More Watts From Your Halo

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How to construct and adjust a simple, inexpensive and effective impedance matching device that raised the output of the authors halo 9 db.

Don't throw away your halo yet. Read my story and you won't. A couple years ago I went on 6 meter mobile using a whip antenna. The results I had were good but like most hams I wanted to do better. I sent for a halo and when it arrived lost no time in making up the suggested balun and getting the thing installed on the car, following the directions carefully and tuning the halo for minimum SWR which was quite low.

I operated with this arrangement a couple months and the reports received were that my signal was about the same as before but with a lot less flutter. About this time my XYL decided if the halo was no better than the whip why did she have to ride around underneath it? Obviously something had to be done. A little testing seemed in order.

I drove the car to a spot about a mile from the home QTH and transmitted a signal, first on the whip and then the halo. I shorted out the antenna not under test so the unused antenna would not effect the field pattern of the one that was transmitting. Also the whip was cut exactly to frequency for maximum field strength. At the receiver end the *rf* gain was adjusted for an S9 reading from the whip signal. When the same amount of power from the transmitter was fed into the halo there was only an S8 reading on the receiver. I decided that the balun was not the right length I proceeded to make another. This time instead of cutting the balun to the number of inches stated in the instructions I fed a signal into the feed line with a crystal oscillator at 50.2 megacycles and set up a field strength meter some 30 feet away. I chopped away at the balun length an eighth of an inch at a time and each time connected it up to the halo and took a strength reading. Slowly the meter reading rose higher and higher. Suddenly with one clipping the meter gave a much lower reading. I had reached the correct spot and cut beyond it! Repeating the process with a new balun I clipped a sixteenth of an inch at a time and when I reached the peak reading I had before I stopped. (How can you tell exactly where the peak is without going thru it?) I found the length of balun for best match to be almost 2 inches different from that stated in the instructions that come with the halo. I later tried 2 other brands of coax and found each to be still different, possibly because of a different V.P. factor. Sure that the halo would now be ready to make a lot of DX contacts I drove back to the test point. Now the receiver showed the same reading for the halo as the whip. This was a gain of 5 *db* or equivalent power increase of 3½ times. In spite of this success I was still getting no more *rf* from the halo than the whip. Surely the halo should do better.

The Problem

The balun as a matching device is useful only for matching multiple impedances. Could it be that the halo itself wasn't matching the balun? I spent a lot of time in the next few months checking the impedance of all the halos I could get my hands on. I found that none of them measured alike, but they averaged about 130 ohms. Since no balun could match either a 52 or 75 ohm line to 130 ohms another way of matching had to be found. One important function of the balun is to match the unbalanced feed line to a balanced antenna, and however the antenna is matched this must be done.

The Solution

By this time K9GPS, who had been having the same trouble matching his halo had become very much interested in the problem. We got together one night and before we knew it we had spent all night carefully and tediously trying several methods of matching the halo, all of which were unsatisfactory for one reason or another. Then we hit on the idea of trying an auto-transformer. With this device we could accomplish the function of matching the unbalanced feed line to the balanced antenna and still have a very satisfactory way of exactly matching any line to any antenna. The "Auto-coil" described here is the result of our experiments. It increased the signal from the halo by 9 *db* over that of the whip antenna! This is the equivalent of increasing your transmitter output 8

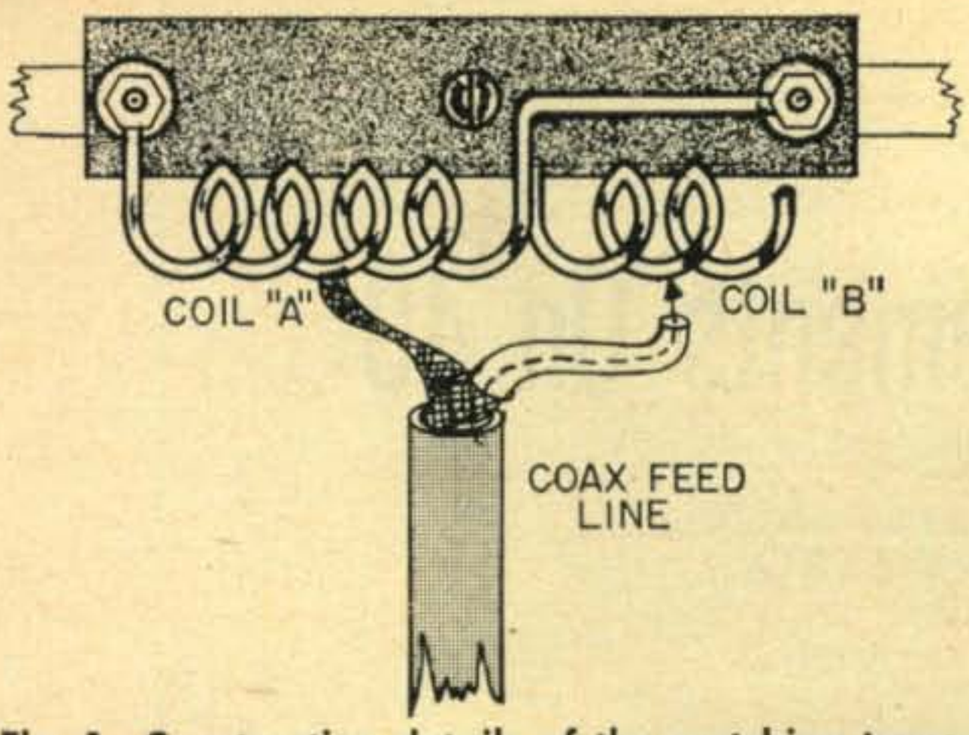
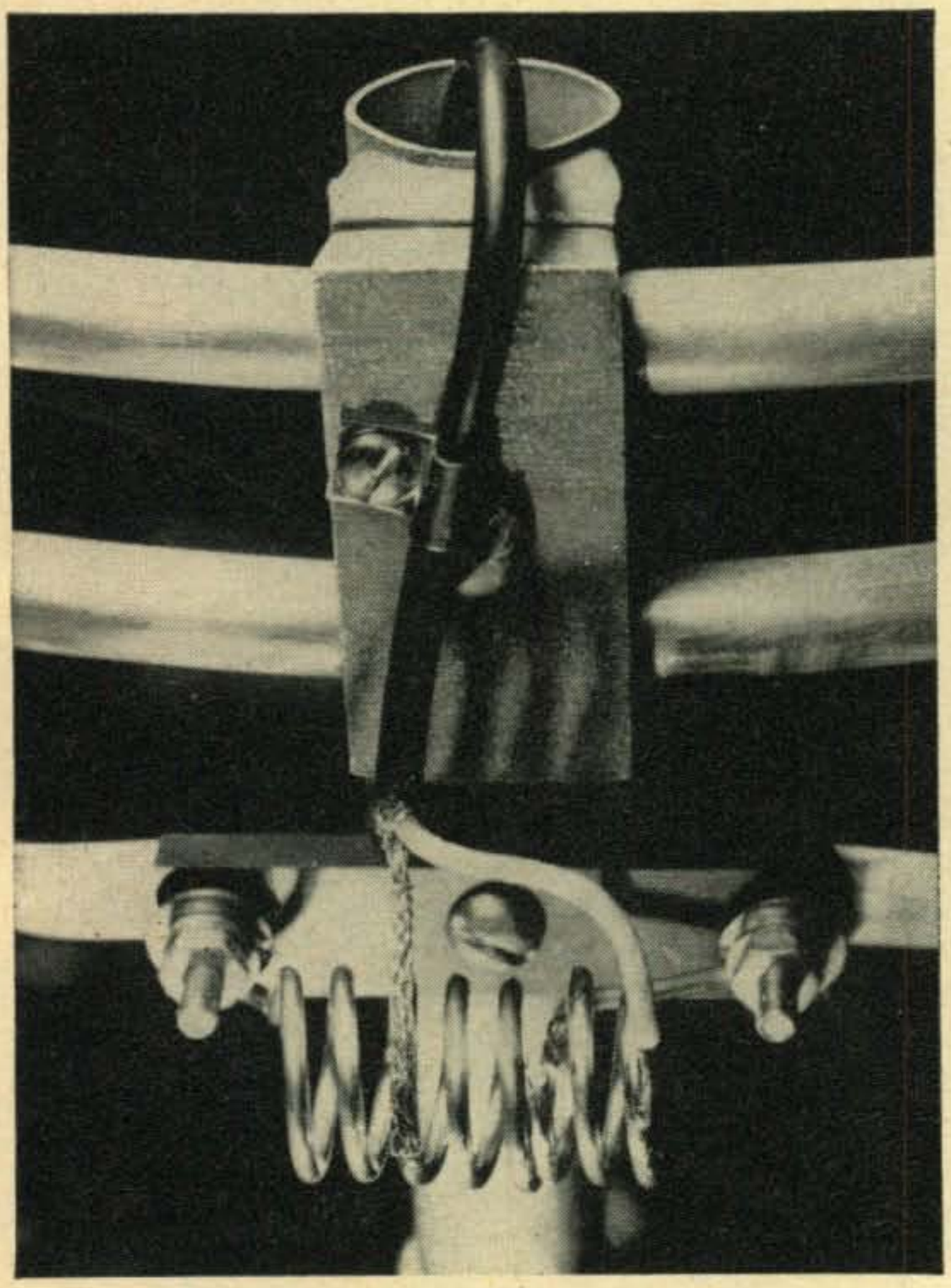


Fig. 1—Construction details of the matching transformer. Further details are given in the text.

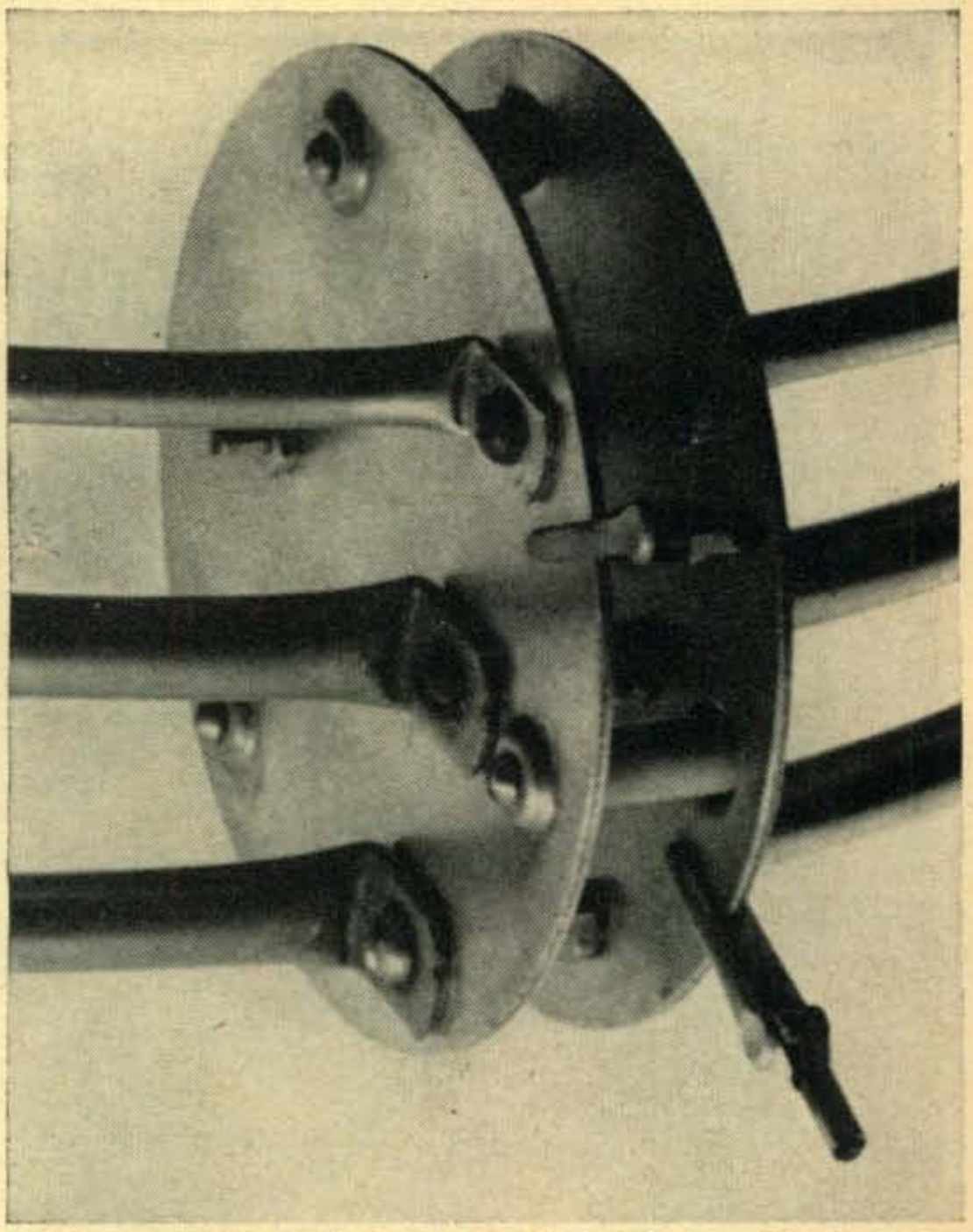
times! Even more important in a mobile installation it increases your receiving ability by that much too. Since using this coil the past year we have worked 26 states, South America, and Mexico. It has been used by many hams we've shown it to and they all report amazing results. You can build this coil in less time than it takes to read this article and it will cost you less than the price of a hamburger.

Facts About Your Halo

We might point out at this time that the halo is a very sharply tuned antenna and falls off rapidly on either side of its resonant point. To help overcome this I have tuned my halo to 50.4 *mc* and peaked my converter to 50.1 *mc*. This helps to flatten out the response over the



Location of the coil on the antenna. The coax is brought up through the mast and down to the terminals.



The capacity adjustment in the halo is critical and not easily changed when you just want to QSY a few kilocycles. Here's a way you can keep the halo tuned exactly to frequency easily. Place the 2 alligator clips on the halo about as shown and adjust for minimum SWR the center adjustment between the plates. You can adjust for maximum field strength if you prefer. Now if you move the clips so they are across from each other you will be about 50.05 mc and if you move them further apart so the one on the left is straight up you will be set at about 50.6 mc. On a band opening I just remove the one on the left and am automatically tuned up to about 50.85 mc. This is a good place for a mobile during the openings when the lower portion of the band is so crowded.

lower portion of the band. When it rains or is very damp outdoors the halo's resonant frequency drops considerably—sometimes to as low as 50 *mc* when it is tuned to 50.4 *mc*. The rain and moisture have very little effect on the auto-coil. The resonant frequency of the antenna changes due to the dielectric change in the capacity plates of the halo. We use the sensitivity of these plates to advantage in a tricky way of tuning the halo to whatever frequency we wish to use without changing the critical tuning adjustment within the halo plates. (See photo of halo plates and caption with photo).

Let's Make An Auto-Coil

Wind a coil of 5 turns of #8 or #10 copper wire on a ⅝ inch form as shown for coil "A". (Refer to diagram). Make the ends of proper length and spacing to fasten on the halo terminals. Wind another coil of about 3 or 4 turns of the same kind of wire and diameter as shown in "B". Now push coil "A" against coil "B" and

[*Continued on page 119*]

HALO [*from page 43*]

make a good solder joint so that coil "B" is an extension of "A" and the two coils are now in fact one coil. Solder the outer braided shield of your coax feed line to the center of coil "A". Connect the coax center wire to the coil about in the position shown in the diagram.

Now connect an *swr* bridge in your feed line. Adjust the capacity adjustment in your halo plates for minimum *swr*. This adjustment is quite critical and very important. Be sure to stand away from car when taking readings and be sure the halo is mounted on your car exactly as it will be when you are in motion. Changing position of halo on the car so much as an inch will throw it off considerably.

After getting the *swr* down as much as possible with the halo adjustment, try connecting the inner wire of the coax to different points along the coil and solder it permanently to the point where you find minimum standing waves. Your match will now be very good but if you want every ounce try adjusting the coax shield each way from the point it was first soldered. Although you connected the shield to what is the physical center of the "A" coil the electrical center may be a bit one way or the other. Solder shield to where you get minimum *swr*. If you don't have an *swr* bridge you can use a field strength meter and make all of these adjustments for maximum field strength.

In conclusion I hasten to point out that I claim this 9 *db* increased signal over the whip while working halo to beam. Perhaps if the receiving antenna were vertical the situation would be reversed, however since 99% of the contacts I have made have been to home stations using beams or to other mobile units using halos, I feel now the halo is worth keeping on the car. ■

15 METER BEAM [*from page 41*]

ing straight up. To this top end we attached short pieces of guy wire while the other end of the guy wire was attached to the ends of the boom. This served to keep the boom from drooping under element weight and gave additional strength to our beam. The bottom end of our vertical section has an expandable coupler which allows it to slide down over our mounting stub. A pin is placed through the coupler to keep it from turning.

Performance

As far as results go: we were well pleased to work KC4-land while the beam was on the house. Running 100 watts on AM we managed to get a 59 report. Since that time the beam has been used over a year, and we have received favorable reports on phone and CW in all parts of the world. ■