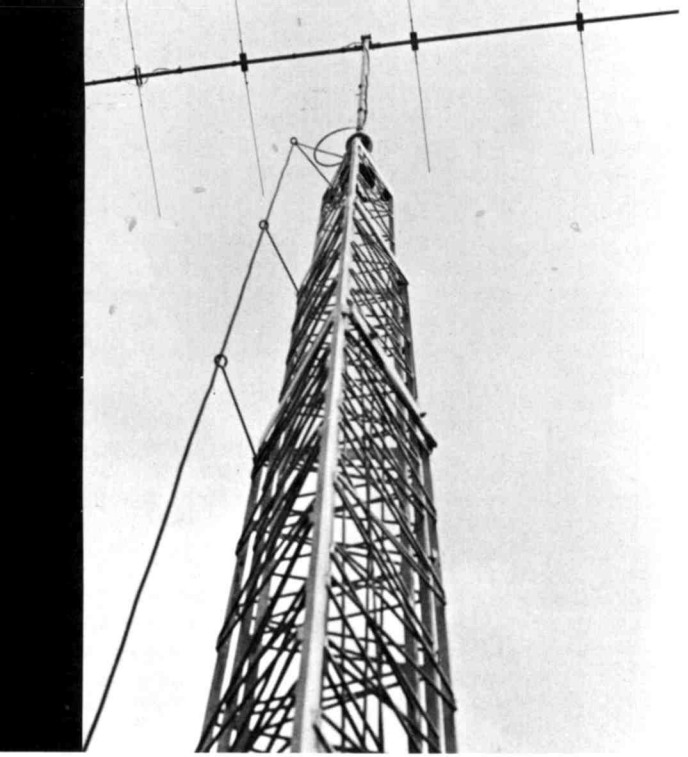

homemade tilt-over antenna tower

Construction details for a triangular, 70-foot tower you can build for a fraction of the cost of a ready-made structure

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Many hams would like to have a good tilt-over antenna tower for as little money as possible. This was my wish also, but I didn't do anything about it until a good friend, WA3AHM, started needling me about building one. This article describes the result of my answer to this challenge – a 70-foot tilt-over tower for only $44.62 in material costs. I used material purchased from local junk dealers for all structural members except the 3/8-inch round-rod diagonal trusses (**fig. 1**), which were donated by friends. If purchased, the 3/8-inch round rod would come to about $15.00 extra – still a pretty good bargain when you consider the cost of a commercially built tower of this type. Accessories such as gears, lift motor, cables, and tilt-over winch are additional expense items, of course.

construction

This article is presented with the assumption that you've had some welding experience. If you haven't and wish to build the tower, you can have the entire assembly welded professionally and still come out ahead of the current market price for a tower of this size.*

I've included some hints based on my experience that should help if you've never undertaken a project such as this. The main point to bear in mind is that the verticality of the finished structure will depend on how accurately you measure the templates and the care with which the parts are positioned during welding. A small shift in alignment during assembly will be magnified many times in the completed tower.

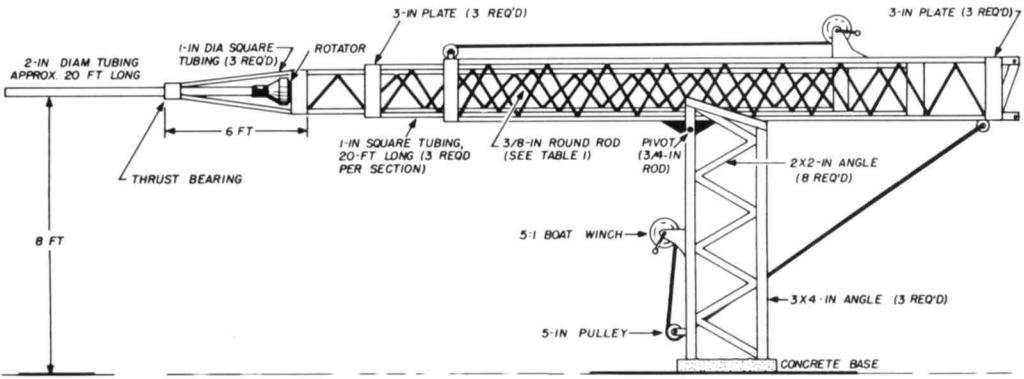
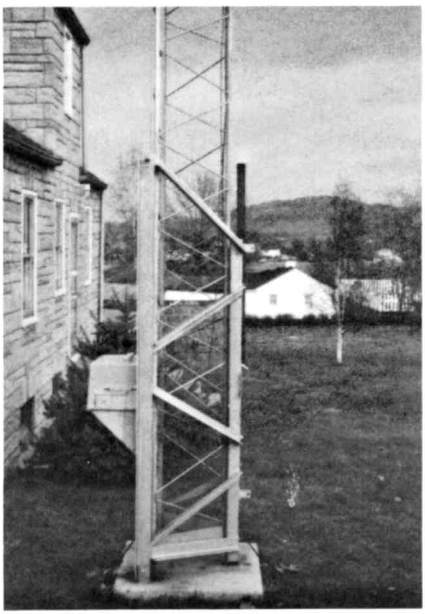


fig. 1. The 70-foot tower in the tilt-over configuration. The tubing extension at top is adequate for a 6-meter yagi antenna; other antennas will require extensions using different tubing sizes and lengths.



Clean lines and true verticality result from careful jig measurement and prealignment before welding and placement in concrete base.

templates

My reply to WA3AHM's challenge about building a triangular tower was, "You can't keep the triangular elements

table 1. List of materials for the homebrew tilt-over tower. All material is soft iron.

quantity	description	size
1	round	3/4" x 25"
2	angle	3" x 4" x 8' 6"
1	angle	3" x 4" x 6' 8"
8	angle	2" x 2" x 27"
66	round	3/8" x 23"
66	round	3/8" x 22"
66	round	3/8" x 21"
10	square tube	1" x 20'
18	plate	1/16" or 1/8" thick x 3" wide; approx. 19" long

*An estimate for the complete welding job, based on precut and accurately dimensioned parts, is about $50.00 for labor and welding materials. With some energetic bargaining, this cost could be reduced. **editor.**

aligned during construction." Then I came up with the idea of making three jigs, or templates, from one 4 x 8 sheet of 5/8-inch-thick plywood. The detail of the jigs is shown in **fig. 2.**

After laying out one piece of wood in the hexagonal shape shown, I made two more and nailed all three pieces together. Three circles were inscribed on the top piece, then each circle was divided into six equal parts using a large pair of dividers.

Next, one-inch squares were laid off at each corner of the three triangles. These were drilled with a ¾-inch bit and shaped into square holes with a saber saw. (These holes will accept the main longitudinal members, which are 1-inch-square lengths of tubing. See **table 1** and **fig. 1.**) The 1-inch-square holes should allow the tubing to slide through the wood easily, but with a slight amount of drag. It might be necessary to stagger the holes slightly in the center piece to provide solid support for the tubing in the jigs.

setup

The jigs were separated and numbered 1, 2, 3 in relation to the way they had been nailed together. The 1-inch tubing was then placed through the holes in jig 2 and allowed to extend about six feet beyond the end of the jig. Jig 1 was placed just over the end of the six-foot protrusion of the tubing, and jig 3 was placed over the far end of the tubing. It is important that the number of all jigs face

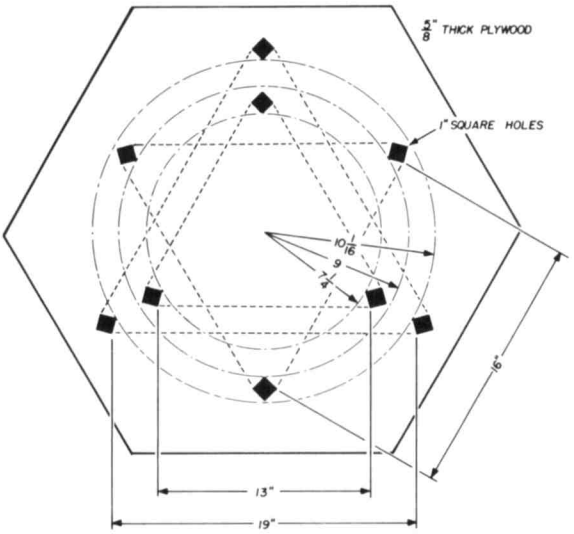
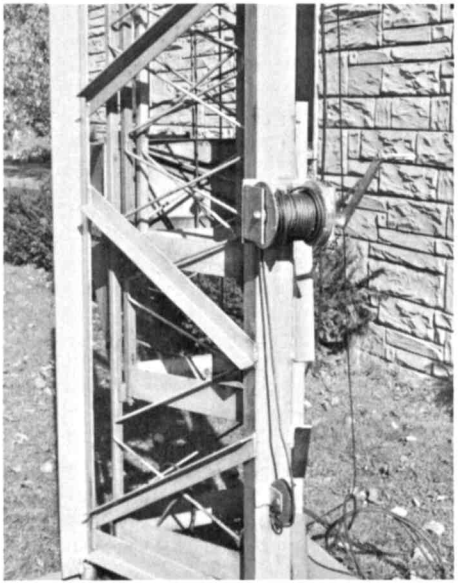


fig. 2. Geometry of templates used for positioning tower elements during welding. Jigs are made from a single sheet of 4 x 8, 5/8-inch plywood.

Details of the tilt-over stub and boat-winch.



in the same direction. Otherwise accumulative alignment errors will creep in, which will affect the verticality of the final structure. (You don't want the neighbors to think you're a CBer!)

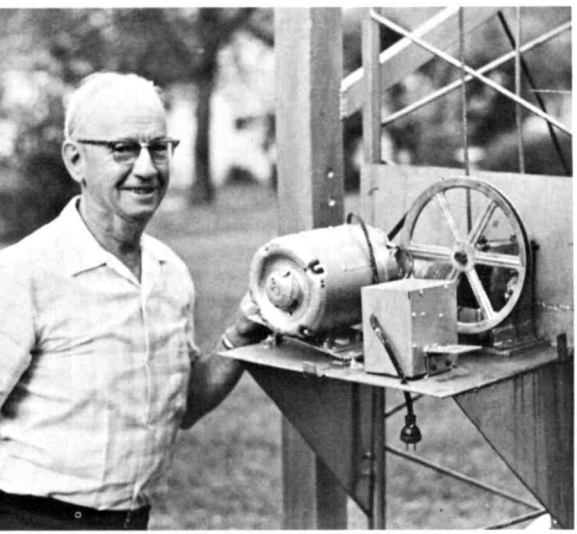
Choose a level spot on which to set the jigs and tubing. You'll need some wooden wedges to level the jigs. Place a string over the tops of jigs 1 and 3, and adjust jig 2 for level if necessary. Then run the string along the corner of the jigs to make sure there is no side twist in the assembly.

welding

The 3-inch plates were welded around the triangle at jig 1 first. Then the 3/8-inch round rods were placed zigzag fashion up the side of the triangle and tack welded. This procedure was repeated on all three sides of the tower section, up

to movable jig 2.

A problem in welding a structure of this type is positioning the diagonal truss members and keeping them in place while welding. I used a magnet salvaged from the yoke of an old TV set to hold the pieces in place during the tack welding.



Electromechanical elements for raising and lowering the tower. A 1/3-HP motor and 40:1 gear train are used.

Each diagonal truss was bent slightly (approximately ½-inch radius) before welding. This enhances the appearance of the structure.

The next step, after tack welding the diagonal members, was to move jig 2 approximately six feet and recheck for level and twist. The tack welding was continued until jig 2 was against jig 3. Then jig 3 was removed, and jig 2 was left in place. The 3-inch plate was welded around this end of the triangle. Next, both jigs were removed, and the 3/8-inch round rods were welded permanently. This completed one section of the tower; the other two sections were constructed similarly. Three-inch-long pieces of ¾-inch angle were then welded at the corners of the sections to act as guides when the sections are raised and lowered.

tilt-over stub

This part of the assembly was built from 3 x 4-inch angles (longitudinal pieces) and 2 x 2-inch angle trusses. The tilt-over stub is triangular and mounted in a concrete base. Use extra care here to obtain an absolutely vertical structure. Make several measurements, then recheck each before the concrete is poured. This work is extremely important if the tower is to be vertically true.

A length of ¾-inch round rod completes the assembly as a pivot piece for the tilt-over stub.

accessories

The lifting and lowering mechanism consists of a 1/3-HP electric motor and a 40:1 worm-and-gear arrangement. The tower is tilted by a 5:1-ratio boat winch and pulley assembly. The cables for the entire tower are 1/4-inch galvanized stock.

acknowledgment

Several amateurs in this area have used these jigs to build similar towers. I'd like to thank all who have contributed information for this article.

ham radio

Top of tower construction.