The Birdcage

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It IS an intriguing name, isn't it?

Sorry to say, however, I can't take credit for the appellation. It was called a "Stacked Twin-3" to begin with, but since it perched near a thoroughfare and was easily visible from it, and since quite a number of imaginative Hams travelled that route—well, the "Birdcage" it became.

And quite an antenna it was, too. It towered gauntly into the sky, impressively dwarfing mere Yagi arrays—and not only in size, either.

But I'm getting ahead of myself. It all began one day in the early part of 1946. For months I'd been using my post-war version of the single Twin-3, a duplicate of the antenna which I'd fallen in love with in the halcyon days before WW Two on both Ten and Twenty meters. It had been a performer then, and it was living up to expectations now.

Like most Hams, though, I wasn't satisfied. I wanted more. Well, why not TWO of the little gems, stacked. *Two of 'em? One above the other?* Sure, why not? *How you gonna rotate it?* Oh, it can be done. (This last, vaguely.)

And thus it was that the project began. Slowly, the ideas jelled. It was the physical construction which kept throwing rocks into the lawnmower. The elements, for example, should be maintained in a taut condition even with aging and the inevitable stretching of the wire of which they were to be made. Bamboo poles were out. It was a known fact (through sad, previous experience) that bamboo will quickly sag, drooping the elements below it like a limp bowstring.

Ah-ha! How about a *taut* bowstring? And on top, so the weight will tend to increase the tension? *What's to keep it from flopping sideways?* Anchor it in the middle. *Maybe, but will the ends stay put?*

All right, then, we'll make the "bow", itself, out of material which can't flop to either side —and that settled that. The "bows" (see fig. 1) were constructed of 1x6 pieces of clear redwood. Three egg insulators at each end secured the wires of the dipoles, with jumpers placed in such a manner as to create a long, squatty "S" out of the entire configuration.

The over-all length, including that of the two jumpers, was computed from the formula 480 over Fmc times three.

The reason for the odd-ball number (480) instead of the usual 468, or the free-space figure of 492, is that end effects were considered to be that of a single-wire dipole, while the length was that of three of them. A compromise was struck (and proved to be amazingly accurate).

Now, the two dipoles of a Twin-3 should be spaced about an eighth-wave apart in order to match an open-wire feedline through the two quarter-wave matching sections of the same impedance. A perfect match could be obtained by varying the spacing between the dipoles, and without impairing the gain. But we're dealing with high impedance here. Slight variations have negligible effect on the match.

With this in mind—and remembering that there would be four quarter-wave transformers joined at the feedpoint instead of the usual two—it was decided to hold to eighth-wave spacing on each Twin-3. The closer the spacing here, the lower the impedance. The lower the impedance at the center of each three-wire dipole, the higher the impedance presented to the feedpoint a quarter-wave away. And with four such impedances in parallel—well, it was decided to keep it high for obvious reasons.

In time-honored fashion (time-honored to me, that is, on all prior Twin-3's), the eighth-wave booms were five foot 2x2's. The 1x6 "bows" mounted to the booms with angle brackets, as in fig. 2.

Fig. 3 shows the single Twin-3 element, its dimensions and its feed-point. By golly, it was shaping up!

Yeah, but it still has to be rotated. Remember?

Ugh! That's right. But a ray of hope! Since the antenna is bi-directional, it only needs to be rotated through 180 degrees in order to obtain full azimuthal coverage. And THAT, my little unseen kibitzer, pins a different tail on the donkey.

Hinges—plain, old, ordinary gate hinges— will turn through 180 degrees. And they'll hold up a barn.

Yeah!

Thus it was that (with a since-abandoned abhorrance for metal supporting structures) a 4x4 redwood pole 20 feet long was selected to

[*Continued on page 167*]

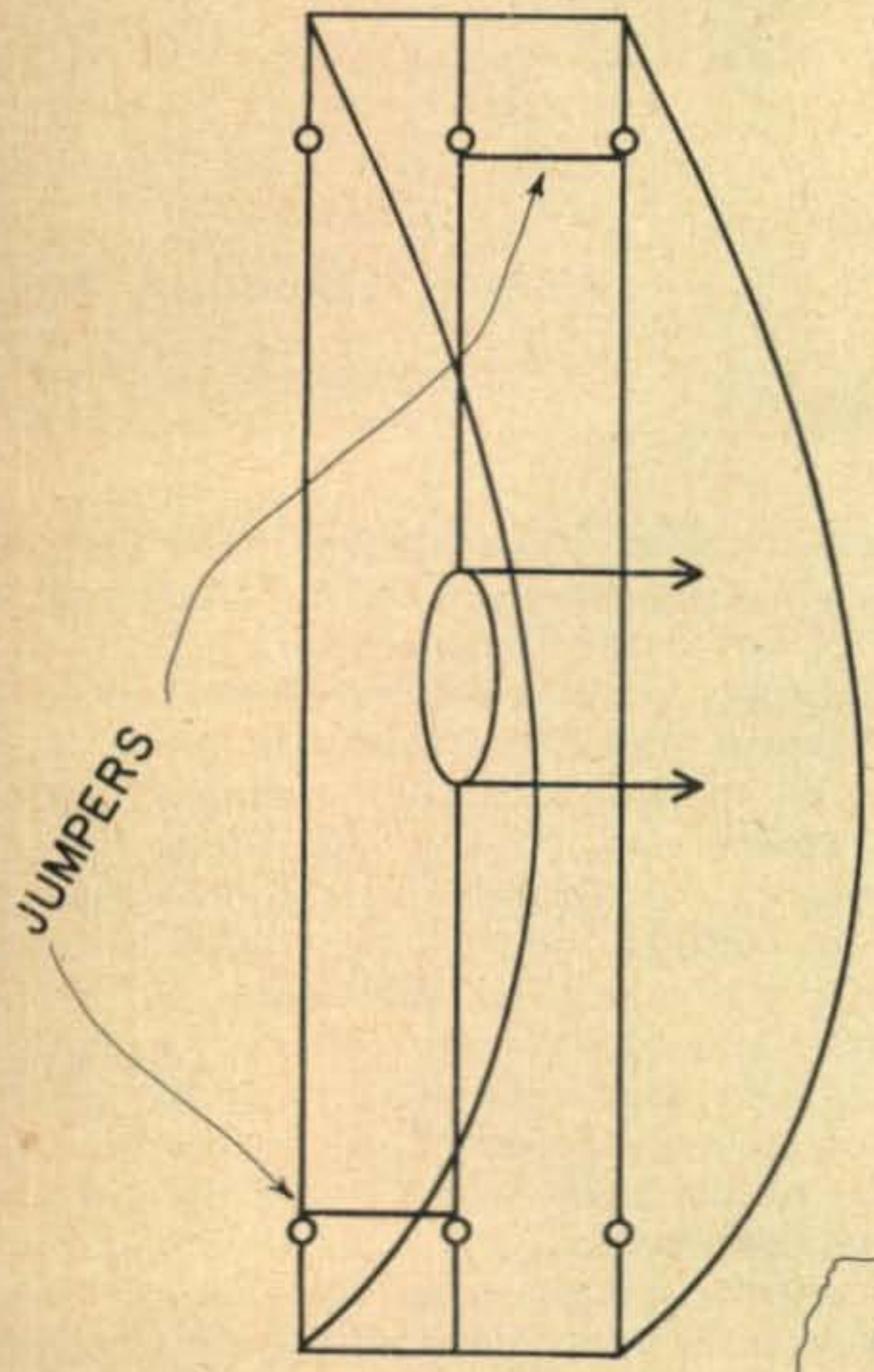

Fig. 1

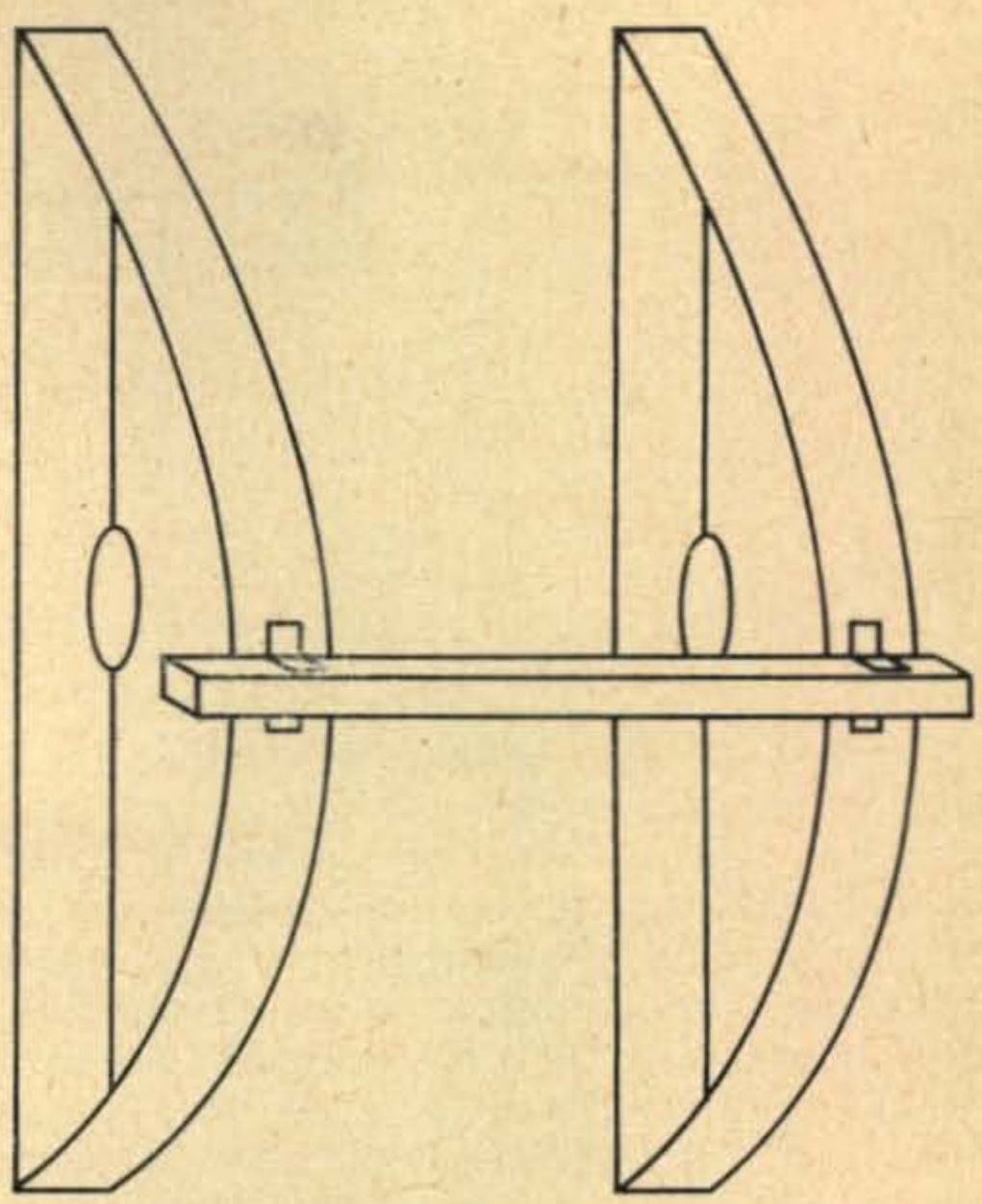

Fig. 2

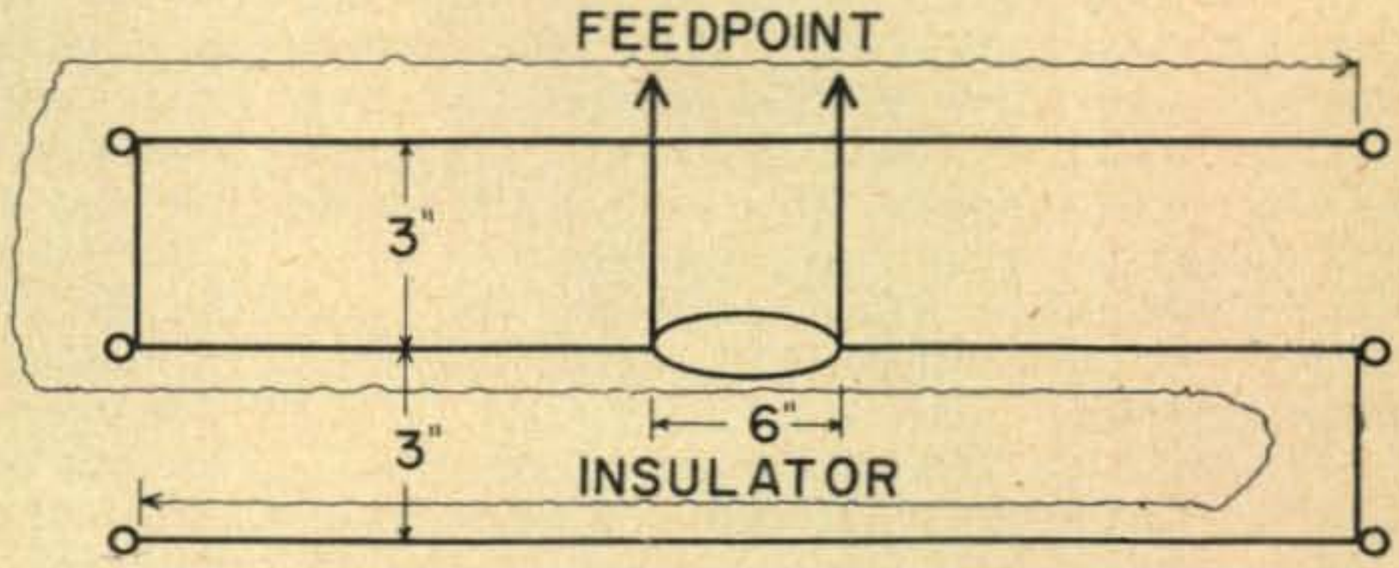

Fig. 3

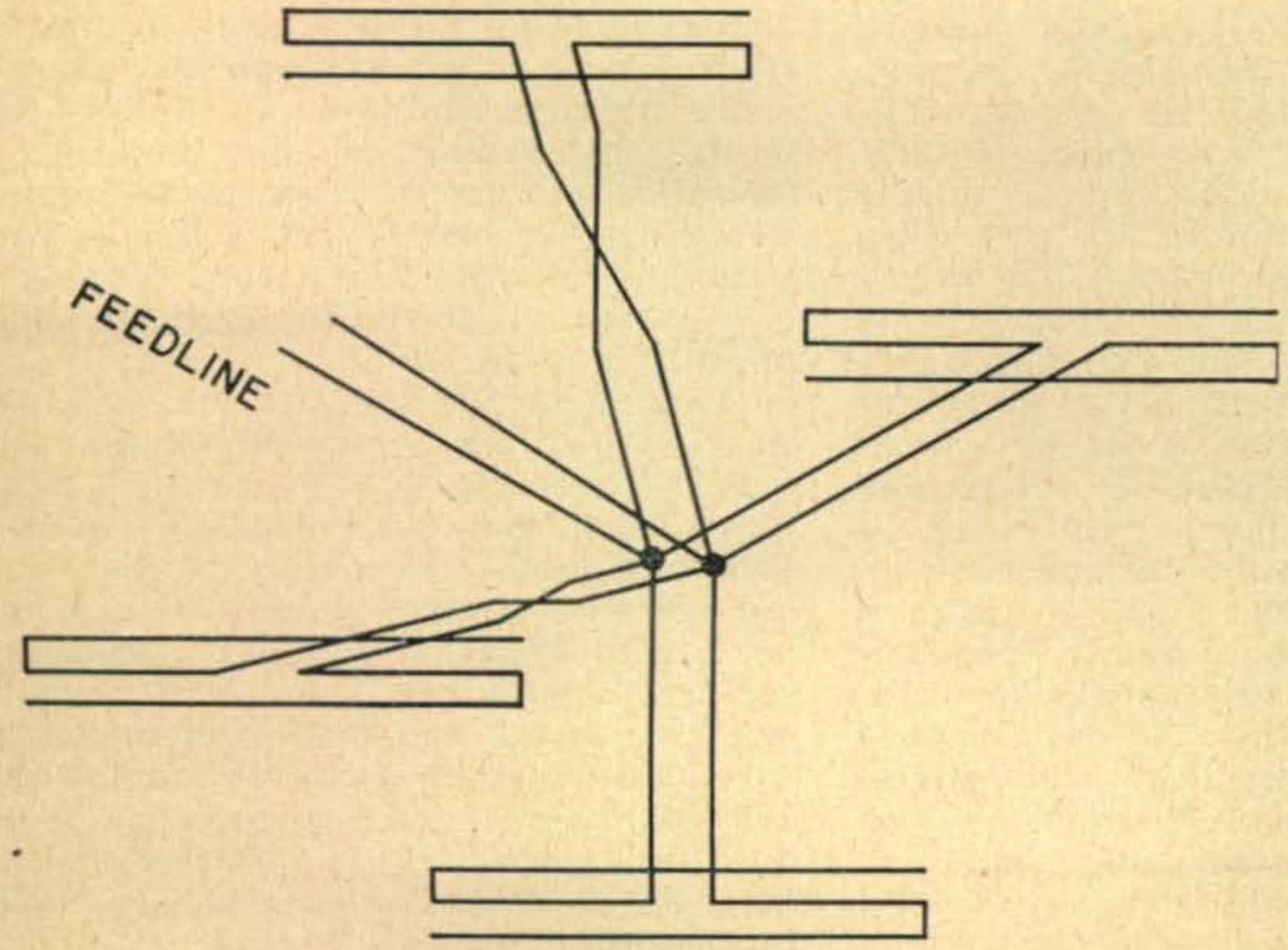

Fig. 4

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serve as a rotating mast. The upper Twin-3 was secured in place on top, again with angle brackets, and the second one allowed to find its position below in accordance with the distance allowed by the length of the quarter-wave matching sections. Once this position was determined, of course, the lower boom was bracketed to the mast.

The phasing and matching lines were of the 600 ohm variety; that is, they were #12 wire spaced 6". The length of each was computed from the formula 246 over Fmc.

Phasing them is simple: merely keep the dipoles in-phase vertically and out-of-phase horizontally. This means "crossing over" both the top and the bottom quarter-wave sections on one side of the entire array. (See fig. 4)

Since a single Twin-3 of this type would be matched with a 600 ohm feedline, two of them would match 300 ohms, since they are in parallel. In 1946, twinlead was used. Today—with Indians on the warpath—coax is a wise idea. 75 ohm RG11/U into a half wave balun would also match 300 ohms.

The vertical spacing of the two Twin-3's left something over four feet of the 4x4 remaining at the bottom, and this was ideal for mounting with the hinges to the anchor-post of a large signboard on the roof of the building. One hinge, of course, was screwed to the bottom of the 4x4, the other just under the bottom Twin-3.

It was finished. Ready to go up.

The rotation was smooth and majestic—if a trifle squeaky.

I moved from there long ago. When I did, I didn't have the nerve to try to take my "Birdcage" down again. I'd grown older and weaker—and much more cautious. The owner of the building must have taken it down about a year later, though.

Actually, then, the principle of the stacked Twin-3 is an excellent one. While the mechanical construction was a farce, the electrical information contained here is sound, and the antenna is capable of unusual performance. Theoretically, the gain of such an array would fall in the 7 to 8 db range, but, especially at the higher frequencies such as ten meters, its *effective* gain is much better, due to concentration of the signal at the lower radiation angles.

To be effective, the lower Twin-3 should be at least a half-wave above the ground. The entire array, of course, should be as much in the clear as possible.

As Wayne Green said in one of his editorials, you can never tell what to expect from such an antenna. Build it light (by all means!) and get it up in the air. You may trap a few birds, but you'll be happy with the signal you'll put out. ■