This is the view that greets my neighbor when he steps into his backyard. Six bands worth of antennas on a 54-foot tower.

SAFE & SOUND

TOWER INSTALLATION

Part I

BY MORT WATERS,* W2NZ

AFTER 8 years of constantly nursing a quad I decided to switch to a yagi because it just had to be less trouble. I couldn't see how it could help but be an improvement, at least physically. Even if it broke as often as once a year, I'd be way ahead.

The Hy-Gain TH6DXX looked good to me so that was chosen as the basis of my new antenna farm. This brought about complications, however. My skinny old self-supporting tower had served me well, but it couldn't carry this load. Neither would the AR-22 I'd been using be able to keep the big beam pointing where I wanted it. Both would have to be replaced.

Because backyard space is small at my QTH, a guyed tower was out of the question. Also, because I refuse to climb higher than the third step of a ladder, the new tower would have to be a crankup, foldover type.

After much soul searching and catalog studying, I picked a free-standing Rohn tower, model HD-3-54. The model number tells the story: heavy duty, 3 section, 54 feet fully extended. I like the way Rohn designs their towers. As they get higher the bottom sections get fatter, instead of just adding thinner ones at the top as some do. With it I could get a tilt base that incorporated a built-in self-erecting winch. There was another feature that appealed to me greatly because my old tower lacked it. These sections moved smoothly on roller guides. Hoisting and lowering were easy and silent. Thinking ahead, I also liked the 40 to 1 ratio gear winch which could be easily motorized so that it would be possible to raise and lower the tower from the operating position.

If your situation is like the one I faced—extremely limited space for a tilting tower—you have to find a place for it with room to tilt. At the same time, you have to consider the spread and turning radius of the antenna to keep it within the bounds of your property. The TH6DXX's turning radius is 23 feet.

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The boom is 24 feet long and the biggest element is the reflector at the end of the boom. Its length is 31 feet plus, precise size being determined by the chosen resonant frequency.

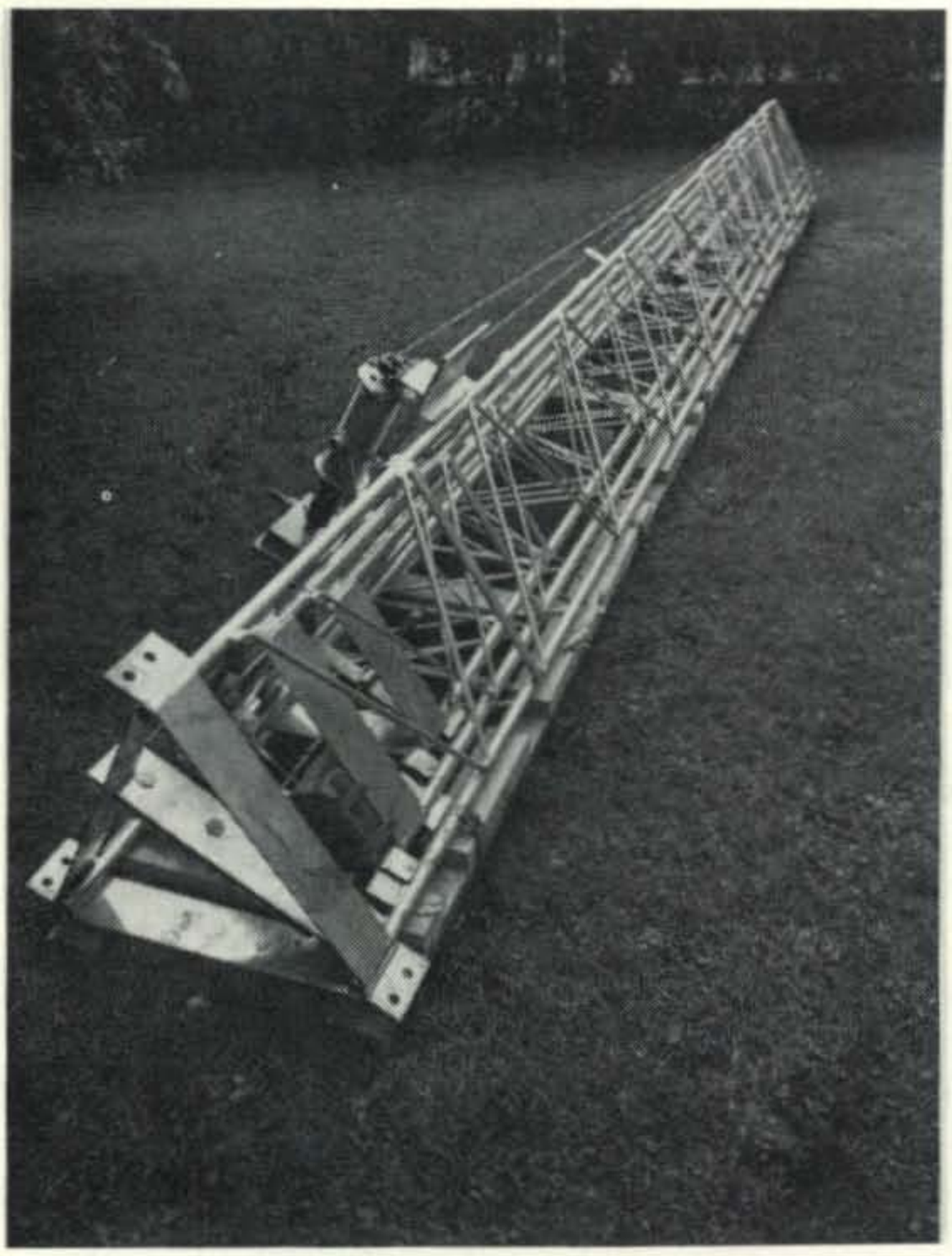
To summarize, these are the factors to consider in selecting the spot for the tower:

1. Antenna turning radius.
2. Orientation of the base and tower so that it tilts in the proper path.
3. The amount of clearance required in one or more directions from the base, for both erection and tilting.

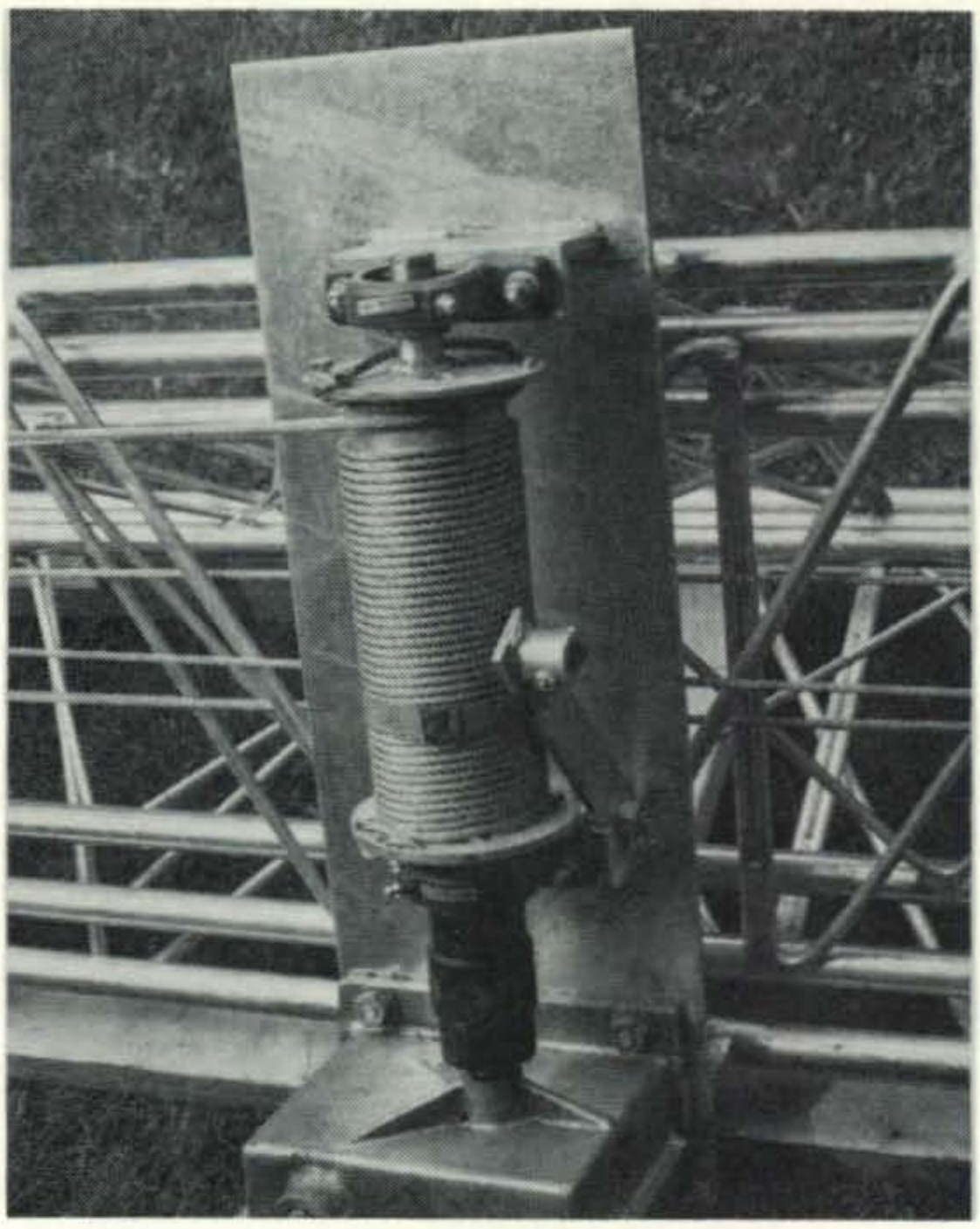
To determine the latter, you must obtain from the manufacturer the distance from the top of the tower (when fully collapsed) to the hinge point, and from the hinge point to the bottom of the tower. For this tower, these distances were 13½ feet and 8 feet respectively. To the upper dimension, you must also add the height of the mast—or, as I did, the height to the point where the beam would be attached, because I wanted it to lie entirely within my property when tilted.

While some makes don't require it, the Rohn system is such that you have to provide one-time clearance of the full collapsed length of the tower, in a direction 180° from the path in which it will tilt. This is due to the uniquely easy erecting system Rohn has used for many years. The photos show how it's done, but here's a brief explanation. With the base set in concrete, the tower is maneuvered into position on the ground so that the welded ears on the bottom of the tower match another pair on the bottom of the base. A pair of bolts is slipped through matching holes, a cable from the small erecting winch is attached, and the tower is cranked to a vertical position. Once upright, ears 8-feet up the tower mate with ears at the top of the base. Again bolts are slipped through. The hoisting cable is removed from its erecting position, rerouted through another pulley at the bottom of the base, and shackled to the tower. The pair of bolts inserted in the first step is then removed and the tower is free to tilt *in the opposite direction* on the upper pair of bolts.

It is suggested that all holes be checked for bolt clearance before erection. I found that excess galvanizing had managed to solidify over part of the openings, and had to be removed before the bolts would fit. This can be done with a 1/2-inch rattail file, but I used a tiny grinding stone powered by a high-speed Dremel Moto-Tool, which did the job in moments. In addition, although the tower hardware is also heavily galvanized, I smeared



The tower is delivered assembled with hoisting cables already strung and attached to raising winch. Notice ears at bottom in foreground, for bolting to base. One of two ears on which the tower pivots for tilting is visible well above the winch.



Winch drive is by 40 to 1 worm gear. Crank is strapped to drum for shipping. Cabling is double; pull-down cable pays out as tower goes up. Hoisting cable winds on drum at same time. As tower is lowered, the reverse takes place.

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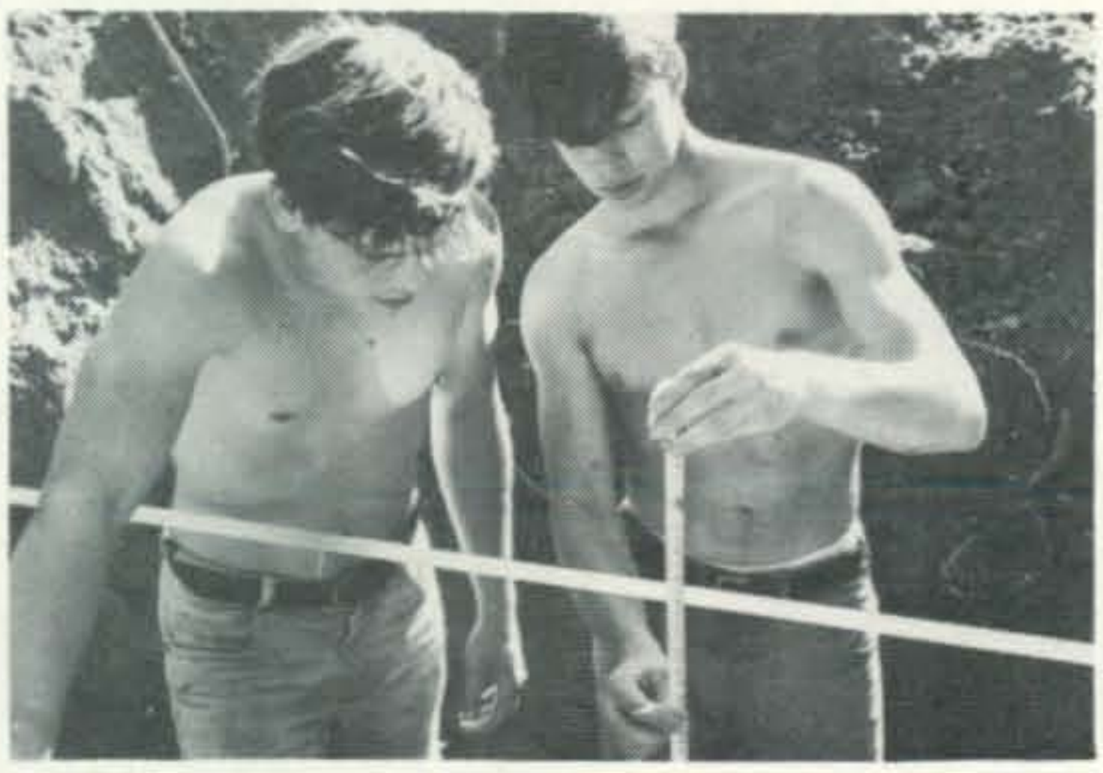
Massive base is constructed of heavy steel galvanized pipe and solid rod braces welded to uprights. Enclosed area in foreground goes into the concrete. The open vee protrudes above ground and enfolds the tower.

Careful locating of the base and the hole for it are absolute musts, as explained in the text. Two young huskies begin digging. A layer of clay was found right beneath the surface, probably from backfilling when the house was built. Pick was needed to break through it.



Hours later, the right depth had been reached. You can measure it accurately by laying a straightedge across the hole and dropping a rule from that point to the bottom. The sides of the hole must be square or even undercut.

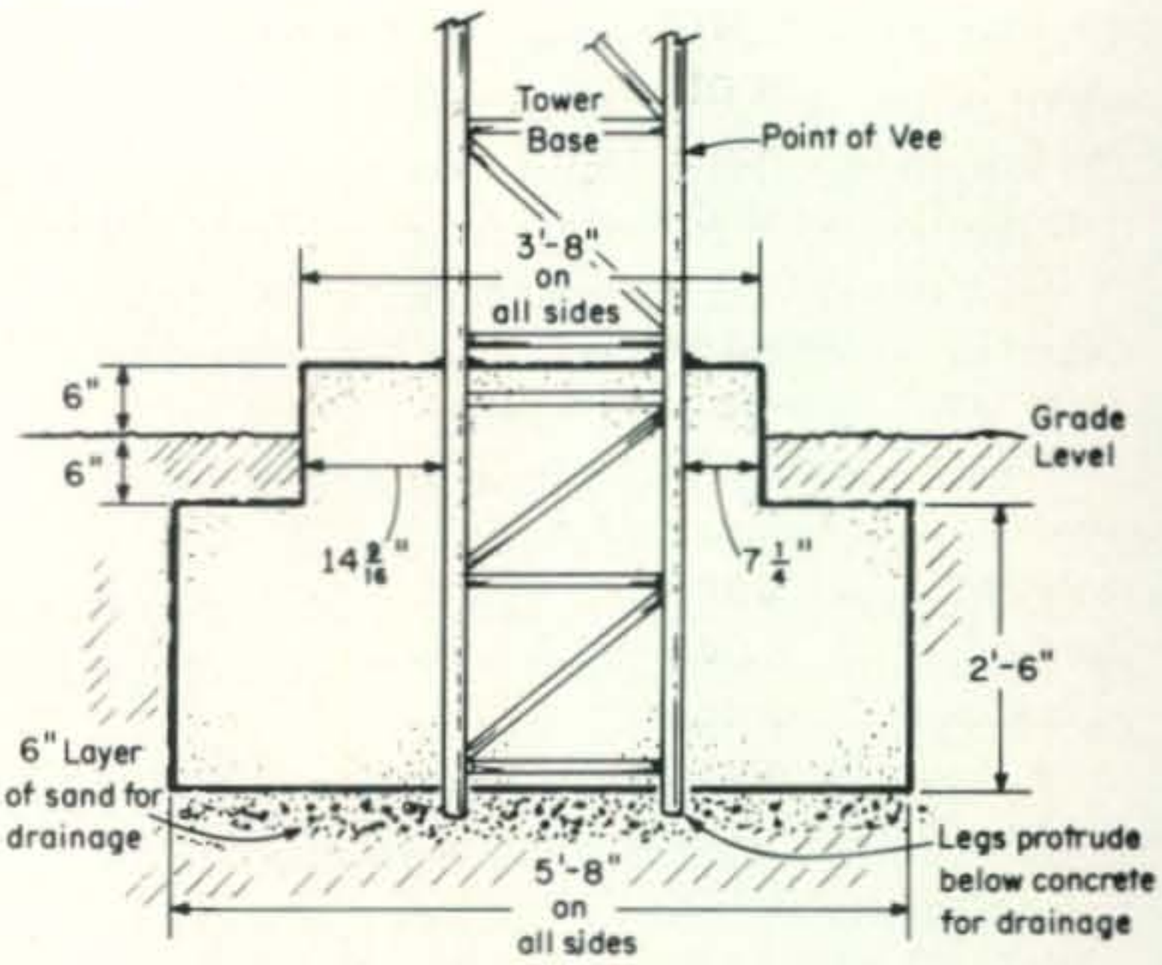


Fig. 1—Recommended configuration of poured concrete base for the author's 54' heavy-duty crank-up tilt-over tower when erected in sandy or unstable soil. Note that the tower base is *not* centered in the concrete to allow for the shifting center of gravity as the tower is tilted.

the bolts and nuts with a coating of wax-like waterproof graphite grease. I had used it on my old tower, too, and it stood up for eight years. The hardware came off as if it were brand new. The grease is made by Joseph Dixon Crucible Co., Jersey City, N.J. and can be identified by its consistency. It is as stiff as paste wax, if not more so, and should last practically forever. Ordinary grease will wash away and need renewal. I also used this grease for all mechanical hardware on the antenna—perhaps an unnecessary waste of time, but I know that anything I ever want to remove won't fight back.

My problem was further compounded by the fact that a couple of trees grew within antenna span of the only possible place I could locate the tower. The trees were about 35 feet high—well above the nested tower height and would therefore interfere with assembling the antenna to the mast. More on that later. The XYL refused to let me cut them down, as that would destroy much of the shade in our yard. Furthermore, a third tree would interfere with the original erection of the tower, but that was easily corrected by lopping off a couple of its lower branches. Finally, the antenna would have to clear the roof and the end of the house as it described a descending arc when being lowered for adjustment or repair, because the elements on one side of the boom would have to come down in an area only about 8 feet wide, between the house and the hedge at the property line.

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To find the proper spot, I carefully measured the height of the roof where the antenna would pass over it in tilting, the distances to the hedges and the end of the house, all the while keeping in mind the tree that would be in the way when getting the tower upright the first time. These careful measurements were then plotted to scale on graph paper. Then I laid on a scaled-down cutout representing the tower and antenna to see what kind of clearance I had. It was close, but I could do it. This care paid off later. The tower fit exactly as I had planned, but cleared the house with only a foot to spare.

The point is important and worth emphasizing. Be sure to arm yourself with every fact you need to know. Be sure to have the manufacturer's complete installation instructions before you commit yourself to a site.

Erecting The Base

The first step in actual construction was staking out the location for the concrete slab. Here I had previously encountered a problem that, while not unique, is not too common, and brings in yet another factor which had to be considered. The soil of much of Long Island, especially the south shore where I live, consists of very fine sand just like the ocean beaches. In describing this to the Rohn engineers, they recommended a larger-than-normal concrete base. The usual size for this tower is a cube measuring 3½ feet on each side, less than 2 cubic yards. For my backyard beach club, however, a larger amount was suggested. The shape was to be a sort of squared off keystone. And because of the condition again, the steel base was not to be sunk squarely in the center of the block, as was the normal practice. Instead, it was to be placed offside, the better to withstand the strains and stresses of tilting and erection in what was, perhaps, an unstable soil. Fig. 1 gives the dimensions of this slap.

Okay—so now I staked out the slab. Then I found myself a couple of local huskies to do the hard work. The dirt they dug up made quite a pile. When digging any hole into which concrete is to be poured, go down only as far as you must. Avoid disturbing the earth below that point. However, if you do go deeper, for whatever the reason, and then must backfill, moisten (don't soak) the fill and tamp it down firmly. Let it settle for a few days before pouring the mix, in order to provide a base that won't sink later under the heavy load.

The base is set in the hole and positioned properly with respect to the edges. It is *not* set dead center (see text and fig. 1). Check orientation also to be sure of clearance for tilting. Tower tilts toward the point of the open vee.

Drainage for the pipe legs must be provided to prevent water from accumulating inside and rusting the pipes. Fortunately, the bottom of this hole was pure sand and nothing else had to be done. The base is seen here being leveled before the concrete arrives.

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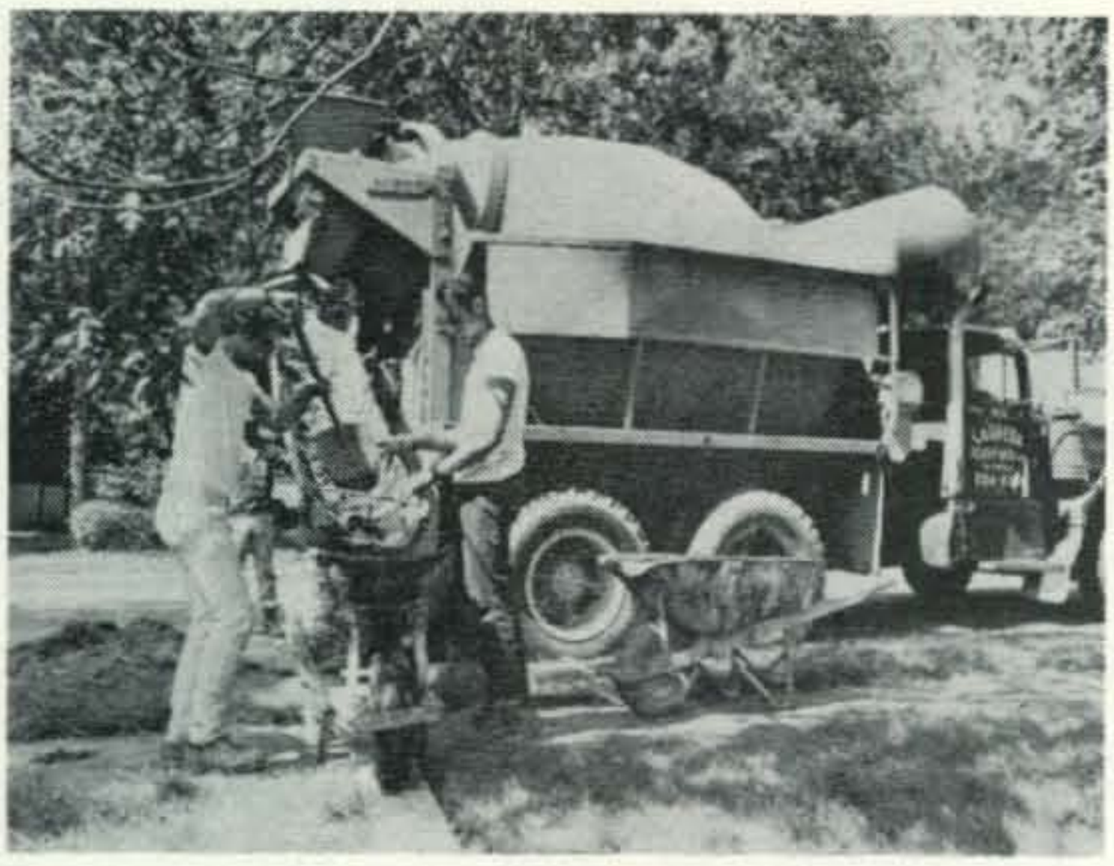
Half-inch reinforcing bars are wired together around the base, the vertical members being spaced about 1 foot on centers. Location is not supercritical. Reinforcing bars are also placed horizontally, right through the base. Wherever they touch the base, they are wired together.



The concrete truck arrived on schedule. The mix is a standard 3000 lb. concrete.

A big moment! The first wheelbarrow load is dumped into the hole. Throughout the pouring, the base was leveled frequently, and several times needed slight correction after having been disturbed by the force of the falling concrete.

Several 8-foot ground rods should be slammed into the bottom of the hole. When the tower base is placed, wire it to the rods with #8 or larger aluminum wire for good grounding. Level the base with care for the tower won't be plumb if it isn't just right. The Rohn base is designed to extend below the concrete to provide drainage for the pipe legs, so you have to include that in your calculations as well.

The last step before pouring was to build a criss-cross wire-tied cube of half-inch deformed reinforcing bars, according to Rohn's specifications. They formed a cage around and through the tower base. Bars and base were tied together with wire at each meeting point. The base was checked for level at each stage of the work. I cannot overemphasize the importance of doing so. It's bad news if you don't.

With all in readiness, the Transit-Mix truck arrived with a load of standard 3,000 p.s.i. concrete. This was brought around to the house in big wheelbarrows and dumped into the hole. Several times during the pouring, the base was checked and readjusted to the vertical from which it had been slightly moved by the force of the wet concrete falling into the hole.

Many barrowloads later, the level of the large part of the slab had been reached. Here's where I learned a new trick from the contractor. He built two L-shaped forms, placed them around the base on top of the fresh pour from which the reinforcing bars still protruded, nailed the ends of the L's together and had a nice square form for the

[*Continued on page 97*]

At this point, the top of the main slab has been reached and the mason is trowelling before putting on the form for the final pour. Note the tops of the bars protruding. The balance of the pour was made in such dim light that photos couldn't be taken.

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Towers [*from page 18*]

smaller top slab. More concrete filled the forms to the top and was then troweled smooth. Even though the additional concrete was poured right on top of the first batch the form didn't lift or budge at all. After it had set a bit, he edged the slab inside the form with a curved finishing trowel.

A couple of hours later, I set up a soaker hose around the base and left it on for a week. The slower concrete dries, the stronger it will be. The idea is to keep the water in the mix from evaporating too quickly. This is especially important in the kind of hot weather we had when the pour took place. In the winter, you must keep the concrete from freezing. This is accomplished by covering it with a thick layer of hay or straw with roofing paper over that. In extremely cold weather, you can get a special concrete mix that has some built-in antifreeze.

Now all I had to do was wait for the block to cure until it was strong enough to stand the stresses raising the tower would place on it. Concrete reaches about 75% of its maximum strength in 7 days when properly curing, so don't rush to raise the tower or you may find yourself with a few tons of cracked concrete—and then what do you do?

Here's another free bit of advice—if you're not doing it yourself, be there when the base is set and the concrete is poured. My contractor obviously knew how to handle concrete, but wasn't very good with figures. Had I not been present, the tower base would have been set about four inches deeper into the concrete than called for. It doesn't sound serious—but had this happened, the tower could never have been tilted and the tilt-base would have been a complete waste.

Next month we'll continue our description of the tower and beam installation, much of which can be accomplished while the concrete base is curing. ■

USA-CA [*from page 81*]

for All 3079 Counties—details soon, *and* it is thought that Jack Shipman W5DAU will soon decide to issue an Award for working him mobile in a required number of counties!

A telephone call from Reno, Nevada from Jack Carpenter, K8MNG to the effect that his friend, the Chief of Police of Carson City advised him that on September 4th, 1969, the County of Ormsby was taken into Carson City and that Ormsby is no more. A

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SAFE & SOUND

TOWER INSTALLATION

Last month's installment of "Tower Installation" described locating the tower base, and designing and pouring the massive concrete footing needed to support a 54' tower. Part I left off with the conclusion of the "Transit Mix" concrete pour. Part II, below, tells what to do while the concrete cures, and how, finally, to erect the tower-beam combination.

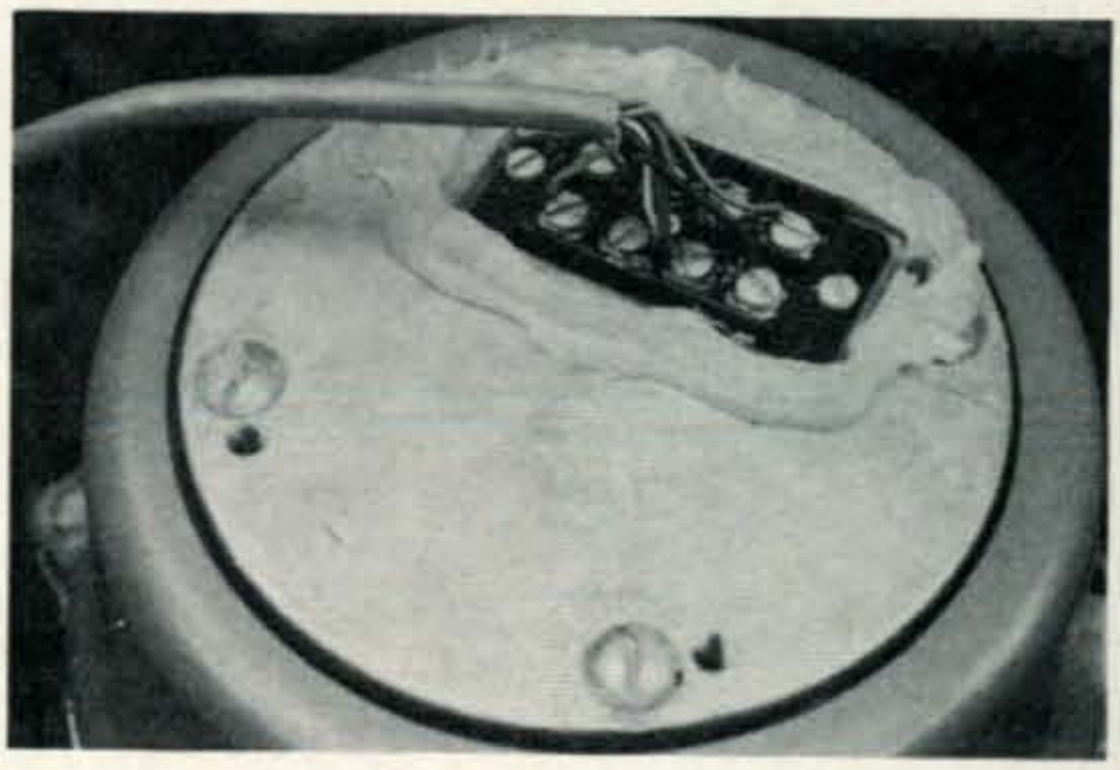
Part II

BY MORT WATERS,* W2NZ

WHILE the concrete was setting, as described last month, work proceeded elsewhere. First came the mounting of the rotator—the old standby, a Ham-M. Like many towers, this one had a platform below the peak that was predrilled for the Ham-M. In mounting it, I decided that I didn't like the idea of leaving exposed the terminal block on the bottom of the rotor, because of the inevitable corrosion. It would be open to weather in two ways—through the small gap between the rotor base and the tower plate, and through the opening in the tower plate through which the cable dropped down.

There's a rubbery stuff called Silicone Seal sold in tubes in any hardware store. It's weatherproof, very tough and stays permanently pliable—an ideal gasketing material. A bead of this sticky stuff was squeezed out around the terminal block and allowed to dry. When the rotor mounting screws were tightened, they compressed the sealant tightly, closing the gap around the terminal block. The other end of the cable had been fed through the opening in the tower plate. Then, strips of tape were criss-crossed around the cable over the opening, overlapping its edges a bit to provide a foundation for more sealant, which was then applied generously over the tape and beyond its edges, so that it would adhere directly to the metal instead of relying on the tape for bonding to the plate. This too was allowed to dry, while the big thrust bearing was bolted to the top of the tower.

The Ham-M is designed for a mast of 2 1/16" diameter. The 10-footer I received with the tower measured only 2 inches, to match the thrust bearing. For proper centering, two shims of 1/32-inch stainless steel were placed in the vee of the rotor's mast mount, one on each leg of the vee. If you ignore this, there



Terminals on base of rotor required sealing to prevent corrosion. Silicon sealant was used in a 1/4" thick bead around block and allowed to dry. Holes for bolts which fastened rotor to tower must be kept free of the sealant, as at the right edge of the block. Screws, like one in foreground, were given coat of silicon to lock them into place.

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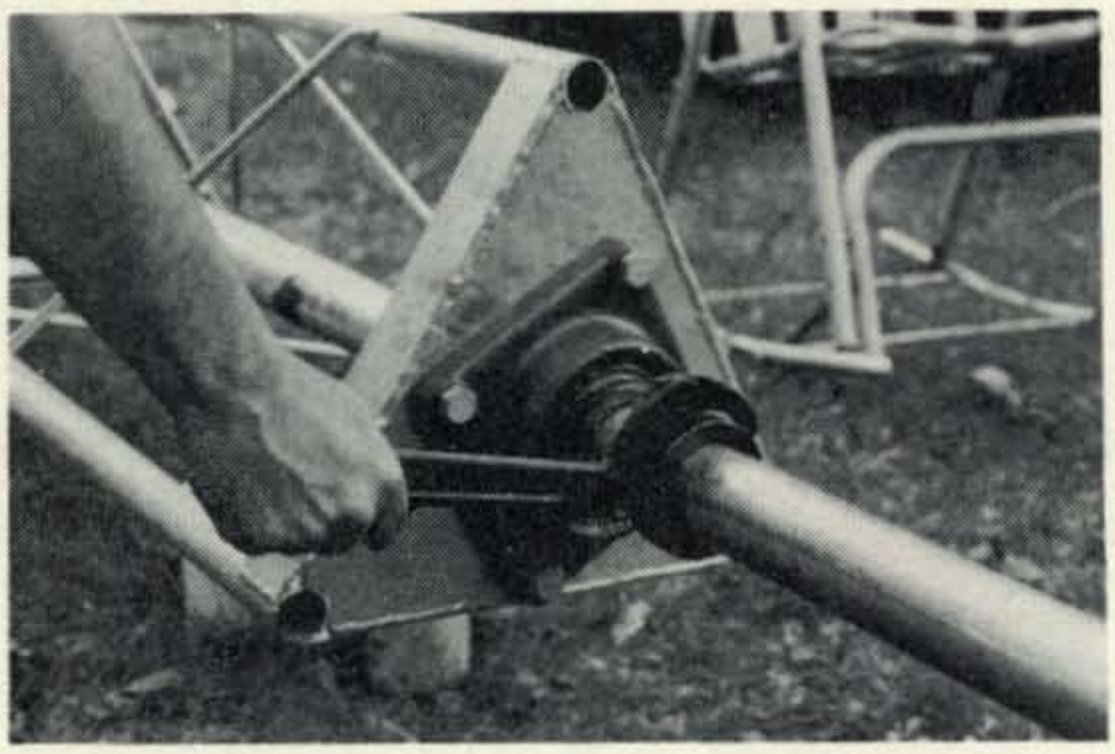
will be a severe strain on the rotor every time you turn your beam. When correctly installed, and with the thrust bearing taking the entire vertical load, the rotor supplies turning force only and should last until there's no more DX to be worked.

A separate part of the bearing—a heavy steel collar—fits over the mast and is locked to it with a large Allen head setscrew. Then, as the mast is seated in the rotor clamps, the collar fits on a race and becomes part of the thrust bearing. The two pieces are locked together with a special tool (see photo) called a pin spanner. I bought one just for this photo, but you can do the job by driving the collar tight with a punch and a hammer.



A pin spanner, which is what this odd-looking tool is, is a hard tool to locate. It fits around the thrust collar and jams it home on the thrust bearing atop the tower.

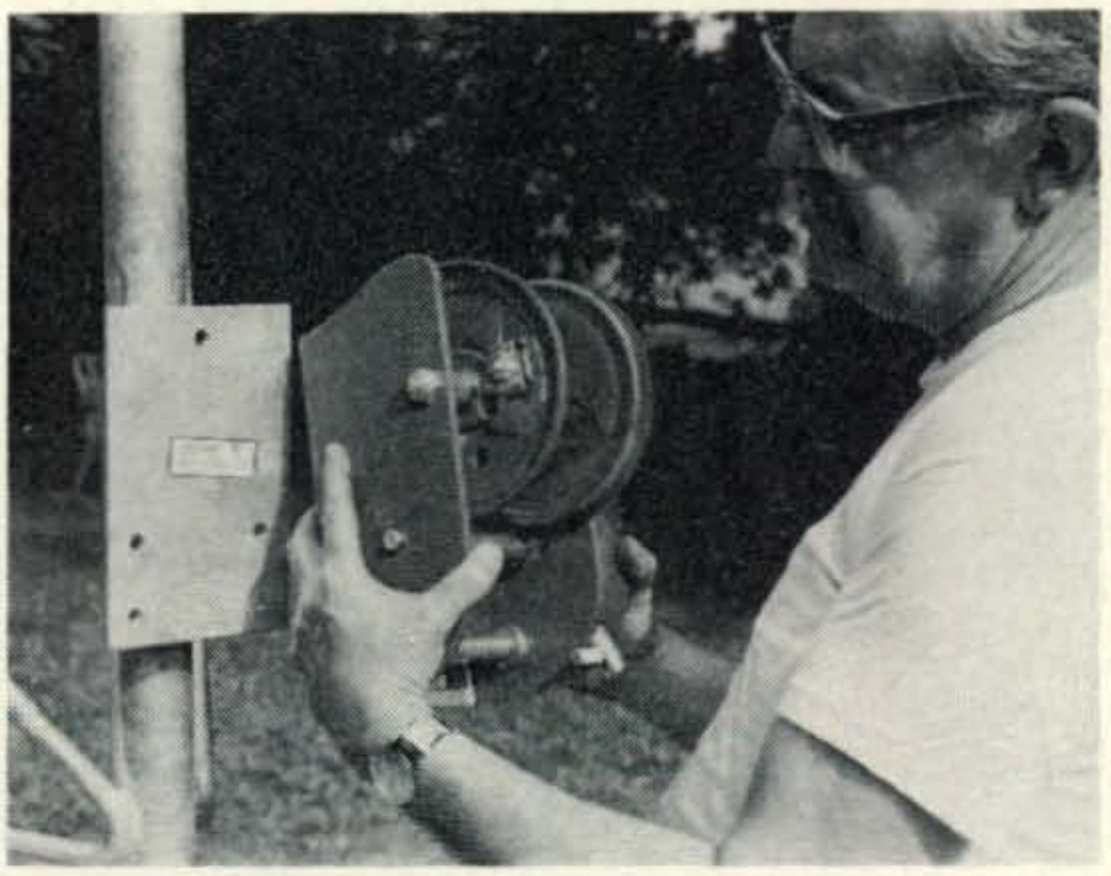
Erecting The Tower

What I thought would be the most difficult part of the project was really one of the easiest. This tower is heavy—it weighs about 520 pounds without rotor or mast, and the base is 205 lbs. more. Getting it off the truck and into the backyard took a lot of hands and plenty of groaning. I thought getting it into position against the tower would be just as hard. The tower had been deposited about 10 feet away from the base and was lying on the wrong side of the triangle, so it had to be moved closer and rotated 120° on its longitudinal axis before it could be hoisted erect.

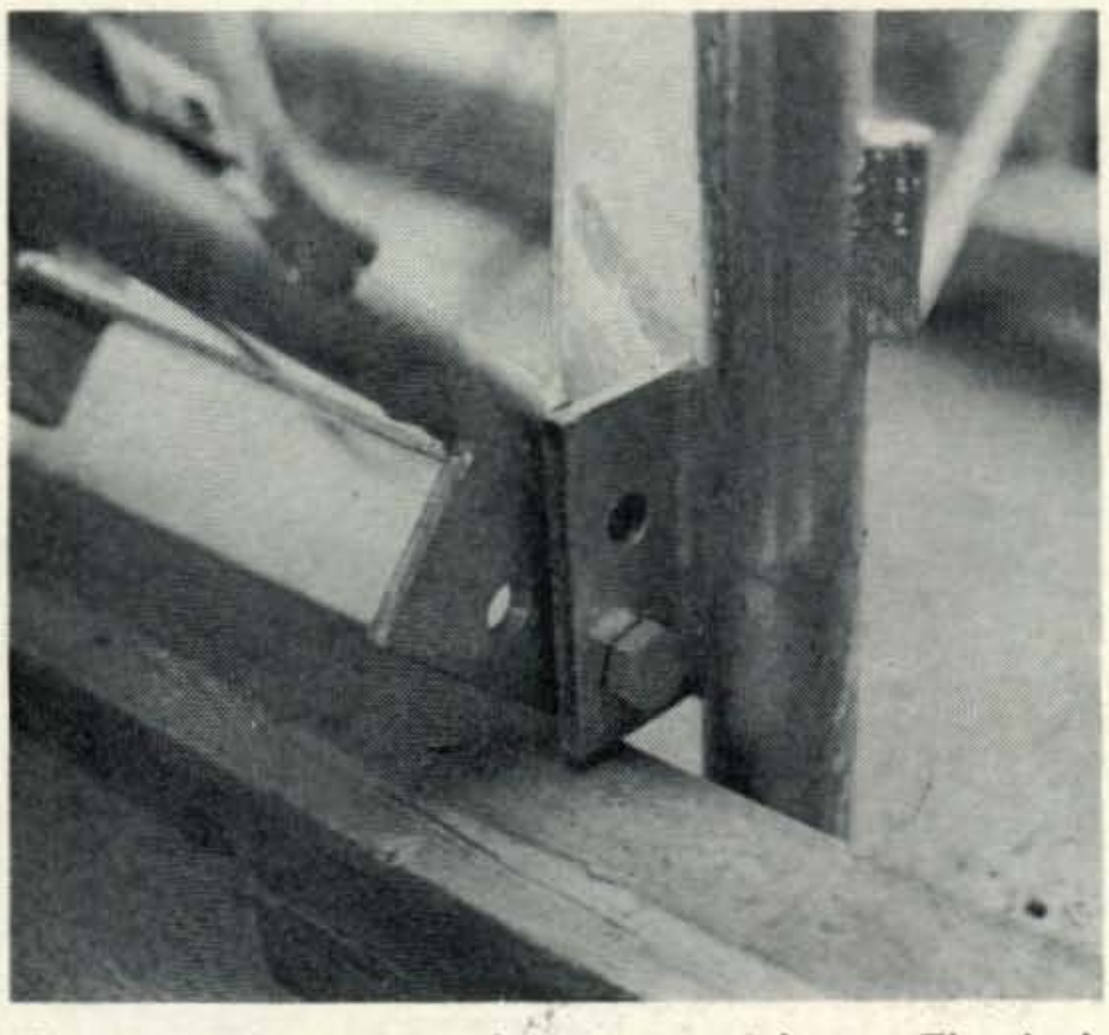
To prepare for this heavy task, I had asked some of the locals to drop by the following Saturday for a lifting party, but the previous evening I looked at it again and got an inspiration. If the erection winch was powerful enough to pull the thing upright, why couldn't it horse the tower into position? Only trouble was I didn't want the far end to drag on the patio where it rested—not that I was worried about the patio, but I didn't want to scratch up my shiny new tower!

It took a few moments to jack up the far end, and slip a dolly under it. Then the winch cable was run through the top pulley, shackled to the tower, and I began cranking. The tower moved smoothly over to the base. Eureka!

Now I just had to rotate it so that the desired side was facing down. Removing the cable shackle, I refastened it to one of the other legs which, when hoisted far enough, I could see, would cause the tower to turn as I wanted it to. The top end, however, would twist over on the patio with a crash unless I cushioned it, so I placed a piece of scrap plywood alongside the top where it would fall.



Small in size but big in capability, is the winch that erects and tilts the tower. The author is shown here about to install it on the mounting plate at the point on the vee, on the base. Tower was hauled into position by this little winch.



Closeup of mating of tower and base. The bolt heads are 1 inch across, just to put the whole thing in scale.

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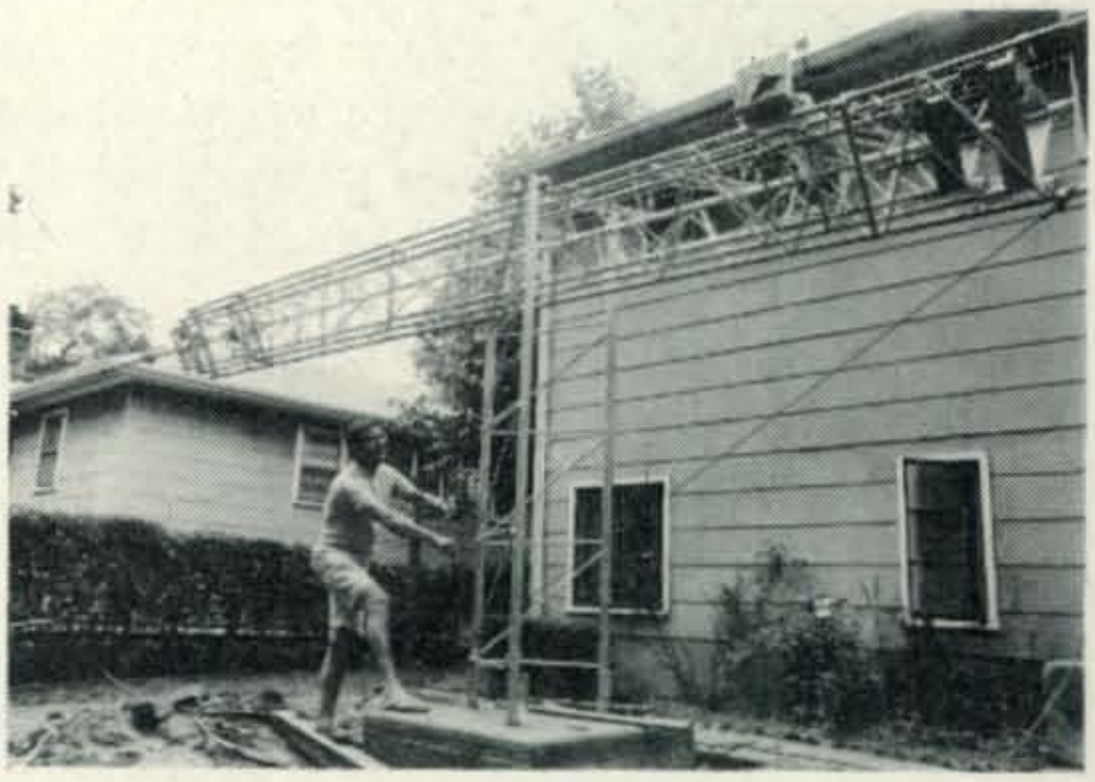
Matching ears at bottom are bolted together and winch is cranked. Tower comes erect smoothly. Tree in background interfered at this point and a couple of branches had to be removed.

Once again, I began hoisting. The part of the tower near the base lifted slowly, up and up, but showed no sign of turning. I continued cranking. Little by little the tower began to twist in the direction I wanted. Suddenly, the force I was applying through the winch overcame the tower's inertia, and with a loud thud it turned over. A quick examination showed that there was no damage. I don't recommend this method unless you're as impulsive as me or can't get any help—but I proved it can be done by one man in just a few minutes.

The rest of the job was even easier. Again using the winch, I hoisted the tower until the ears at the very bottom came up level with those on the base and mated. Then the first pair of bolts were slipped in, as previously explained. The cable was unshackled and moved into erecting position, as shown in the photo. Cranking the winch began, and the tower came erect slowly but surely. This winch has a 12 to 1 gear train, each turn of the drum reeling in perhaps six or seven inches of cable. With that much mechanical



The tower has gone through the vertical position and is now pivoted in the opposite direction. First bolts have been removed, and tower is swinging on bolts at very top of base. Notice that same winch is now doing the work, but the cable has been rerouted through a second pulley at bottom. That's W2MUM on the winch handle.

advantage, it really doesn't require a lot of effort to do the work.

Antenna Assembly and Installation

According to the instruction manual, there are three suggested ways of installing the TH6DXX. None of them would work for me because all involved at least partial assembly on the ground, and there simply wasn't room in my backyard to attach even one of the large elements to the boom. Here's where the tower's tilt feature proved its value in yet another way. The boom is in four pieces which bolt together. I could put it together right on the mast and attach the elements as I progressed.

To begin, I assembled the boom on the ground. There was room for that. Then I assembled the element clamps loosely and slid them into their approximate positions on the boom. With the help of the dimensions given in the manual, the distance between elements was carefully measured and marked with strips of masking tape around the boom. Each was identified by marking with pencil right on the tape. The beta match parts were attached to the boom also. The boom was then disassembled and stored.

The elements were then laid out on the ground and assembled with much checking and double checking of the measurements. Each element consists of two halves, one for each side of the boom. Each half is made up of two or more pieces of tubing and/or traps, and assorted clamps. To assure the

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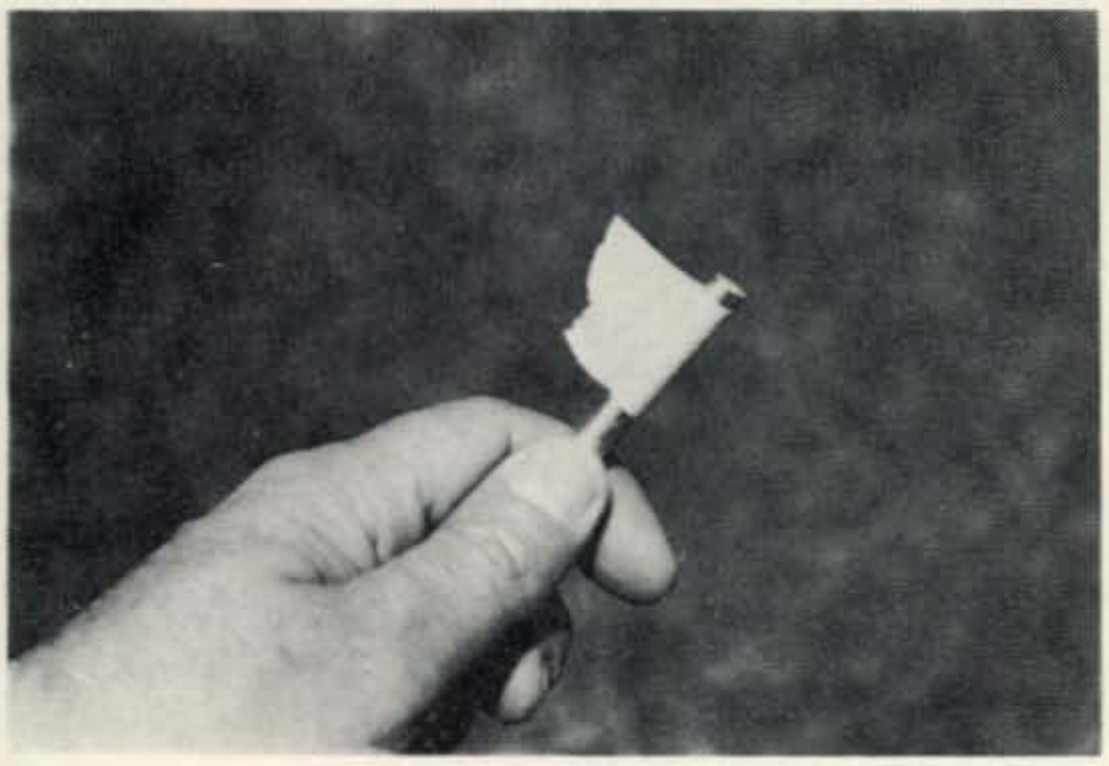
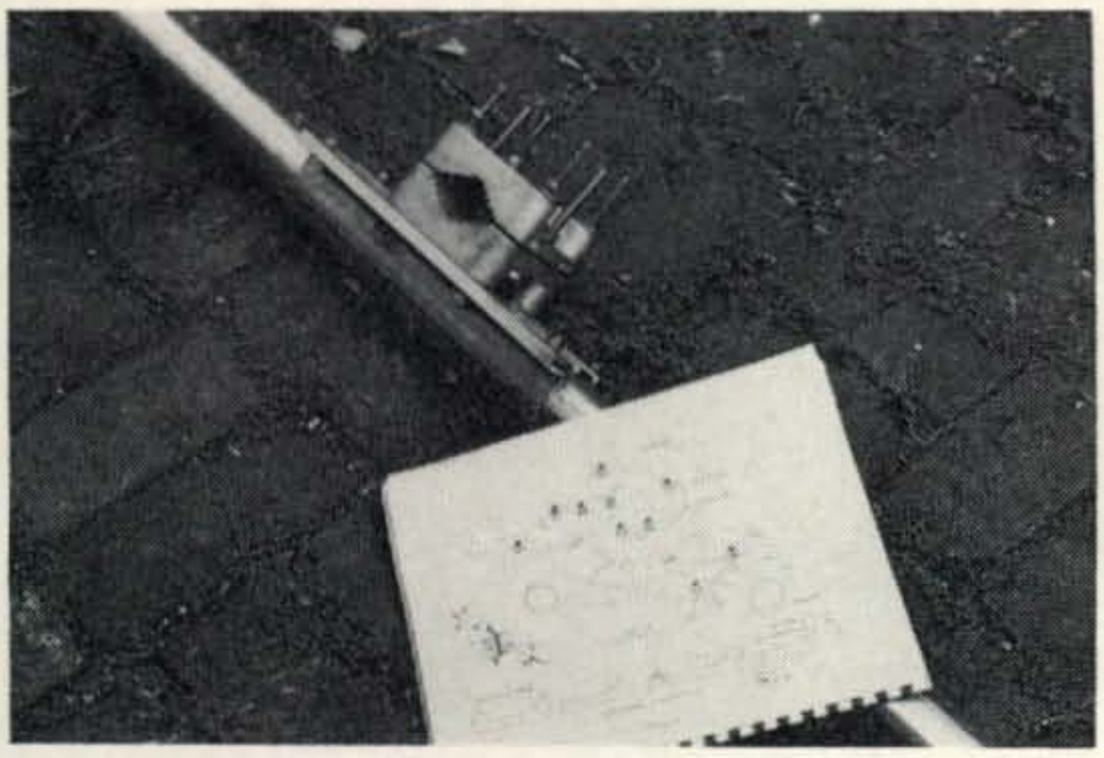


The elements of the 2 meter antenna have to be cut to length. The aluminum rod is easy to work with a hacksaw, but you might try this little trick to make cuts more accurately. The element was measured and masking tape rolled onto it to indicate cutting line.



Massive boom clamp and two central sections of boom of TH6DXX are assembled on the ground, then attached to mast. The instruction manual shows how with clear diagrams.

Mac attaches the guy wires which run from a fitting 3 feet above the boom to support the TH6DXX. Guys are clamped securely at both ends. Hy-Gain BN-86 balun already mounted here had to be moved later to shorten the leads from it to the driven element. It's the little box right below the boom clamp.

best electrical connection between elements, I went beyond the instructions, steel-wooling the surfaces where they would join, then coating them liberally with Penetrox A, a conductive grease especially formulated for aluminum. The clamps were then tightened. Don't get overambitious when you tighten yours, as I did. The heads of the first two clamps crews twisted right off because of the excessive pressure I applied with a pair of Vise-Grip pliers. Putting the elements together took nearly a day. When through, they were stored indoors to keep them dry. In assembling the elements, keep all drain holes oriented in the same direction, and remember to clamp them to the boom later so that the drains will face down.

My antenna plans also included an 8 element job for 2 meters, the Hygain Model 28. It was so easy to assemble it took only about a half-hour, so I won't go into that here. Worth mentioning, though, is that this antenna's boom clamp requires a thinner mast than the one I had, so I fitted a stub of smaller diameter to the top of the big mast and bolted them together in wo places.

The two meter antenna would be on top of everything and relatively inaccessible because of the much longer boom of the TH6DXX, so it was installed first. The coax was then attached and taped to the boom and mast.

At this time, I also provided for a 7 and 3.5 mc antenna to be hung from the top of the tower. A piece of 1½-inch thickwalled aluminum pipe about 4 feet long was

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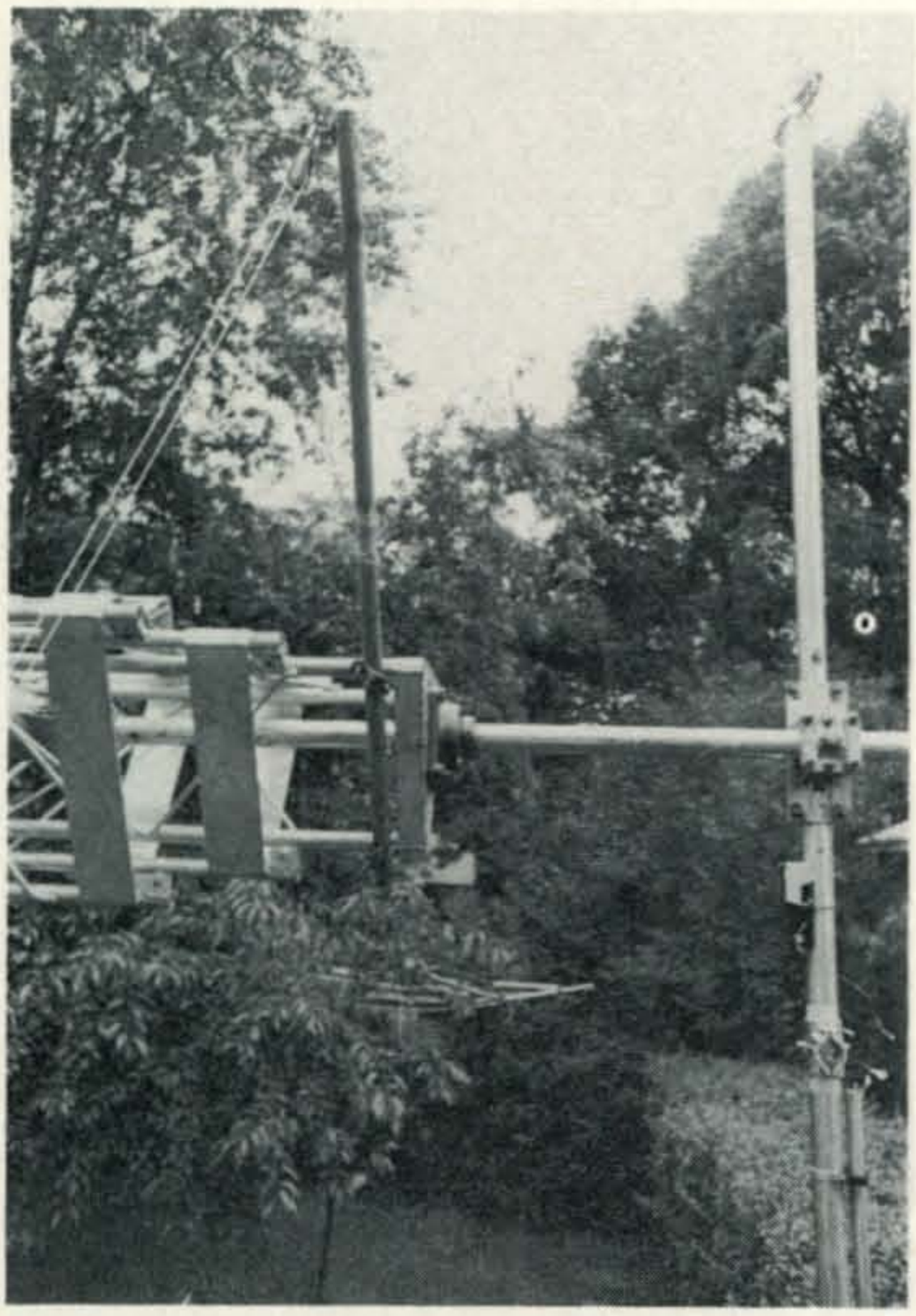
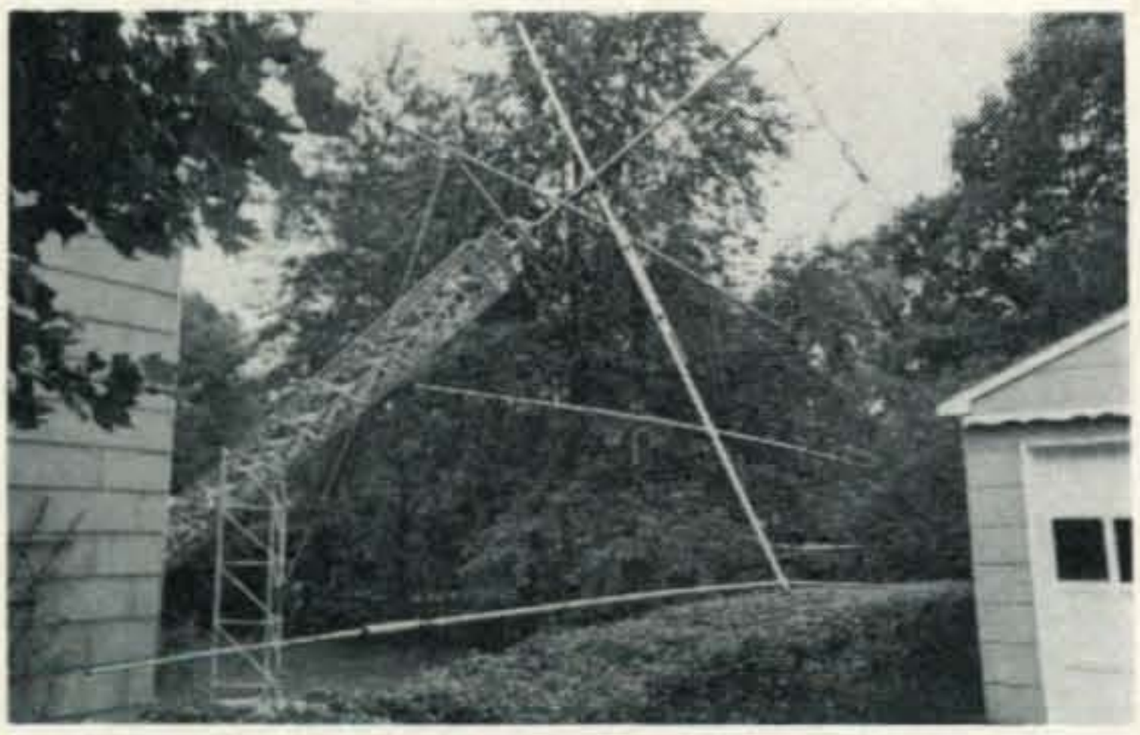


The 4-foot piece of pipe clamped to the end of the tower will support a 40 and 80 meter inverted vee antenna. Pully and lanyard for hoisting that antenna up and down are already affixed.



This photo taken from neighbor's yard shows how half the big beam looks now that it's ready to be hoisted up. The hedge is inside my property line.

With all work completed, the antenna is on its way, all the way up. I rented a huge industrial 3/4-inch electric drill, chucked it right on to the winch handle and pulled the switch—and up she went! Beats hand-cranking by a mile. That 40 to 1 reduction on the winch means perhaps 1200 to 1500 spins of the crank—now you know why I want to motorize it.

The balun was loosened and moved over, jammed against the driven element bracket. As a result, the connecting wires were shortened at least 3 inches each. Further tests of the antenna after this change indicated proper operation.

clamped horizontally to two legs of the top section of the tower right below the platform that carried the thrust bearing. To this was attached a pulley and a lanyard long enough to reach the ground with the tower fully extended. Later, when everything else had been done, I hung a balun from the lanyard and tied the antenna to it.

Now, came the big beam's turn. The massive cast aluminum main clamp was pinned to the mast and two pieces of boom were

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Tower Installation [*from page 50*]

bolted into it, one on each side of he mast. Next, a BN-86 Hygain balun was hung from the boom, but I didn't use my head in locating it. As it turned out it was so far away from the driven element that the leads which connected the two were too long. Don't make that mistake. Mount the driven element first, then jam the balun up against it, to keep the leads as short as possible. When I checked out the beam later, the s.w.r. was too high, but when the balun was moved and the leads shortened the results were as expected.

Once the driven element was clamped, using the masking tape marks as a locating guide, the tower was raised far enough to attach the remaining piece of boom that belonged on that side. Then both the reflector elements were fastened, again using steel wool and Penetrox at the clamps.

Now half the antenna was done. The tower was winched upright, and the main winch was worked until the antenna rose above the interfering trees. It was then rotated 180°, the tower was lowered all the way and tilted again for access to the other side of the boom.

The three directors were then attached to complete the assembly. With all work done, the tower was again hoisted erect and raised to its full height. What a sight! One neighbor even said, "What a beautiful tower!" Of course, men in white coats came for him next day.

Results have been gratifying. With 600 watts input, I have been able to work nearly every DX station I want on the first or second call, even in pileups, including a couple of AP5's and a 3V8 that had a really huge group calling him. VK's, ZL's and JA's have given me consistently excellent reports. Even with the antenna resonated for c.w., I have ventured on to s.s.b. a few times, enough to know that results there are better than I have any reason to expect. For instance, on s.s.b. I worked A2CAH (Botswana) on the very first call with 5 × 9 report.

My thanks to all the gang who pitched in one way or another—Mac, WA2DEV; John, K2QAI; Joe, WB2NLM; and Elliot, W2MUM. Also to Ezra, K2UUJ for his moral support. Thanks too to the gang at Rohn, Hygain and Cornell-Dubilier for their advice and cooperation in answering my many questions, and to the many DX stations who took the time to give me comparitive reports. Most of all, though, to Rosalie, my XYL, who patiently sat through four boring (for her) weekends while I was working on this project, and even volunteered her help at various times, including typing this long manuscript. ■

CQ ADVERTISING RATES

Each month our advertising department receives numerous requests from readers for advertising rates. We've decided that we can save everyone some time by listing those rates right here. The costs per ad will vary, depending upon the number of ads run during a twelve month period. Advertisers may earn a rate from *the time the first ad appears*, rather than being obligated to run on a calendar year basis.

	1 or 2 times	3-5 times	6-11 times	12 times
Full Page	$525.00	$470.00	$430.00	$385.00
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3/16 Page	106.00	101.00	97.00	93.00
1/8 Page	80.00	75.00	70.00	65.00
1/16 Page	40.00	38.00	35.00	33.00

Costs for second color are $75.00 per ad. Bleed charges are $50 per page, $35 per fraction. Ad copy should be submitted by the 15th of the second preceding month; i.e., April issue closes by February 15th. For additional information or assistance contact CQ advertising department.

OSCAR News [*from page 61*]

Typical of the many interesting observations reported are the following contained in the log submitted by K1HTV of Meriden, Conn.

"The period calculated here after 60 orbits is 115 minutes 5 seconds. The westward progression at the equator appears to be 28.66 degrees per orbit.

"Ten meter modulation is very low and very different to copy. Maximum 2 meter signal heard so far has been 27 db above the noise.

"I have sometimes noted that when the 10 meter signal is nearly overhead it drops out completely for a while. The F layer of the ionosphere is probably shielding the signal from the earth until the satellite moves up or down range a bit. When 10 meters has been open, I have heard the 29.450 mc signal as far down range as the island of Gough in the South Atlantic, and as far to the northwest as the Asian mainland at 200 degrees west longitude and 55 degrees north latitude. No skip reception has been observed on 2 meters, although I have listened carefully for it.

"The 2 meter frequency goes from 144.0485 up range to about 144.0437 mc down range if my calibration is correct, with the greatest variation noted on overhead passes.

"My observations tend to show that the W1AW

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