout and heavily galvanized, down-hauls have quiet authority, and antenna wire looks as if it had been recently removed from a crane. Leave us do likewise.

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1 Amis, Paul C., "The Tuned Doublet," *CQ*. March 1968, p. 67.

Insulators

You will need three strain insulators for the flat-top portion of the doublet. These should be heavy duty and low loss. Some military glazed ceramic insulators with generous ribs, with and without cast bronze ends, have appeared on the surplus scene. (See fig. 1.) These are excellent. Some heavy duty commercial plastic strain insulators are very good. But the inexpensive small clear glass strain insulators such as found in dime stores are definitely *out*. The attaching holes of the center insulator should nearly match the spacing of your chosen feed-line, although this is not too important.

Pulleys

If you plan to utilize one or two trees as antenna supports, be prepared for them waving in the wind. This means that a counterweight on one down-haul will be required, with its subsequent pulley in the tree. And this pulley should be a rugged, heavy-duty type, able to stand your atmosphere for long periods, and should have as large a diameter wheel as possible. Three, or four-inch diameter wheels are the minimum recommended. Awning pulleys and small cast boat pulleys are not suitable because of their small wheel diameters and generally frail axles. A down-haul running over a swaying, small-diameter pulley wheel will invariably break at the pulley before too long because of the relatively sharp, right-angle bend. Cast aluminum clothesline pulleys of about five-inch diameter are sized right, but are not strong enough for a heavy-duty antenna hanging from a swaying support. One of the catalog houses

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has a line of rugged yet inexpensive pulleys with roller-bearing axles for less than $3.50 each. If two trees are used for supports, generally one counter-weighted down-haul is required, but both antenna down-hauls should be run over pulleys for ease of installation and maintenance.

Hardware

Securing pulleys to fixed supports, such as poles or buildings, can usually be accomplished by eye bolts, heavy screw eyes, or straps. When living trees are used, however, strict attention to mounting hardware is advised. A wire loop or strap, wrapped around the trunk or limb of a tree can result in "girdling" and the subsequent death of the tree beyond that point. A large size eye-bolt inserted in a hole drilled through a small trunk may weaken the top so that it breaks during a wind-storm. Neither of these methods are beneficial to the tree, the landlord's nerves, or your antenna. A large galvanized screw-eye has proved the best method of securing hardware to a growing tree. Actually, the screw threads become more firmly enmeshed in the trunk as the tree grows, and the screw does practically no damage to the tree. Further, a minimum of tools are needed to install such a screw-eye, and this becomes of prime importance when you are using most of your arms just to hang on.

For connecting hardware, boat shackles, heavily galvanized, are hard to beat. The antenna can then be taken down for Field Day or maintenance with just the use of a pair of pump pliers. A bit of grease on the shackle threads will assure long-lasting ease of disassembly.

Antenna Wire

For the antenna wire and feeders, strength and resistance to constant strain and flexing is mandatory. The most satisfactory flat-top is made up from three #14 or two #12 Copperweld wires twisted together. This twisting together of two or more Copperweld wires will take the fight from the wire and give it a tamed flexibility that is a joy to the heart.

To properly twist up a flat-top cable, measure out the two or three individual Copperweld wires, each being about 10% longer than the desired finished antenna length. At one end, collect the wires into one strand and secure it to a stout post or tree. Stretching the individual wires out, being extremely careful not to pull an "eye" (or loop) into any

Fig. 1—Heavy duty strain insulator with ½" diameter porcelain and aluminum alloy end bells. (E. F. Johnson type #136-151.)

of the wires, chuck the far end of the three wires into a pistol drill or, if power is not at hand, a wood brace or large hand twist drill. Then, with the wires tightly and evenly chucked into the drill, pull an even strain on your cable and start twisting.

For Copperweld, I like from one to two complete twists per inch. You will have to over-twist the cable a bit since it will untwist after power has stopped being applied. Once you have the wires twisted together into a cable, secure it at the end you've twisted from so as to keep a strain on it, and tack-solder the cable every two or three feet along its entire length. Break the exact center of the cable for the center strain insulator and install the end insulators for the length desired. Electrician's brass wire clamps work very well to secure a wire loop through the eye of the insulators.

Feeders

For wide-spaced feeders, the wires can be made up from two #14 Copperweld wires twisted together in the same fashion as above. To attach the feeder spreaders, stretch out the two finished lengths of twisted #14 Copperweld at waist height, spaced apart the distance which will fit your spreaders, and secure to a couple of supports. For four to six inch ceramic or plastic spreaders, the wire used to secure them to the feeders should be no smaller than #14 soft copper. It's natural for the feeders to sway and "work" when erected, and smaller securing wires will eventually break, allowing the feeders to come adrift. Unless it is absolutely necessary, do not try to install feeder spreaders on a feedline which is hanging loosely down from the antenna. You will wind up putting twists on each feeder with the spreader securing wire

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which will "cork-screw" the feeders when re-erected. A spreader every three or four feet seems to work out quite well.

Probably the most important proviso in the construction and erection of a Tuned Doublet (or, for that matter, almost any center-fed wire antenna) is that the feeders must come away from the antenna at 90° to prevent feedline radiation and antenna unbalance. If, due to placement circumstances beyond your control, the feedline must eventually angle away from the antenna, run the feedline away at a 90° angle as far as possible *then* gently angle it towards the shack.

While we're on the subject of feeders, if the finished antenna is secured to a tree, the feeders must be expected to whip about in a wind to some extent. This means that care must be exercised at the shack end of the feeders to prevent stand-off insulators, if used, from being snapped off during a storm, or undue strain being placed on your entrance insulators and hardware.

A simple way to attach the feeders to the flat-top is to simply thread each feeder wire through its respective eye of the center strain insulator and secure it to the antenna under the same wire clamp used to fasten the flat-top eye.

Down Hauls

The subject of down-hauls becomes slightly controversial, but it's hard to beat a good grade of Manila rope, one-half-inch diameter, or larger. It will outlast wire rope, stranded clothesline wire, nylon braid, or solid wire, and brings no additional metal within the field of the antenna. Also, Manila takes kindly to continual running across a pulley wheel with little wear, and weathers excellently. Unless the pulley wheel is of good diameter and is quite smooth, nylon ropes have a tendency to abrade and break at the pulley. Wire ropes are expensive and will break, in time, from the same causes as above.

By the way, the down-haul rope need not be long enough to reach from the ground, up to the pulley, and back to the ground again. Each rope need be only slightly longer than the height of the pulley above ground. Then, when you lower the entire antenna for servicing, merely tie on a lighter line so that the upper rope eye can be lowered to the ground. When the antenna is again erected, the lighter line can be removed and stored.

An eye should always be woven into the upper end of each rope for the antenna shackle. A diagram of how to weave an eye

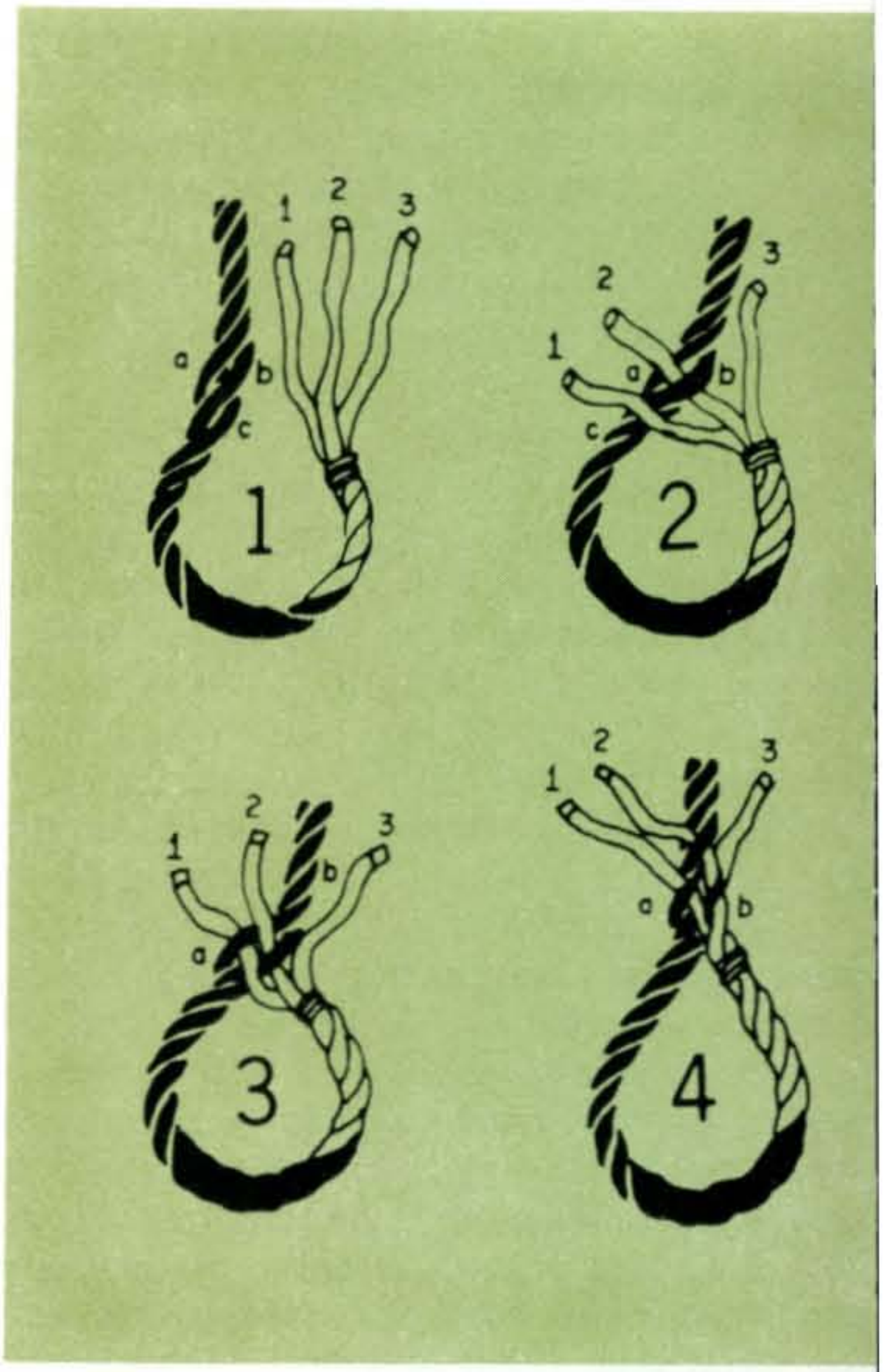

Fig. 2—The basic method for making an eye splice is shown in the four steps above. 1—Untwist the ends; 2—Slip strand 2 over C and between A and B; 3—Slip strand 1 over B and under A as shown; 4—Insert strands 1 and 3 as was done for strand 2.

into a rope is shown in fig. 2. A galvanized thimble for the size of rope should be used to prevent rope eye wear.

If you use Manila rope for your down-haul, remember that this rope will be exposed to all the weather elements your area can produce. Since half-inch (or larger) Manila rope is not exactly cheap, any means for extending its useful life is well worthwhile. After the rope eye has been woven into the end of the rope and the other end wrapped with light, waxed twine to prevent unravelling, soaking the rope for several hours in creosote and allowing the treated rope to air dry for a day or so, does wonders. It smells to high Heaven, and is messy to handle, but it is an excellent preservative, and will generally double the life expectancy of a down-haul.

The only two things needed for permanent wire antennas is an open mind and an open hand. For the antenna, think efficiency and height; for the hardware, think strong, build stout. ■

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