A Ten-Meter Rotatable Alford Beam

Extended Double Zepp and Reflector Requiring No Special Supports

By Don C. Wallace,* W6AM

Here is an "experience story" on a ten-meter directive antenna following the principles outlined by W2NB in June QST. It has been in use long enough for a real idea of its capabilities to be obtained. If you already have an ordinary antenna of sufficient height, do as W6AM does and hang one of these from it.— EDITOR

WHEN Hugo Romander, W2NB, was here three years ago, we decided that a twenty-meter schedule once a week was desirable. To facilitate contact, a twenty-meter beam was put up during Hugo's visit and this beam has been successful in maintaining 100 per cent weekly QSO's with New Jersey throughout the entire three years.

Since that time later developments, particularly the Alford principle of beam construction,[1] have come forth and it was deemed advisable to try one of these for ten-meter work. Although Hugo had suggested that the antenna be put up horizontally, it was decided as a starter to make it vertical so it could be rotated easily.

The complete antenna consists of an extended double-Zepp [1] and reflector, mounted on spreaders as shown in Fig. 1. It can be suspended from any antenna now in existence, inasmuch as the overall length (or height if it is to be considered as such) is only 44 feet, approximately. Any antenna that is 50 feet or more high readily can be adapted as a support. Two swordfish swivels (which hold 260 lbs.) allow the unit to rotate very nicely. At present the rotation is accomplished simply by throwing the two-pound weights, which are tied to light ropes at the bottom, into different bushes. This holds the antenna in place and it is quite steady even in a heavy wind.

TUNING

The construction is such that the entire antenna can be made on the ground, then suspended horizontally at a height of say 8 or 10 feet above the ground. If it is built in this manner, the tuning can be done with a stepladder and later the entire beam hoisted into its final position.

Although slightly better tuning might be secured if a little more time were spent on it, the antenna has worked very well with the following procedure. With the unit in a horizontal position just a few feet above the ground, the transmitter was hooked on any aerial which happened to be in the vicinity so that radiation would occur at 28,600 kc. First the radiator wires were tuned to resonance, with the quarter-wave matching stub at the bottom disconnected. Resonance was secured by moving a 6-inch shorting bar along the radiator tuning stub at the center until the maximum reading occurred in a thermo-couple r.f. meter in the bar. Then the quarter-wave matching stub at the bottom of the beam was attached and the 6-inch shorting bar on it was moved back and forth until maximum reading again occurred on the meter. Then the meter was taken out of circuit and placed in the shorting bar for the tuning stub for the reflector wires, and the procedure repeated until maximum current existed in the reflector.

Next, the 600-ohm line to the station was connected, as shown in Fig. 1, on the quarter-wave matching stub, and moved along until the meter in the shorting bar in the radiator tuning stub showed maximum current. It was noted that this point, which was 16 inches from the closed end of the matching stub, coincided with the point where a resistive load was indicated at the transmitter; in other words, where the resonance dip on the final tank condenser was at the same setting regardless of whether or not the 600-ohm line was connected. Finally, the meter was again placed in the shorting bar in the reflector tuning stub and the latter was once more adjusted for maximum current.

Then the whole array was hoisted vertically (all the tuning up to this point had been done with it in a horizontal position) and corrections of 1 inch made to see if there was any change. The change was so slight as to be negligible, so for all practical purposes the antenna can be tuned up at a distance of say 8 or 10 feet above the ground in a horizontal position by use of a stepladder. This is considerably more convenient than hoisting the whole system up and down each time a change is made.

The dimensions of the radiating sections are the same as the reflecting sections and corrections are made to the stubs rather than by changing the lengths of the active wires. It also will be noted that the radiating section is approximately 0.66 wavelength, which closely resembles the top

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[1] Romander, "The Extended Double Zepp Antenna," *QST*, June, 1938.

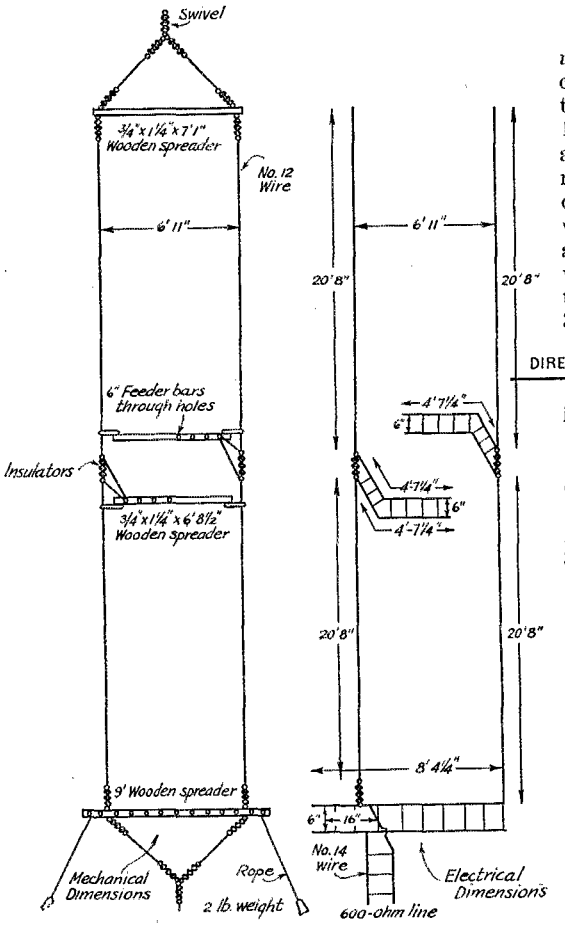

FIG. 1—THE ROTATABLE ALFORD ANTENNA AT W6AM

Designed for a frequency of 28,600 kc., it is useful over most of the 10-meter band. Antenna at the right, parasitic reflector at the left.

figure for the maximum output radiator used by broadcast stations. The length gives the proper spacing as outlined by Alford; that is, two half-wave radiating sections, considered as such, should be spaced 0.28 wavelength. Of course all the dimensions are subject to "end effect"; corrections are automatic when the tuning stubs in both radiator and reflector wires are adjusted.

The beam described here was designed for 28,612 kc. before the ten-meter 'phone band was shifted. It works noticeably better on this frequency, although no particular reduction in loading is noticed up to 28,500 or 28,700. It is still useful at 29,000 but diminishes in utility beyond that because of improper matching. On the whole it can be considered exceptionally good for about one-quarter of the band and useful over the whole band.

RESULTS

When tests were made with stations using receivers equipped with db meters, the change from maximum to minimum (front-to-back ratio) varied between 12 db and 18 db. Tests have been made with stations as far away as England and Asia on the rotatable feature and their reports agree quite closely with those in the immediate vicinity. The ratio would be greater if the antenna were horizontal, no doubt, but the vertical position is very convenient for rotation, inasmuch as the turning radius is but 3½ feet for the whole system. In fact it takes but little more space than a plain vertical antenna.

The operation of the antenna is indicated somewhat by the following: From April until September, W6AM tried to be on the air three times a week, whenever travel permitted. K6MVV sent a daily call from Hawaii just prior to 3 P.M., P.S.T., listened for United States stations between 3:00 and 3:05, and then reported all stations heard. On many days only three or four stations in the United States could be heard, while on some days fifteen or twenty might be reported. W6AM was, nine times out of ten, very close to the loudest one reported, and in many cases the loudest.

The important thing was this: Only once during that entire time of supposedly poor ten-meter conditions was it impossible both to hear and get a report from K6MVV. On the particular day when the report was not forthcoming, a station in Denver was worked immediately thereafter, thus showing that ten meters has been consistent *every day* the station has been in operation during the months from April to September. This, we feel, is in a large measure due to the operation of the beam. Prior to this, such results were far from obtainable at this location.

With the beam properly pointed there has never been an exception to the rule that W6AM is louder than any ten-meter 'phone within a radius of 100 miles from the station. It is of course true that a great many of the stations get into the same localities very well and are using less power, but the fact that the system does work the way it's supposed to—namely, a one-kilowatt transmitter with a four-element beam—indicates its utility for ten-meter work. We plan on duplicating it for five meters (with additions to fill up the space available) and to make some sort of twenty-meter rotary beam, using some of the principles as outlined by Alford.

It is equally as useful in receiving as in transmitting and, like other beam antennas, when used for receiving indicates which stations are getting the transmitter best. Consequently, the user immediately knows just whom to call.