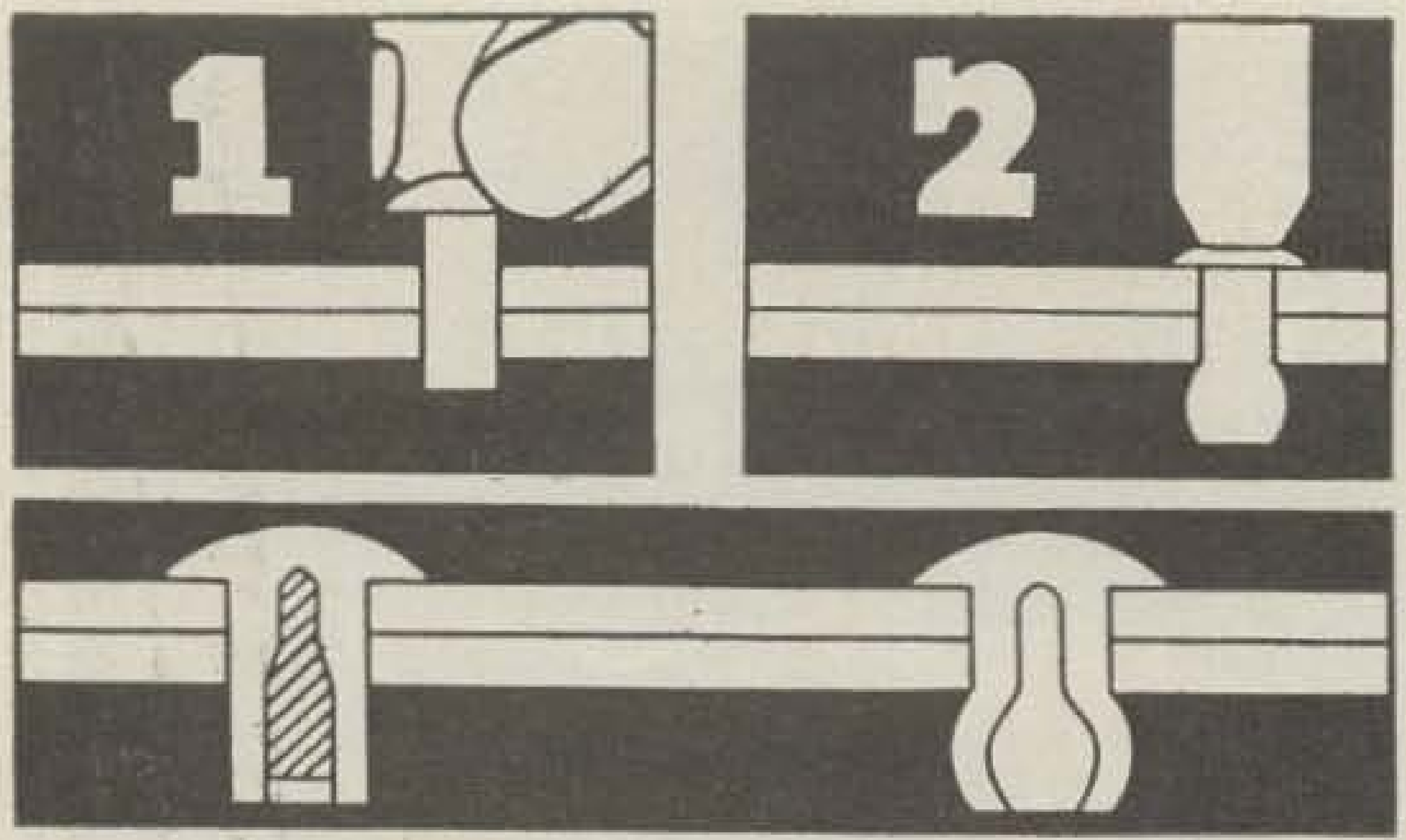

Cross-section of Rivet before and after expansion.

means of assembly and through bolts are ruled out by the danger of collapsing the aluminum tubing normally used. The gusset plate and one wall of the tubing are drilled as a unit, with the rivets inserted as each hole is drilled. The rivets are then expanded, the assembly turned over, and the second gusset plate installed in the same manner.

While Du Pont does not recommend this, a standard electric soldering iron, not a gun, of 100 watt or higher capacity, may be used to expand the rivets. The copper bit should be reversed in the iron and the blunt end shaped to fit the rivet head. The drawing shows the details on inserting and expanding the rivets. Bit temperature is fairly critical and a Variac is suggested. In any event, the heat should be such as to expand the rivet in ½ to 4 seconds.

These rivets are available in a variety of styles, materials and sizes. The following list shows *some* of the sizes manufactured in the 56S aluminum alloy, modified brazier head type:

DU PONT TYPE	RIVET DIAM.	SHANK LENGTH	DRILL	WORK THICKNESS MIN.	MAX.	COLOR
56S-134A-4	.134"	.150"	#29	up to	.045"	yellow
56S-134A-20	.134"	.310"	#29	.166"	.205"	blue
56S-134A-36	.134"	.470"	#29	.326"	.365"	black
56S-173A-8	.171"	.235"	#17	.025"	.085"	red
56S-173A-26	.171"	.415"	#17	.206"	.265"	black
56S-173A-38	.171"	.535"	#17	.326"	.385"	red
56S-204A-10	.202"	.290"	#6	.025"	.105"	blue
56S-204A-32	.202"	.510"	#6	.246"	.325"	brown
56S-204A-56	.202"	.750"	#6	.486"	.565"	black

The above list is by no means complete and is presented only to show the size range of these fasteners. Complete information, along with prices, may be obtained by writing Chemical Sales, Explosives Department, E. I. Du Pont de Nemours & Co., 350 Fifth Avenue, New York 1, N. Y. The biggest problem in the use of these rivets, from the amateurs point of view, is the fact that they are available only from the Du Pont outlets in minimum quantities of 100 each. Cost ranges from under $5.00 per hundred and up, depending on type and size.

These fasteners really work and their use will ease many difficult construction projects. If the cost seems high, have you recently priced high quality screws, nuts and washers?

Photograph and drawings courtesy of E. I. Du Pont de Nemours & Co.

The Half Wave Transmission Line

Mitchel Katz K2KPE

As most hams already know, a half wave line repeats the load impedance back towards the feed point at each half wave node when the line is terminated in its characteristic impedance. Using this information several ideas came to mind to facilitate antenna tuning and installation.

Before putting up a new antenna, measure the distance from the antenna site to the transmitter. Some rope, string, or scrap wire can be run over the final transmission line path to determine the length. Now calculate the transmission line length required so as to present a half wave multiple between the antenna site and the transmitter, for the lowest frequency band to be used. A half wave length of transmission line has a different length than a half wave of antenna wire in free space due to the velocity factor of the line. As coaxial cable using a Polyethylene dielectric has a velocity factor of .659 the following formula can be used to calculate the length of our half wave line. Length in feet, 492 multiplied by .66 and divided by Fmc. (324.72)

As an example, if we design a line for 7150 kc, using the formula we come up with 45.4

feet. This line then becomes 1 half wave at the design frequency. It is also 2 half waves at 14300 kc, 3 half waves at 21450 kc, and 4 half waves at 28600 kc. From the above it can be seen that if you cut a transmission line for the lowest band to be used it can also serve for other harmonically related bands. If we are primarily interested in 20 meter operation we could have designed the line for perhaps 14300 kc. This line would then figure out to 27.7 feet. Any multiple of the 27.7 could then be used between the transmitter and antenna.

Now for the actual installation. Measure the coaxial line so that you will have some full multiple of the half wave line between the antenna and the transmitter. Connect a suitable connector at one end of the line. Next cut off 10 feet of cable at the other end, and terminate these two ends with Amphenol type 83-1P male coax connectors. The other end of the 10 foot section can now be conveniently attached directly to the antenna proper. Both the main transmission line and the short sections, going to the antenna, can be joined by means of an 83-1J straight connector (female at both ends) and then taped over. If aluminum foil is wrapped around the fittings before taping they will stay bright and clean and will be well protected against the weather. In the future when you want to change the antenna, instead of removing the complete transmission line it is only necessary to replace the small 10 foot section, still maintaining our original half wave line length. If the transmission line you are using is much longer than the distance originally measured from the antenna to the transmitter, the coax may be coiled up at any convenient place, and tucked away out of sight.

Getting back to the half wave line, it is now possible to insert an SWR meter at the transmitter and know exactly what type of match we have between the transmission line and the remotely located antenna. Of course if the SWR is actually 1:1 then you would get the same meter reading on any length line. However if a mismatch does exist then by means of the half wave line you can ascertain the actual SWR of the antenna to transmission line.

If a spare line is built and kept coiled up, it can also be used for connecting a dummy antenna to the transmitter, still maintaining the proper SWR indication on a bridge. This may be important in tuning or aligning a transmitter. A 52 ohm dummy gave an SWR reading of 1:1 when connected directly to the terminals of an SWR meter. The same reading was obtained with the dummy load connected to the end of a half wave line. When intermediate line lengths were tried with the dummy, surprisingly large amounts of variation in the apparent SWR was indicated on the meter. . . . W2KPE