A Coaxial Antenna for 112 Mc.

Its Application in Mobile Work

BY LT. R. H. PARKER,* CAP, W1TO

THE advantages of the coaxial-type antenna are well known to most amateurs. The greatest of these, of course, is the reduction in influence of the transmission line upon the radiation pattern of the antenna. This is especially important at very-high frequencies where line radiation is difficult to control and where even a small physical length of line represents an appreciable portion of a wavelength. In such a case, the presence of the line in the immediate field of the antenna often results in a serious alteration of the radiation pattern from the theoretical for a half-wave antenna — usually resulting in a shift of the chief portion of the radiated energy to relatively high and ineffective angles.

The use of an antenna of this type also results in improved stability when operating mobile self-excited rigs at 112 Mc. The shifting of frequency with the movement of open-wire lines, so familiar to all WERS operators, and other capacity effects largely are eliminated. Making necessary allowances for thermal drift, it is possible to go back to the same frequency at the same dial setting time after time when the set is installed in a car. It's a real pleasure to use a superregenerative receiver with this antenna. It performs better than anything else we've tried and it has been well worth the time and care required in its construction.

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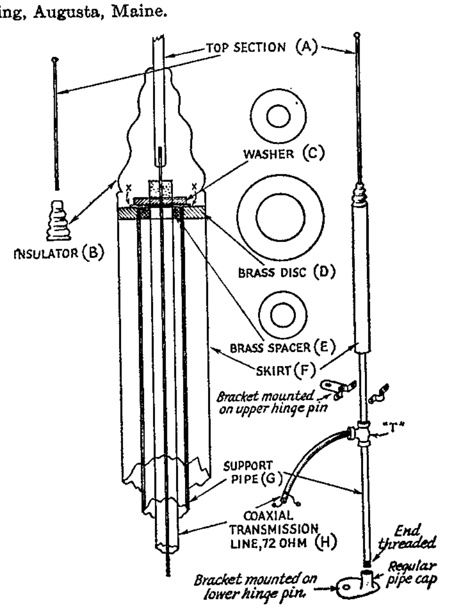

Fig. 1 — **Sketch showing details of construction of the 112-Mc. coaxial antenna.**

At the higher frequencies it becomes important to pay careful attention to the method of feeding an antenna, since the transmission line may have adverse influence upon the radiation pattern. The coaxial type of antenna makes use of a feeding system which reduces this effect materially. A model for 112-Mc. mobile work is described in this article.

It would appear that the difficulties of constructing an antenna of this type are not beyond the home work-shop scope, and no special tools are required in its construction. While a lathe certainly would be useful, it is not a necessity, and even an old file can be used as a substitute for the grinder for cutting the groove in the insulator.

Radiator Dimensions

The sketch of Fig. 1 shows the details of construction. There seems to be considerable misunderstanding of the dimensional requirements of the elements for this type of antenna. The essential dimensions are the *lengths* of the radiator and skirt, which should be cut to a very close tolerance. The radiator length in feet should be $243.3/f_{Mc.}$ and that of the skirt $235.6/f_{Mc.}$ The diameter of either radiator or skirt is not critical and there is no required relationship between dimensions, nor does the supporting member have a required diameter. It is essential that the skirt be clear of the supporting member throughout its length, and if spacers are used at the lower end to maintain this separation, they should be of very low-loss material, preferably polystyrene, and of quite small cross-sectional area.

The quarter-wave top section, *A*, of the antenna should be made of good springy material. Ours was cut from a section of an old car antenna. The lower radiating section or skirt, *F*, is a piece of plumbing fixture, a section of thin-wall brass tubing 1⅜ inches in diameter. The shorting disc, *D*, at the top of the skirt is a piece of brass plate about 3/16 inch thick. It is shaped to fit snugly between the skirt, *F*, and the support pipe, *G*. A brass collar, *E*, is required to fit between the mounting pipe, *G*, and the coaxial cable, *H*. This spacer also should be 3/16 inch or so in thickness. A washer, *C*, of polystyrene or lucite about an inch or so in diameter and about ⅛ inch thick is desirable for the top of the coaxial line.

With the exception of the pipe required for mounting, the only other part needed is the insulator, *B*, at the top of the skirt. Unfortunately we had no polystyrene stock large enough to make this part so we used a ceramic stand-off insulator whose diameter at the bottom is the same as the inside diameter of the skirt. The steatite material is much finer grained and softer than porcelain and can be readily ground to the required size to fit within the skirt. Also, it is quite easy to grind a groove around the base into which the upper end of the skirt may be "rolled" to form a solid support, this, in turn, furnishing a support for the upper radiator section. This groove should be about ¼ inch from the base of the insulator and less than ⅛ inch deep. All dimensions given above are based upon the parts that we used and, of course, they will be subject to revision with the necessary substitutions, remembering only that the *lengths* of the radiator and skirt *must* be exact.

Assembly

Having cut the skirt to proper length for the frequency and the two brass spacing washers to snug fits, it is time to start assembly. With all of the above parts well cleaned where they contact one another, they should be assembled so that the upper surface of the inner spacer, the supporting tube, and the brass disc all are even, and this assembly set about ¼ inch below the top edge of the skirt. (This will allow the material necessary at the top of the skirt to roll into the groove in the insulator.) With all parts thus assembled they should be well soldered together. Since a considerable amount of heat is required, the use of either a torch or very large soldering copper with rosin-core solder is advisable.

Now the coaxial line should be prepared, and care should be used in this operation. About two inches of the outside insulation should be removed, being careful not to cut or rupture the shield. Then the line should be fed through the mounting tube until the bared shielding extends above the spacer in the supporting pipe. The strands of this shielding should be separated and bent to about ½ inch in length and laid flat on the brass disc, to which they all are to be soldered. This should be a good secure joint and it is desirable, if possible, to have the shielding soldered to the brass spacer where it passes through. This job can be done with care. When completed the upper surface of the brass disc should be quite smooth and if it is not, it will be necessary to scrape the solder until there is a flat surface upon which the lower surface of the insulator will rest.

Next, the polystyrene or lucite washer, which has been cut so that it will fit over the coax line and will go within the opening in the insulator, is slipped into position and cemented in place. In the construction shown in Fig. 1, the hole in the top of the insulator is a sliding fit for the radiator, so it was possible to slide the insulator into position after the radiator had been soldered to the center conductor of the line.

This being done, there remains the job of "rolling" the upper edge of the skirt into the groove of the insulator. This is not very difficult, but it does require care. With the upper edge of the skirt resting solidly on a hardwood block, the

(Continued on page 90)

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Gold Stars

LT. COMDR. WILLIAM O. BEACH, USNR, W7BHH, 28, was killed December 13, 1944, during an enemy air raid in the Philippine area.

W7BHH received his amateur license in 1931 and in 1934 he enlisted in the Naval Reserve. During the next few summers he was a radio operator aboard various ships of the Alaska Steamship Co. After attending the University of Washington for two years he held the post of operator at Seattle's Harbor Dept. station, KPE, until he was called to active duty with the Navy in 1940.

W7BHH served first on the *Pennsylvania* and then on the *West Virginia*. During early 1941 he was attached to the staff of the Commander in Chief, Pacific Fleet, and later to the staff of the Commander, Battleships, Battle Force. In September, 1941, he reported for communications duty to the *Maryland* and was aboard that ship at Pearl Harbor when the Japs attacked on December 7th. The ship was only slightly damaged and after it had been repaired he continued to serve aboard it until June, 1943, when he reported to the Post Graduate School at Annapolis for special instruction in communications. In July, 1944, W7BHH flew out to the Southwest Pacific to join the staff of an amphibious force. Before his death he had participated in several actions, including the initial landing on Leyte.

CAPT. JOHN S. INGRAHAM, AC, W7CYC, was killed in a plane crash on Florida Island in the Central Pacific on July 26, 1944. No details of the accident have been released by the War Department.

W7CYC joined the Army Airways Communications System in September, 1942. He served with that organization for nearly two years as technical officer at various Army air fields and later as technical and tactical inspector at Hq. 2nd AACS, Chicago, Ill. He was sent to the Pacific Theater in July, 1944.

Previous to entering the service W7CYC was senior technician at station KVI, Tacoma, Wash. He had been an amateur for the past ten years.

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Captured Enemy Equipment

(Continued from page 33)

Dual-Range Voltmeter

Another piece of captured German equipment which has been added to ARRL's collection is a miniature dual-range panel voltmeter sent in by W6DKZ from somewhere in Belgium. It is 1¼ inches in diameter and extends ¾ inch behind the panel. The two ranges are 3 volts, presumably for filament checking, and 150 volts for plate-voltage measurement. A small push-button switch on the face of the meter changes the range. The current required for full-scale deflection is only about 300 microamperes, which is a pretty sensitive instrument for field use.

While this particular model has neither a laminated magnet nor adjustable air gap as most American types and some of the large German voltmeters have, the magnet does have a peculiar shape which is believed to open out the lower end of the scale. The mounting of the coil is quite ingenious and has certain advantages. The jewelled bearings are on the inside of the central iron inside the coil. The little adjusting screws alter the length of a piece of brass holding the jewels, permitting it to be slid inward or outward in respect to the iron pole piece and thus compensate for bearing wear. The current and movement-resisting springs are allowed more freedom of movement, and greater tolerance in producing them can be allowed. Dust and dirt are kept out of the bearings because they are enclosed within the coil. An isolating method of attaching the rear current-carrying spring is simple and accurate and permits easy servicing which often is not possible with meters of conventional design.

— *D. H. M.*

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(Continued from page 41)

edge is slightly hammered down into the groove with a flat-peen hammer. This should be done gently, a little at a time while progressing around the whole edge and not completely in one place at a time. With care this can be hammered into the groove so that it will make the insulator very solid. When complete, this edge and the hole in the insulator where the upper radiator section emerges both should be well covered with polystyrene coil dope. If this is applied in several coats there will be a very good watertight joint.

This completes the radiator. There is an almost unlimited number of ways of mounting the antenna on a car. In this particular case the car on which the antenna was to be used had extruded hinges, making the mounting system shown in Fig. 1 very convenient and easily detachable. Later cars do not have this type of hinge. However, the support should be of sufficient length so that the complete antenna will be above the roof of the car. The lower edge of the skirt should be several inches above any part of the car.