The VK3ATN Moonbounce Rhombic

Wayne Green W2NSD/1

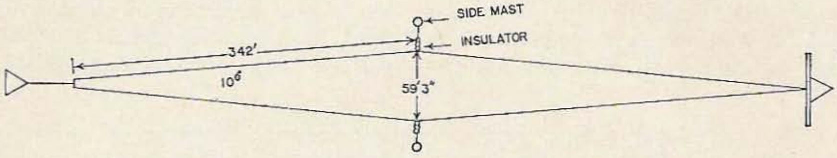

Fig. 1. The Moonbounce Rhombic doesn't require very high towers, the top of it being only 35' in the air. The ends of the antenna are tied to the two end towers and the slack in the wires is taken up by counter weights on pulleys on the side masts. A track on the tower in the forward direction permits the whole rhombic to be swung a few degrees one side or the other to permit aiming it at the moon and thus giving you four or fire days a month for bouncing instead of the one or two you would get if it were fixed. The side pulleys permit easy moving of the positions of the side wires to keep the antenna in shape. Ray tried apex angles between 8° and 12° and found that 10° seemed to be optimum.

In January 1966, after being convinced by W1FZJ/KP4 that a long, long rhombic would have the gain necessary for moonbounce on two meters, even with the 150 watt power limit of Australia, Ray Naughton, VK3ATN started researching the published data on these antennas. It was sparse indeed. He worte to some "authorities" to find out what he might be able to expect from, say, a 50 wavelength long rhombic.

It soon became apparent that he would have to just go ahead and build one and find out for himself what actual in-practice gain he would get, what lobes would develop, and even more important, what the actual direction of radiation would be. This was, understandably, critical since he intended to point the gigantic antenna at a spot in the sky where the moon would pass on about two days a month. Even a few degrees error and no moon.

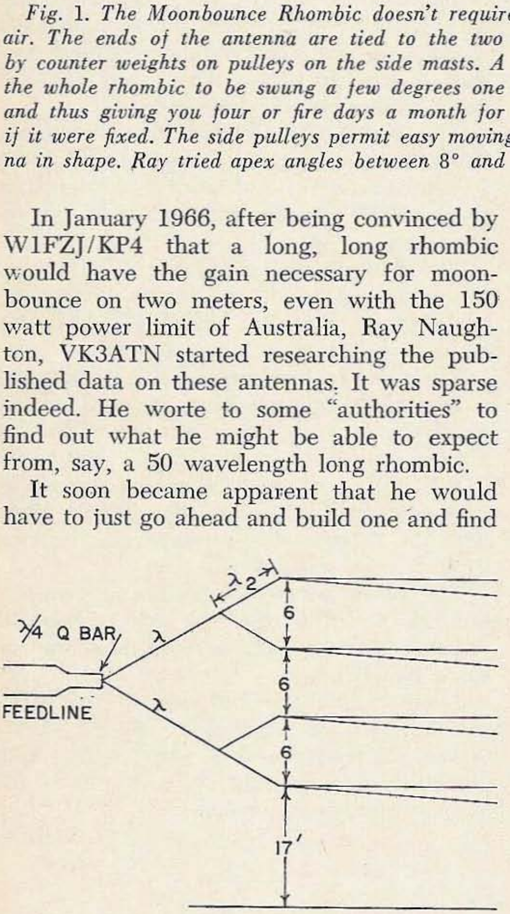

Fig. 2. The bottom rhombic is 17' off the ground. The other three are one wavelength each above that, 6'. They are fed by half wave sections which are in turn connected by two full sections of feedline. The match is made with a quarter wave Q-bar. The half wave, full wave and feedlines are all made with #12 AWG hard drawn copper wire spaced ½".

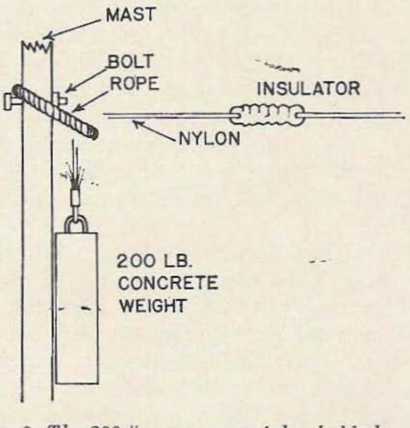

Fig. 3. The 200# concrete weights hold the wires of the rhombics so that there is only about 2' sag in the 342' stretches of wire. You'll need four of the weights for each side, one for each rhombic. Arrange to have them hang down close enough to the ground so you can reach them without a ladder as you have to adjust them now and then, particularly when you want to swing the antenna a few degrees one way or the other.

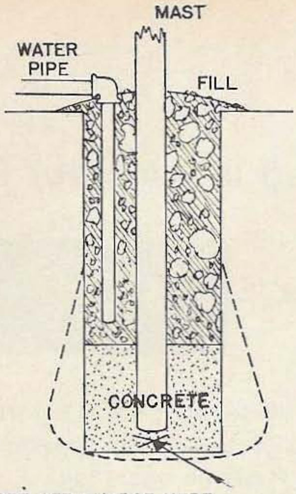

Fig. 4. Ray has towers and masts all over the place and has some good words for planting these things. If you want to plant a tower or mast so it will stay planted through anything dig your hole down as diagrammed. Put a couple of pieces on the bottom of the tower to keep it from pulling up vertically. Put a small dynamite charge in the bottom of the hole. Fill up the hole a little less than half way with concrete. Then put a water pipe down into the hole, almost down to the concrete layer. The end of the pipe should be perforated. Fill the hole with dirt and stones to a mound above the top. Set off the charge. This will expand the bottom of the hole and fill it with the wet concrete. Then run water into the pipe until it runs out the top. Pull out the pipe and when it all dries out you will have a tower or mast that will confound your great-great grandchildren.

Rhombic theory was fairly well established, but Ray wanted to stack them and little had been done on this. Collins had used stacked rhombics during some of their tests during the 50's on 49 MHz, but their published data was of little help.

During February 1966 Ray erected a 50 wavelengths long two-stacked rhombic. He missed the February moon pass, but was all set for the March pass and, sure enough, back came his echoes. They were weak so he got to work and added two more rhombics to the stack. The result was definitely readable and at times strong. By June he was getting good readable signals through from K6MYC on scheds, but Mike was having troubles in receiving and not yet able to hear his own echoes, much less Ray's.

The first two way for Ray turned out to be with K2MWA. The boys in New Jersey got a chance to use the big dish there during the December 1966 moon pass and K6MYC, who had just installed a receiving filter and was finally set to work Ray, had to sit there, biting his fingernails, hearing both K2MWA and VK3ATN, but missing out on the first U.S./Australia two meter moonbounce contact. This was in November 1966. In December it was Mike's turn and he made it through to Ray.

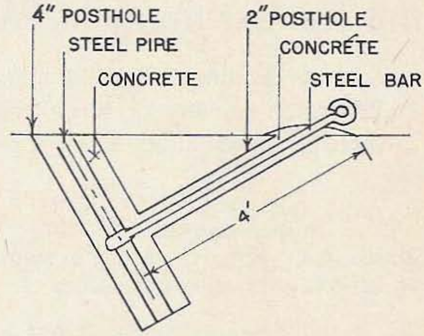

Fig. 5. Most of us just screw our guywire deadmen into the ground and let it go at that. Not Ray. He makes a permanent job of it per the diagram. Use a 4" posthole digger and cut into the earth at about a 45° angle away from the guy wire direction. This hole should be about 6' deep. Then with a 2" posthole digger run a hole in from 45° in the other direction so it comes out in the 4" hole. Put your 4' long guy shackle into the 2" hole. The ring on one end should just stick above the ground and be verticle with the ground. The other end of the shackle has a ring at 90° from the top one and a steel pipe should be passed through this ring and driven into the ground until it is below the ground level on top. Do not use galvanized pipe as this will rust. Fill in both holes with concrete. Let the concrete come up around the loop on the end of the shackle to half cover it for maximum strength. This is a little more work, but it is not likely to come up in a wind.

The bounce club had regular get togethers on 15 meters to coordinate their work and schedules. They decided on a code for bounce contacts to save time. "1" meant they were hearing occasional signals, but that they were not identifiable. "2" indicated identifiable letters. "3" meant complete call sign and report received during two minute call period. "4" indicated almost 100% copy. "5" 100%. After using this system for a while they found that the dots of the numbers tended to get lost in the fading. Next they

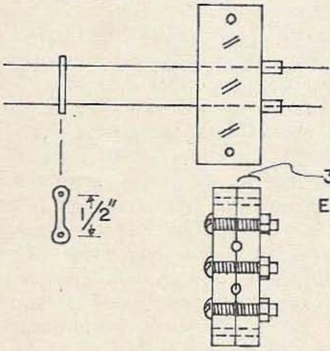

Fig. 6. Ray uses these little half inch spacers for his feedline. They are spaced out every 8' *along the line to keep any discontinuity to a minimum. On curves he puts them above every* 6". *He keeps about* 200 *pounds tension on his feedlines to keep them in shape, taking up the strain with blocks per the diagram. These polystyrene blocks are used to hold the half and full wave sections, the Q-bar and the feedline taut. The loss of the system is kept very low this way. The half inch spacers are a commercially made item, the blocks are home made.*

tried sending "T"s for 1, "A"s for 2, "E"s for 3, "I"s for 4, etc. Still not so good . . . losing those dots. The present system is to use a series of "T"s for 1, "M"s for 2, "O"s for 3, "MT"s for 4, and plain SSB for 5.

The frequency used is around 144.09 MHz. The stability must be good, staying within a few cycles. You have enough problems on moonbounce without having to tune around the band chasing signals.

Ray experimented with various aperture angles for the ends of the rhombic. He tried from 8° to 12° and settled on 10° as being the optimum. It is rough making empirical tests like this for those two days a month go by rapidly and take a long time to come again. On April 24th he got back about 8 minutes of echoes. Nothing on the 25th, the 26th, 27th or 28th, then 12 minutes of echoes on the 29th! More changes and then in May nothing on the 20th, 21st, 22nd, 23rd, and 24th. At last, on the 25th some echoes! And nothing more for the month. It is slow frustrating work this way.

Would tilting the rhombic elevate the lobe? No way to know until you try it and see what happens. The answer, to save you a few months of finding out for yourself, is no. . . . W2NSD/1