Home Brew Tilt-Over

-- the water pipe special

Max Holland W4MEA
Hiwassee College
Madisonville TN 37354

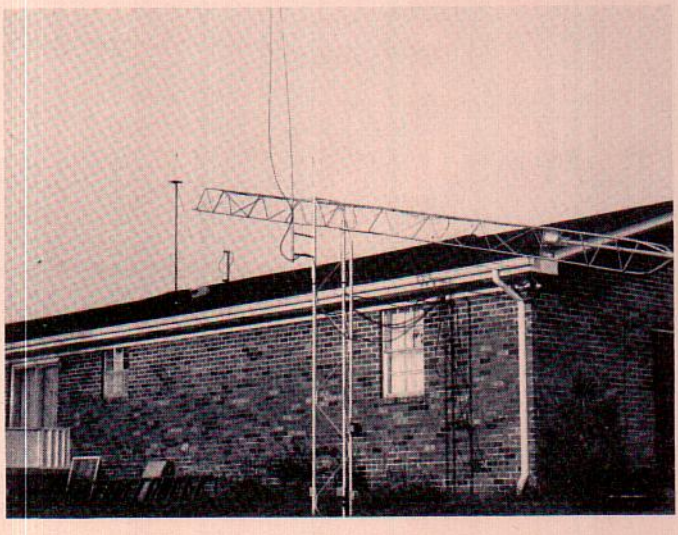
A primary disadvantage of antenna work is the need to constantly climb up and down the tower. A tilt-over tower is very desirable; however, the expense is often prohibitive. If a person has access to a fairly heavy-duty welder and is interested in building his own tower, this design seems to be a fairly good compromise between height and convenience. The very tall towers have such extreme weight when tilted over that they require some heavy-duty cable and construction.

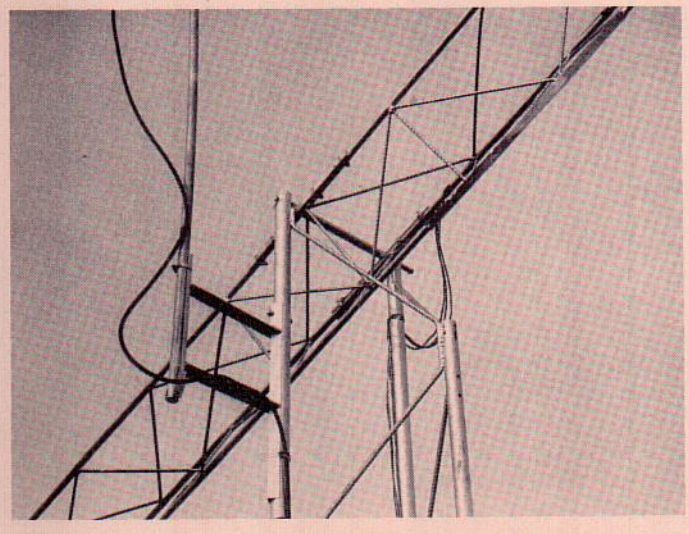
This tilt-over tower was constructed using galvanized water pipe and reinforcing bars (called "rebars") purchased at the local junk yard. The total cost, not counting labor and the welding expenses, was approximately $100. The dimensions given in the accompanying diagram will be of great help in getting started.

Basically, the construction consists of determining the dimensions of the base section and making up two plywood forms with the holes drilled in the shape of a triangle. One and one quarter inch water pipe is put in the holes, and the rebars are cut and tack-welded in place. The final welding is done after the necessary alignment has been checked.

The base section calls for one cubic yard of concrete. The hole was dug 3 feet by 3 feet by 3 feet. Gravel was put in the bottom of the hole, and the legs of the lower section were put down into the gravel to allow for the drainage of any accumulated water. Wires were attached to the legs of the tower, and additional rebars were placed in the sides of the holes at this time.

After the concrete has set, the top or tilt-over section of the tower is hoisted into position, using the cable and winch attached to the tower. After the top is placed in position, a 5/8 inch diameter bar is required. Then the cable and the winch can be moved to the end of the tilt-over section of the tower, and the tower can be pulled up into a vertical position. A





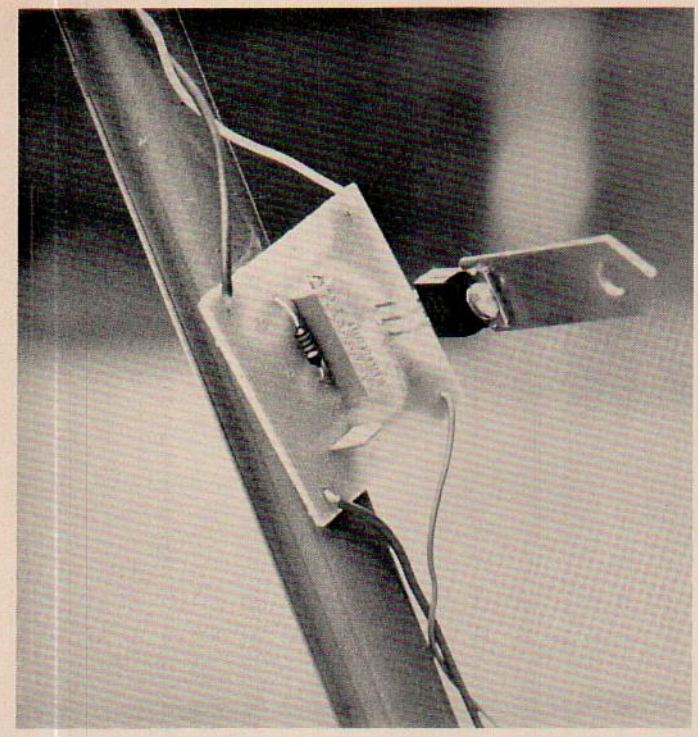


Fig. 6. The Gunn oscillator voltage regulator. A National LM-317 variable regulator, set for 10 volts, is used. The PC board and resistor are part of an evaluation device from National Semiconductor. The regulator is mounted on a leg of the tripod in my experimental system.

Fig. 7. Not a Martian, but a Gunnplexer transceiver rf head. The i-f amplifier and power supply is at the base of the tripod. Two transceivers should be separated by 25-50 feet for initial test. Ultimate range is 50 miles with this system.

resistors in series with a 9 volt battery. The varactor bias is developed at the slider. The negative side of both the Gunn supply and bias supply should be connected to the body of the Gunnplexer. I mounted the Gunnplexers to standard photo tripods by making a simple mount out of copper flashing. Drill two ¼" holes in a 2" piece of flashing to line up with the bottom screws holding the Gunn baseplate to the Gunnplexer body. Bend the flashing around the bottom of the Gunnplexer, and sweat-solder a ¼" nut to the flashing. The nut will mate with the bolt built into most tripods.

Tuning Up

My system consists of two Gunn transceivers. When initially checking your system, position the two transceivers about 50 feet apart, facing each other. Adjust the bias supply so that about 4.5 volts is present at the varactor diode on each transceiver. Apply Gunn voltage. If a 0-500 mA meter is available, check current drain. The Gunn diodes should draw about 225 mA at 10 volts. This is not standard; different diodes draw slightly different currents. Adjust the varactor voltage divider on *one* transceiver. Tune very carefully until the receiver quiets — there, you're on 10.25 GHz! This system is full duplex — you will hear yourself in your receiver when talking. Occasional tweaking of the bias will be required to keep the transceivers locked . . . however, once they are temperature stabilized, remarkable stability will be noted with a 100 kHz i-f.

At this point, you will probably begin experimenting with the transceivers. Try reflecting the signal around a 90 degree corner with aluminum foil. I won't even attempt to suggest experiments and applications — if you've followed me this far and built a system, you don't need my prodding! However, I will be continuing this series with practical experiments and applications involving radar. Don't keep us in the dark, however. I would appreciate hearing from anyone experimenting with Gunnplexers and will welcome articles featuring the device. Write me, in care of *73*.

A Word of Caution

If you have been following my editorial in *73*, what follows will be repetitive. Microwaves are potentially dangerous. Do not needlessly expose yourself to the microwaves generated by the Gunnplexers. Although the level is very low, why take a chance? Opinion concerning microwaves varies, but one fact is certain: Microwave radiation can damage the tissues of the eye. The effects are cumulative, so treat the Gunnplexer with the same respect afforded a high voltage plate supply. *Never* look into the horn of an operating microwave transmitter. Avoid looking at the mixer diode in a Gunnplexer while it is operating; if you see it you're being exposed. I personally do not stand in front of a Gunnplexer at distances under 25 feet. When operating indoors, I use a cheap police radar detector to monitor the Gunnplexer — it's too easy to leave the Gunn supply connected . . . no noise is generated by a Gunn diode! Happy experimenting!

Interesting effects are liable to occur if you operate your Gunn transceiver mobile in a police radar zone. Their radar is broadband by nature, and will respond to your legal microwave transmission, exactly as my detector responds to "out of band" signals from the Gunnplexer. Have a copy of your amateur ticket available — I would hate to learn that your transceiver was impounded. Newfangled devices, what's the world coming to?

I would like to thank Dana Atchley, Jr. of Microwave Associates and Bob Brown of VHF Engineering for their advice and suggestions. ■

References

Gunnplexers are available from: Microwave Associates, Inc., Burlington MA 01803.

VHF Engineering products from: VHF Engineering Corp., 320 Water St., Binghamton NY 13901.

yoke, in which the tilt-over section of the tower lies, is then made, secured by at least 6 stainless steel clamps (the kind used on automobile water hoses). A more suitable method of attachment may be used; however, this method provided good side clearance between the tilt-over section and the base section. After two years of use, it seems to be more than adequate for the weight involved.

The total height of the tower is around 35 feet. The top section was made out of conduit tubing, for the additional benefit of light weight. Three quarter inch conduit fits over the one half inch galvanized pipe used for the tilt-over section. Once again, rebars were put into the tower section in triangular shapes for additional strength where the tower bends. Additional rebars and reinforcement were used to keep the tower from collapsing at that point.

A metal plate was attached inside the tower and a CDR Model AR 22 rotator was mounted. A Model 44 or Ham-M rotator could be mounted in the space, but the holes for the mounting plate would have to be changed accordingly. The pipe upon which the antenna mounts is 1-1/4 inch aluminum with the topmost part being 1-1/8 inch aluminum tubing.

The tower was given a coat of aluminum paint, and seems to be holding up fairly well after 2 years. The aluminum paint will probably last 3 or 4 years. The total time to paint the tower (considering all the small and minute parts) amounted to about 6 hours. Spray painting could be used if desired.

The winch is sold by Sears, Roebuck and Co. The cable is rated at about 1500 pounds.

As an additional safety precaution, when the antenna is in the vertical position, a heavy-duty chain and lock is wrapped around the legs of both sections. The triangular shape of the leg braces for the base of the tower discourages the climbing of the tower.

The feedline for the antenna can travel along the legs of the tower. There is enough clearance between the two sections to tape the coax cable directly to the tower. The bracket mounted on the side of the tower (see photo) is used to support a 10 foot long pole, which is used as a center support for an 80 meter wire dipole. ■

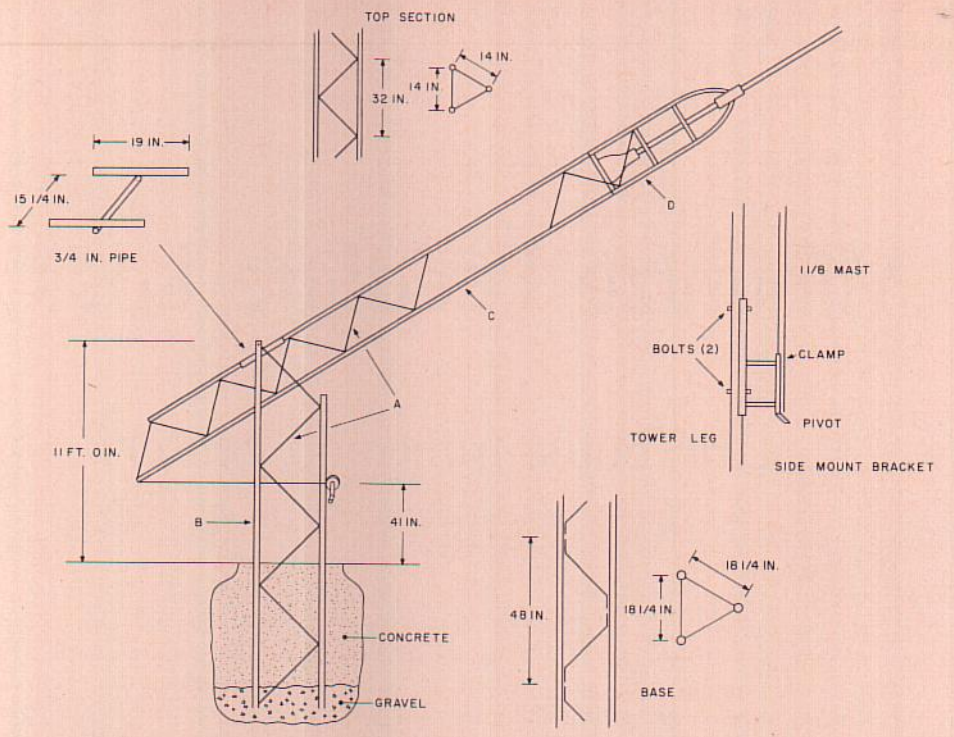
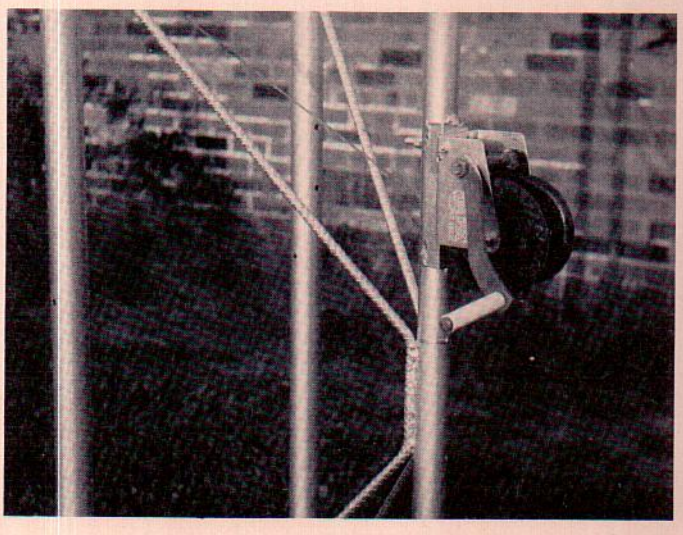
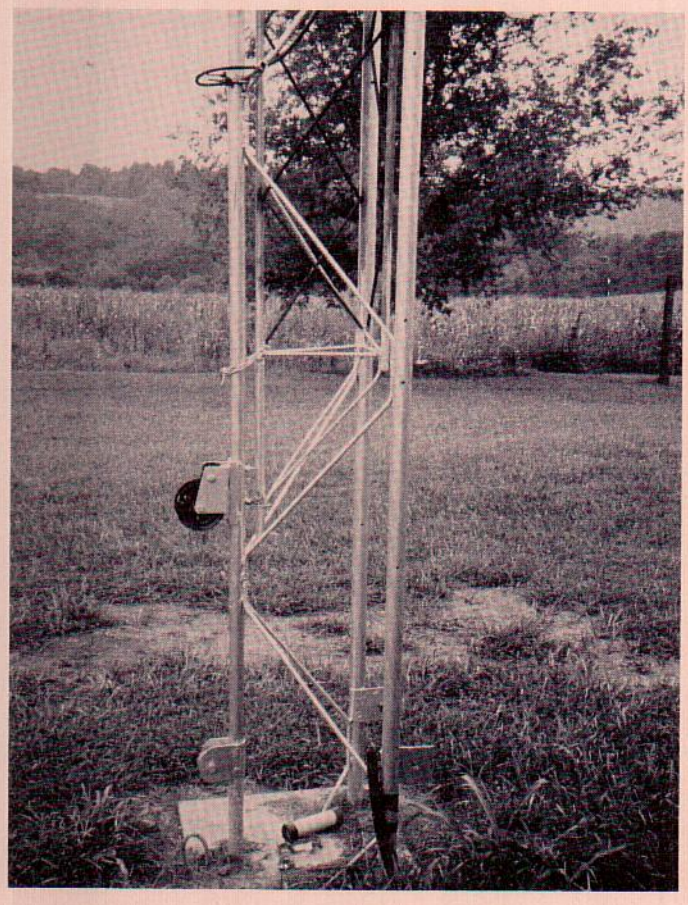



Fig. 1. A = 3/8" rebar. B = 1¼" galvanized pipe. C = ½" galvanized pipe. D = ¾" conduit tubing.