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IN THIS ISSUE

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DON'T QUIT IN THE CHASM!

You probably know some fellows who are great starters, but poor finishers. As long as everything runs smoothly they do nicely, but let some obstacle cross their path and then what happens? They take the easy way out—they quit cold.

The world is crowded with such fellows. They never get anywhere. They are all traveling a well greased one-way road which leads straight to failure. They know their plight. They know they are doomed. They actually feel sorry for themselves, but they won't do anything about it. They think the fellow who gets ahead by study and preparation is lucky. They refuse to recognize the fact that every successful business and career is built upon determination, hard work, and study.

I know a man, today the owner of a prosperous business, who not so many years ago was just about ready to go under. One misfortune after another hit him; at times it seemed impossible that his business could last another day. But he wouldn't quit. Before him, where he could read it every minute, was this motto:

"When today's difficulties overshadow yesterday's triumphs and obscure the bright visions of tomorrow—

"When plans upset and whole years of effort seem to crystallize into a single hour of concentrated bitterness—

"When little annoyances eat into the mind and corrode the power to view things calmly—

"When the jolts of misfortune threaten to jar loose the judgment from its moorings—

"Remember that in every business—in every career—there are valleys to cross, as well as hills to scale; that every mountain range of hope is broken by chasms of discouragement, through which run torrent streams of despair.

"To quit in the chasm is to fail. See always in your mind's eye the sunny summits of success. Don't quit in the chasm! Keep on."

He had faith in reaching those sunny summits of success on the opposite side of the chasm, and that faith pulled him through.

You, too, can profit from this little motto. Read it again—now—and when everything seems to go wrong—when things seem blackest—go to it for the courage and inspiration which will make you keep right on fighting.

I don't know who wrote this motto. It might have been Marconi, or Edison, or Steinmetz; it might have been the owner of a small shop somewhere, but I do know one thing—no failure could write it. Whoever wrote those inspiring words knew what it takes to be successful.

J. E. SMITH. *President*

William F. Dunn

TV Installations In Fringe Areas

By WILLIAM F. DUNN

NRI Consultant

WHEN TV stations began operation on the new channels assigned at the close of the war, engineers believed that reception at distances greater than 50 miles would be practically impossible. Developments in the past few years, however, have proved them wrong. Satisfactory reception at distances greater than 50 miles, or even 100 miles, is frequently possible.

Of course, reception in these locations, which are called fringe areas, is not as good as in the primary service area of the transmitter. However, if we accept this fact and will be satisfied with a picture of somewhat inferior quality, it is possible to get TV programs in locations where reception would once have been impossible.

In fringe areas there will nearly always be a certain amount of snow present in the received picture. Snow, white specks or flakes in the picture, is electrically equivalent to noise in AM radio. In many locations there is a certain amount of snow present at all times due to a low signal to noise ratio. By increasing the signal to the receiver without increasing the noise signal, the snow tends to disappear.

Since the signal in most cases will be quite weak in fringe areas, special antenna installations will be required to obtain a usable signal. Far more care must be taken in installations in fringe areas than in locations close to the transmitter. Installation will probably be more expensive, since in addition to needing a more complicated antenna, it will usually be desirable to get the antenna up as high as possible. Even then, reception may be satisfactory one day, and on the next entirely unsatisfactory.

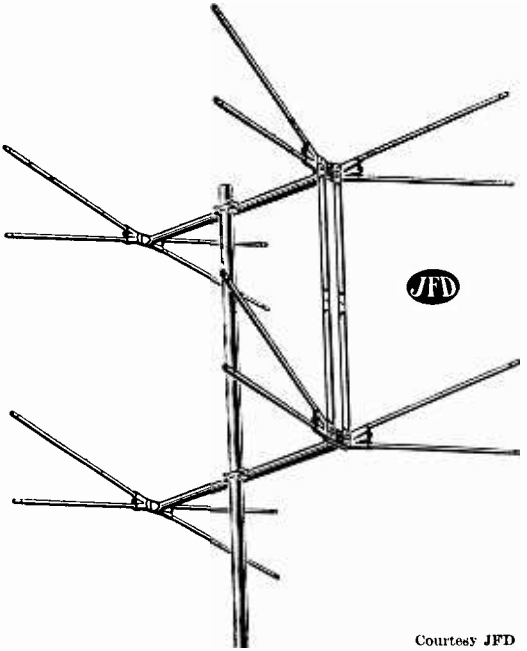
From time to time there are reports in newspapers or in radio magazines of TV reception at distances of several hundred miles. Reception of this type is due to freak atmospheric conditions and it certainly would not be advisable for anyone to purchase a TV receiver with the hope of picking up a station located several hundred miles away. However, in some areas as much as 100 miles from a transmitter, it is possible to get satisfactory reception, and the purpose of this article is to point out the steps that should be taken to obtain the best possible reception in such locations.

Selecting the Antenna

In a weak signal area, the kind of antenna used will usually determine whether the reception will be satisfactory or not. The entire project should be carefully considered before deciding on an antenna, and it would be worth while to investigate nearby installations, if possible, to see the types of antenna used and the results obtained. This information will usually be helpful in making the best selection.

In selecting the antenna, you must first remember that you want one with high gain. The higher the gain, the more signal will be available. The stronger the signal, the better the chances of obtaining a satisfactory picture without too much snow. In addition, if you run into any interference and the signal is very weak, it will usually be impossible to eliminate the interference without losing the signal, but if the signal is reasonably strong, you have a chance of eliminating the interference and still have a usable signal.

The number of stations to be received must also be considered. A high gain antenna designed for operation on a single channel would be unsuitable in any location where there are several stations that can be picked up, unless of course you



Courtesy JFD

Fig. 1. Conical type antenna manufactured by JFD Manufacturing Company, Brooklyn, New York.

are willing to be satisfied with only one station. In locations of this type you want, in addition to a high gain antenna, a broad band antenna. Moreover, if the stations are located in different directions you may need some means of rotating the antenna.

The terrain should also be considered. There are certain antenna types that give better performance in rough, hilly country than others. Similarly, some antennas are more suitable for use in flat areas than other antennas.

Fringe Area Antennas
Conical Antennas

In many fringe area installations you will find stacked conicals. Either a double stacked conical (shown in Fig. 1) or four stacks may be used. This antenna is generally considered a broad band antenna, although it usually works somewhat better on the low channels than on the high. An antenna of this type will work reasonably well in fringe areas up to 40 or 50 miles from the transmitter where a fairly strong signal is obtained. The four-stacked antenna will give better results on a somewhat weaker signal than the two-stack. This antenna is highly directional and must be carefully oriented if best results are to be obtained.

Although this antenna is used in many fringe

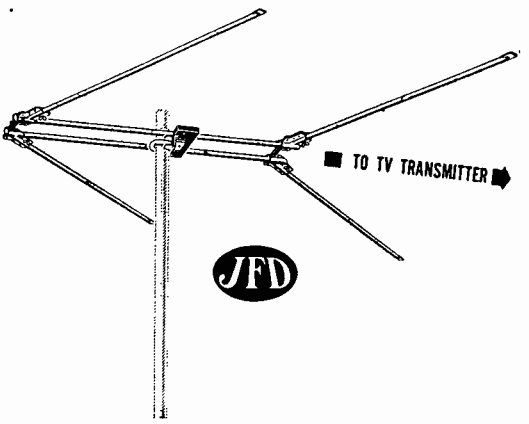


Fig. 2. "V" type antenna manufactured by JFD.

area installations, it is not considered the best type for this use. Because it is directional it works reasonably well if the signal strength is moderate, but in weak signal areas there are other antenna types that can be used far more successfully.

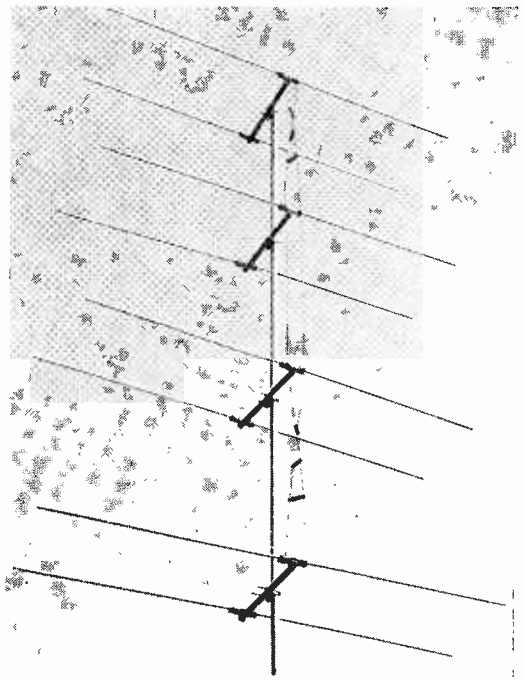
The V Antenna

Fig. 2 shows a typical double V antenna. This kind of antenna can be used as shown, or two or four V antennas can be stacked for additional gain. The stacked double V is a comparatively new antenna, but it is rapidly making its appearance in fringe installations.

It also is a directional antenna, and while it is a broad band antenna and consequently can be used for both high and low band stations, it usually works somewhat better on the high. If the station to be picked up is a high band station, this antenna should be given consideration. On the other hand, if the station is a low band station and is located some distance away, there are others that are more suitable.

In an installation where there are two stations to be picked up, one a high band station located some distance away, and the other a low band station located somewhat closer, an antenna of this type might work out very well. If the two stations are located in the same direction, the antenna can be oriented for best results and then fixed in one position. If the stations are located in different directions, a rotater is required.

If you decide to buy one of these antennas, it would be advisable to get a stacked V rather than a single antenna with the idea of adding a stack later if necessary. If you buy the stacked double V, you will be assured of best results at once, and you need not be concerned about the signal being too strong. On the other hand, if you



Courtesy VEE-D-X

Fig. 3. The VEE-D-X Collinear antenna, manufactured by VEE-D-X, LaPointe Plascomold Corporation, Windsor Locks, Connecticut.

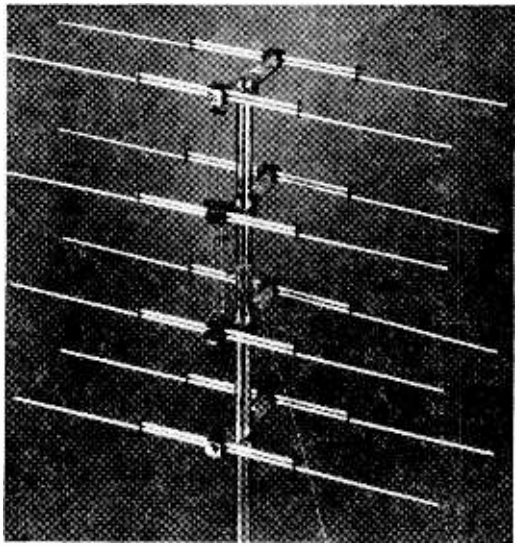
were to use a single antenna and later found it necessary to add another, you may have difficulty obtaining the necessary hardware, and in addition you might have to do considerable experimenting with the spacing between the stacks in order to obtain good results.

The Collinear Antenna

The VEE-D-X collinear antenna shown in Fig. 3 is an excellent antenna for fringe installation. It is a relatively new type and has given very promising results. It is a broad band antenna, and although it seems to give slightly better results on low band stations than on high band stations, it is suitable for use on all channels. Antennas of this type are highly directional, and if they are to be used for two or more TV stations that are not located in the same direction, a rotator will be required.

The Vee-D-X antenna shown in Fig. 4 (Vee-D-X type RD 13A antenna) is somewhat more elaborate. This particular antenna is about the best fringe area antenna for all-around reception. It is quite expensive, but it will frequently give excellent results when other antennas do not.

Of course, it is not necessary to use such an



Courtesy VEE-D-X

Fig. 4. The VEE-D-X type RD-13A antenna.

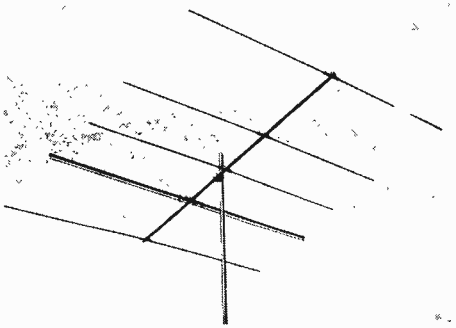
elaborate antenna in all fringe installations. This antenna is a broad band antenna and it is designed for use in installations where there are a number of TV stations operating on different channels. In a fringe area where there is only one TV station to be picked up, there are less elaborate antennas that will be just as satisfactory.

As an experiment, two members of the NRI staff erected one of these antennas on the Eastern Shore of Maryland about 125 miles from Washington and Baltimore. They succeeded in picking up stations in New York City, but the signals from these stations were too weak to use and faded considerably. Stations in Philadelphia, Baltimore, Washington, and Norfolk, however, came in very well, although there was some fading which could have been minimized by putting the antenna higher in the air.

An elaborate antenna of this type, in addition to being costly, has another big disadvantage. It is heavy and difficult to erect high enough into the air for best results. It would not be advisable to plan on using such an elaborate antenna unless you are sure you have some means of getting it up.

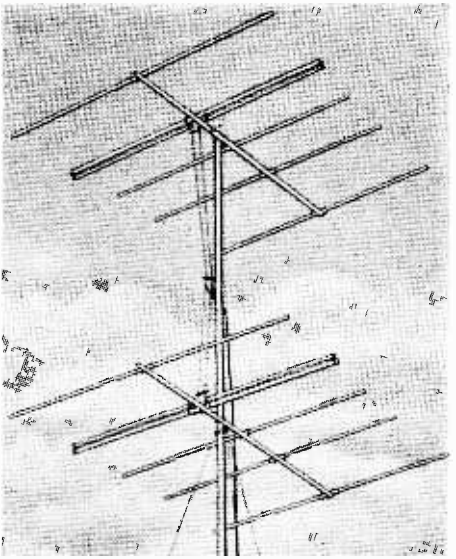
The Yagi Antenna

All things considered, the Yagi antenna is unsurpassed for single-channel reception. It is comparatively inexpensive, easy to erect, has high gain, and is highly directional. There are a number of different types of Yagi antennas. The Yagi may consist of a three-, a four-, or a five-element array. A single array can be used, or two or more arrays can be stacked.



Courtesy VEE-D-X

Fig. 5 (a). Standard JC Yagi Array.

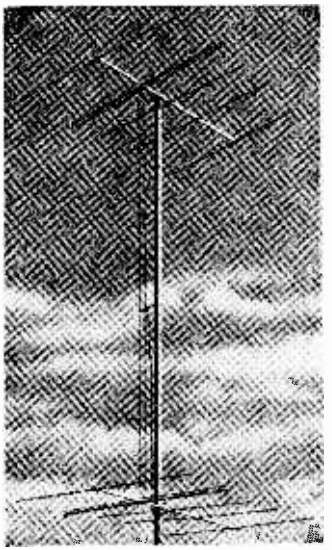


Courtesy VEE-D-X

Fig. 5 (b). Double Stacked JC Array.

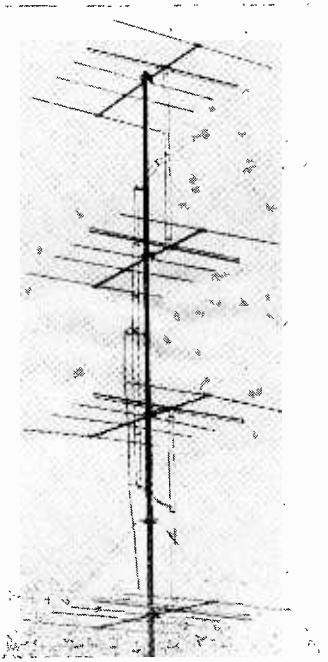
Fig. 5a shows a five-element Yagi array. This antenna will work very well where a single station is to be picked up. Manufacturers supply Yagi antennas cut to length for the different channels, and when ordering an antenna of this type you must specify the channel, since the size of the antenna depends upon the channel on which it is to be used. The channel 2 antenna is fairly large, whereas the antenna designed for channel 13 is small.

Fig. 5b shows a stacked Yagi array. An antenna of this type provides additional gain, and with the two arrays stacked one-half wave apart, better signal-to-noise ratio is obtained. In addition to using a stacked array in areas where the signal is quite weak, it would also be advantageous



Courtesy VEE-D-X

Fig. 5 (c). Double Stacked JC Array with full-wave spacing.



Courtesy VEE-D-X

Fig. 5 (d). Four Stacked Vertical JC Array.

to use an array of this type in noisy locations. A stacked Yagi array is far less susceptible to automobile ignition interference than a single array.

Fig. 5c shows another stacked Yagi array. In this array the spacing is one wavelength. The gain is somewhat higher than that of the array shown in Fig. 5b, but it does not have the noise reducing ability that the antenna shown in Fig. 5b has. Therefore, this antenna will be particularly useful in areas where the signal is weak, but the noise level is low. In many rural areas, especially where the houses are some distance from the nearest highway, an antenna of this type will give excellent results.

The antenna shown in Fig. 5d is a four-stacked Yagi array. The gain is very high, as is the noise reducing ability. Such an antenna is particularly useful in fringe installations in areas where the terrain is comparatively flat. Amazingly good results have been obtained with antennas of this type at distances in excess of 100 miles.

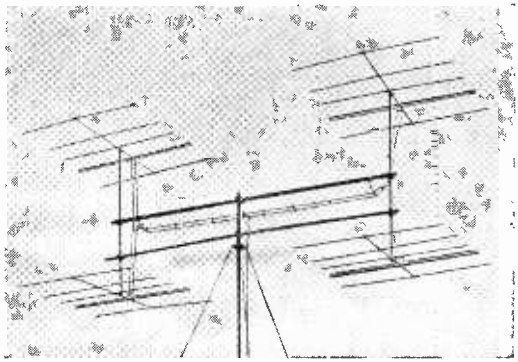
The antenna shown in Fig. 6 is a comparatively new type. The manufacturer has designed it for high gain in hilly and mountainous areas. The antenna should of course be erected as high as possible. It should not be erected on the back of a hill where the hill is between the antenna and the transmitter.

This kind of antenna will be quite large if it is designed for channel 2, and much smaller for channel 13. A telescoping mast would make the job of putting up the large antenna simpler.

Although the antennas shown in Figs. 5 and 6 were designed for use on a single channel, in some locations it might be possible to pick up signals from the adjacent channels, and in many cases the Yagi antenna will give reasonably satisfactory results on adjacent channels. For example, an antenna designed for chanel 8 will probably work fairly well on channels 7 and 9.

The four-element Yagi shown in Fig. 7 is designed for use on two channels. Two different models are available, one for use on channels 4 and 5, and the other for use on channels 7 and 9. When the antenna is being used on channel 4, the element in the rear acts as a reflector, the next one is the antenna, and the two forward elements are directors. On channel 5, the two rear elements act as reflectors, the next one as the antenna, and the front one as a director. The operation of the antenna designed for use on channels 7 and 9 is similar.

This particular antenna is useful in locations where either of the two groups of channels can be received. It is available both in the single arrays shown in the diagram, or in stacked arrays. The stacked array, of course, will have

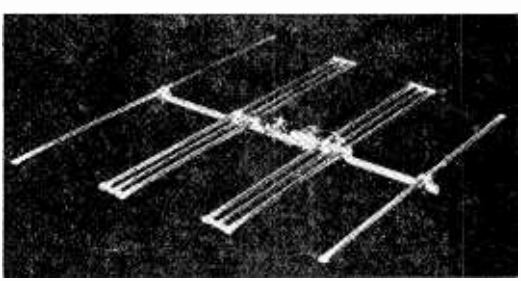


Courtesy VEE-D-X

Fig. 6. Four Stacked Side-By-Side JC Array.

better gain, and it will also be capable of producing a higher signal-to-noise ratio.

In locations where two channels are received, such as a high band and a low band, it might be more economical to use two Yagi arrays than to use a single broad band antenna. In addition, better results will probably be obtained with the two separate antennas. When you have a high band and a low band station to be picked up, the high band antenna can usually be put on the same mast as the low band antenna. Antennas for the high band stations are quite small and inexpensive and will not add too much to the cost of the installation.



Courtesy Tric Mfg. Co.

Fig. 7. Four Element Yagi Antenna, manufactured by Trio Manufacturing Company, Griggsville, Illinois.

In an installation of this type it will be worth while to run a separate transmission line for each antenna. A double-pole double-throw switch is mounted at the back of the receiver so the desired antenna can be selected.

Rhombic Antennas

The rhombic antenna is excellent for fringe area installations. It is highly directional and will provide high gain. It can be designed specifically for any one channel and it will give good results

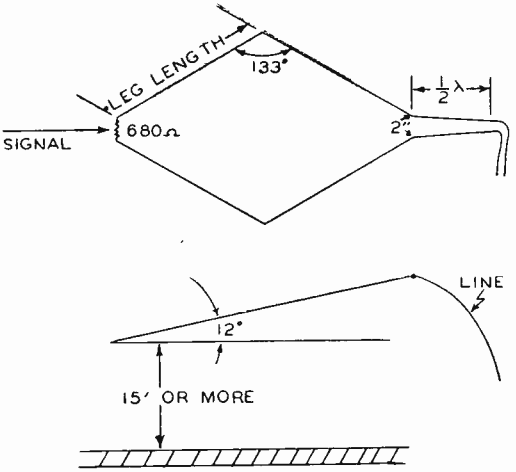


Fig. 8. Rhombic Type Antenna.

over a wide range of frequencies. It is also possible to work out a compromise design that will give reasonably good results over the entire spectrum. Of course, the further you get away from the design frequency, the less gain is obtained.

Fig. 8 illustrates a rhombic antenna. The leg length will depend upon the frequency for which the antenna is designed. If a leg length of 52.2 feet is used, the antenna will be six wavelengths long at 108 megacycles. This is approximately the center of the TV spectrum and represents a compromise design for use for all channels.

To design an antenna for best results on one channel, first determine the center frequency of the channel in megacycles. Then divide this into 936 to obtain the length of one wavelength. Multiply this by 6 and you will get the leg length. Follow the remainder of the information given in Fig. 8 and the antenna should give very good results on one channel. A gain of approximately 15 db should be obtained on the channel for which the antenna is designed.

The 680-ohm resistor must be a non-inductive resistor. A wire wound resistor can *not* be used.

The ends of the rhombic that connect to the transmission line should be spaced two inches apart. You can connect a piece of 300-ohm transmission line to the rhombic by slitting the transmission up the center a distance of ½ wavelength. To determine the length, divide the frequency into 468. Connect the ends of the transmission line to the terminals and allow the slit portion of the line to fan out smoothly. If you are designing the antenna for reception on a number of stations, the transmission line should be slit one-half wavelength at the lowest frequency. In other words, if you design the rhombic to pick up channels 7 and 11, you would use the frequency of channel 7 in making this calculation.

As shown in the diagram, the antenna should be tilted. With the dimensions given, the angle of tilt should be 12 degrees. This angle, incidentally, is quite critical, and changing the tilt either one way or the other will probably have a very noticeable effect upon the performance of the antenna.

Since the rhombic antenna is very directional, special effort should be made to get the antenna pointing in the correct direction. Probably the best thing to do would be to obtain a Yagi antenna cut for one of the stations to be picked up. By using the Yagi you should be able to determine the direction from which the strongest signal is coming. From this information you will be able to lay out the rhombic accurately.

You can use either metal or wooden poles in constructing the rhombic. If the metal poles are used, the antenna should be kept a reasonable distance away from the poles. The best thing to do is to lay out the poles so that the spacing between them is somewhat greater than required by the antenna. You can fasten some type of pulley to the top of the pole and run a rope through it. The rhombic can then be pulled into the air, and if the pole spacing is somewhat greater than the size of the rhombic, the antenna will automatically be kept away from the poles. It is a good idea to put up a rhombic that is mounted on wooden poles in the same way, since it provides a convenient means of raising and lowering the antenna in case repairs are required in the future.

The fact that a rhombic is a broad band device makes it particularly useful in locations where there are several stations. It might be well to keep in mind that, when a rhombic is designed to cover the entire TV spectrum it will not give its best performance. If you are in a location where the signal is moderately strong, the chances are that a single rhombic will be satisfactory and will cover the entire spectrum reasonably well. However, if the signal is likely to be weak, and if you have a number of stations to pick up, it would be worth while considering two rhombic antennas. One antenna would be designed for use on the low band stations and the other for use on the high band stations. In calculating the length, use the center frequency of the low TV band for the low band antenna and the center frequency of the high TV band for the high band antenna. The transmission line should be cut up the center, for the lowest channel. In other words, in connecting the line to the low band antenna you would use channel 2 frequency in determining how far to slit the line, and, for the high band, channel 7 frequency.

There are other types of TV antennas in use in fringe areas, but the ones mentioned are the most popular and usually they can be counted on for the best results. With the exception of the rhombic antenna, I would not recommend trying to build your own antenna. When a manufacturer designs an antenna he has considerable equipment available. Engineers experiment with different lengths or spacing of the elements. Frequently they find by making a slight change they can improve the signal pickup and the final antenna may have had a number of changes made from the original design.

The average person has neither the time nor the equipment for experimenting in this way. Experimenting with the actual installation is not satisfactory, because frequently a change in signal strength at the receiver results from a change in the actual signal reaching the receiver, rather than a change due to the antenna adjustment. In addition, the parts needed to build the antenna would probably cost as much as or more than a commercially manufactured antenna.

Making the Antenna Installation

The first step in making a TV installation in fringe areas should be a preliminary inspection of the location. You can save time and money by making this inspection.

First, decide whether you are going to need a tall mast or a short one. This will depend on several things. The most important things to consider in making this decision are the distance from the TV station and whether the location is on high or low ground. On high ground, and if there are no hills immediately in front of the antenna, you will not need nearly as high a mast as you would if the location were on low ground and hills blocked the direct path to the transmitter.

Look over the surrounding country when making the preliminary inspection. If it is a rural area the chances are the noise level will be fairly low. Of course, if the house is located close to a busy highway then you must expect considerable ignition interference and you should plan on using an antenna that is not susceptible to this type of interference. On the other hand, if the house is located a good distance from any busy highway the noise level will be low, and you can consider a high gain antenna designed for use in low noise areas.

If the installation is to be made in an urban area there will probably be a fairly large amount of noise present and a noise reducing antenna should be used.

It would be worth while to consider the use of a rhombic antenna if room is available. Of course, since a rhombic takes a fair amount of space, it is practically impossible to use this type of antenna in a city or town.

Plan on locating the antenna as near the house as possible. As a matter of fact, when practical, it is a good idea to place the mast near the point where the transmission line is to be run into the house. This will simplify the installation; it will keep the amount of line needed to a minimum; and it will make it easy to provide good lightning protection.

Antenna Mast

There are a number of different masts available. Light weight aluminum masts come in 5-ft. or 10-ft. lengths, which are simply fitted together to make as tall a mast as needed. Of course, a mast of this type must be supported in a number of places if it is to be of any great height. It can be mounted on the ground and erected at the side of a building and supports can be fastened to the building and to the mast at several points. This kind of mast can be used when the antenna need not be more than 10 or 15 ft. above the top of the building. Collapsible masts are also available. The mast consists of a number of sections. The largest section is the bottom section and it can be mounted in place with the other sections inserted inside of it. The mast is then raised so that a bolt hole in the top of the bottom section coincides with a bolt hole in the bottom of the next section. The bolt is then slipped in place and once it has been fastened the next section then may be raised. This is a fairly easy method of getting the TV antenna up and if the mast is supported to a building it is quite rigid.

For high installation or in areas where high winds are frequently encountered, a tower similar to the one shown in Fig. 9 is recommended. This kind of tower is easy to assemble and in addition is strong, so it is suitable for large elaborate antennas that may be quite heavy.

As shown in the drawing, the tower breaks down into sections. The entire tower can be assembled on the ground and then raised into position, or part of the tower can be assembled on the ground and the remainder on the roof top. The antenna can be attached to the top section and then the two sections joined together. This is quite a job and the usual practice is to assemble the whole tower on the ground, and then raise it in one section.

One method of getting up this kind of antenna tower is to rig up a pulley arrangement on the top of the house. A line can then be run through the pulley and fastened to the tower. The other end of the line can be brought over to the other side of the house and it can then be fastened to a truck. Of course, the guy wires that are to support the tower once it is erected should be put in place and there should be at least one man on

each guy. When the tower is pulled into place the men on the guys can support it so that there will be no danger of the tower toppling over on the house. Of course, the truck must be handled carefully, and the tower pulled up very slowly.

It is a good idea to figure the approximate length of guy wires required and then make the guys slightly longer. They can then be fastened in place, and in the event the tower should start to fall over, the guys should prevent it from falling too far. If the guys are too long and the tower starts to fall, it will pick up so much speed that it will snap the wire.

If this method is used to raise the tower, once it is in place the various guys can be tightened up one at a time. It is usually necessary to shorten the wire. A turn buckle should be used in each guy wire so that it can be pulled tight.

Most companies that manufacture antenna masts and towers give instructions on how to get them up. It would be well worth while to obtain any literature that the manufacturer has available on erecting the mast, and since he has probably carried out a number of experiments on his particular type of mast, his instructions should be followed exactly.

Using a tower like that shown in Fig. 9 requires strong guy wires. The support to which the guys are to be anchored must be in place before the tower is pulled up into the air. A concrete support provides a suitable anchor, if it is large and deep enough.

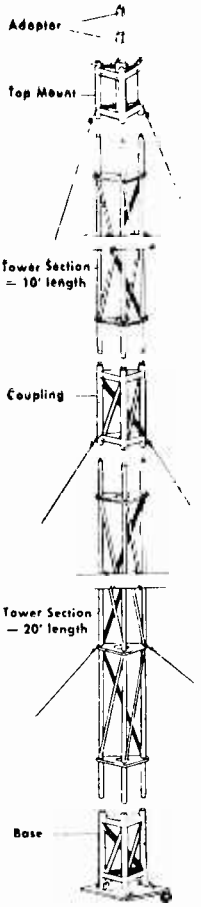


Fig. 9. Typical Antenna Tower suitable for TV antennas, manufactured by VEE-D-X.

Fig. 10 shows how the various cables can be attached to the support. Notice that turn buckles are provided and also that an anchor plate is used. This plate will keep tension on the three guys constant. Equipment of this type is available from the companies manufacturing towers and they probably also have information on suitable methods of supporting their towers.

Lightning Protection

In rural areas, in particular, the lightning protection is very important. In open areas where there are no trees, the chances of the antenna being struck are far greater than in a city or in a wooded area. It is extremely important that the antenna mast be mounted on the ground rather than on the house in a rural area. In the city it is not so important because the chances of the antenna being struck are much less. Of course, the best thing to do, whether it is in the city or out in the country, would be to mount the mast on the ground, but this is not always economical.

The mast should be properly grounded. If the mast is mounted on a concrete form, it would be advisable to drive a pipe into the ground. The pipe should be driven into the ground 6 or 7 feet and the mast should be securely bonded to the pipe. A heavy No. 6 wire should be used. In rural areas it probably would be a good idea to use two or three pieces of No. 6 wire to bond the mast to the pipe.

If the mast has been erected near the spot where the transmission line is to be run into the house, you can probably run the transmission line right down the mast. Of course, suitable stand-off insulators should be used. A lightning arrester could then be installed at the base of the mast just before the transmission lines goes to the house. The mast, which is already grounded, provides a good ground for the lightning arrester. If lightning should strike the antenna or the antenna mast and the installation has been properly grounded, damage will be negligible, since the lightning will simply travel down the mast to ground. On the other hand, if suitable lightning protection has not been used, the TV receiver may be damaged, and in addition it is possible that the building also may be damaged.

In an urban area, if the mast is mounted on top of the building, a ground wire should be run to a pipe driven into the ground. Fasten the wire to the pipe and to the antenna mast by means of suitable clamps. A No. 6 conductor should be used.

As in the case of an installation in a rural area a lightning arrester should be used, mounted at the point where the transmission line enters the building. If it enters a basement window, the best policy is to drive a pipe into the ground right beside the window. The arrester can then be mounted on the pipe and the transmission line brought over to the arrester and from there on into the house. This will provide protection not only in the event that lightning strikes the antenna, but also in case it should strike the transmission line. For proper protection against lightning, use a lightning arrestor *and* also ground the mast—one alone s not sufficient.

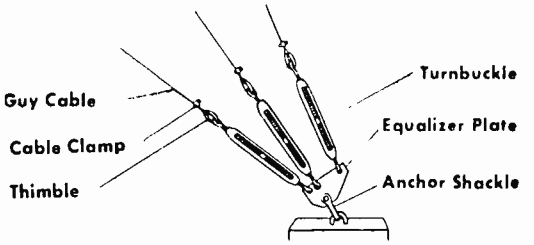


Fig. 10. Method of attaching Guy Cables to anchor support used with VEE-D-X antenna tower shown in Fig. 9.

Antenna Height

Generally speaking, the higher the antenna the better it will perform in a fringe area. However, there are certain limitations, economy, if no other. Also, the higher the antenna the more difficult it is to erect it. If you had an antenna mounted 10 feet off the ground, adding 10 feet to its height would probably result in a noticeable improvement in performance. On the other hand, if you got the antenna up 50 feet, adding 10 feet to its height probably will not make too much difference in the operation.

However, it does not always prove true that a higher antenna works better than a low one. In some cases, it has been found that lowering the antenna slightly improves the performance. If satisfactory performance is not obtained and if considerable fading is noticed, it would be worth while to try both raising and lowering the antenna in an effort to improve reception.

Transmission Line

Generally 300-ohm twin lead is satisfactory as the transmission line. However, in some locations where the noise is high, it may be advantageous to use 300-ohm shielded line or coaxial cable.

In many locations the building in which the TV receiver is to be used may be on low ground. If there is a high hill close by, it might be better to mount the antenna on top of the hill. In an installation of this type the transmission line will probably be quite long. 300-ohm line may work satisfactorily, but it might be better to use an open line. Gonset low loss open wire line can be bought from most wholesalers.

Boosters

A booster is frequently helpful in a fringe installation. This is particularly true when the noise level is low. If the noise level is high the booster will amplify both signal and the noise and usually will not improve reception to any great extent.

There are several different kinds of boosters on the market. Some boosters use only a single stage, others several stages. Of course, the boosters using several stages have more gain, but they are also more expensive.

If reception without a booster is almost satisfactory, that is, if the signal is almost strong enough to be satisfactory, then the chances are that an inexpensive single-stage booster will be all that is needed to give satisfactory results. On the other hand, if the signal is very weak, it would be advisable to obtain one of the more sensitive boosters using several stages.

Boosters have another use. A booster is frequently helpful in eliminating interference. The stages in a booster are tuned, and the more accurately tuned the stages you have are, the better the interference elimination will be. Boosters are particularly helpful in eliminating FM interference due to image reception. They will not, however, eliminate FM interference that is due to second harmonics of the FM station.

Frequently in a fringe area it is worth while to make minor changes in the TV receiver itself in an effort to improve reception. Sometimes one or more tubes in the set can be replaced by tubes having more gain. For example, a 6BC6 tube can sometimes be substituted in place of a 6AG5. In some receivers this results in oscillation or other undesirable effects, but in many receivers it results in increased gain—and it is usually worth trying.

It may be possible to re-align the receiver to increase the gain. This will reduce the band width of the receiver and result in some loss of the high frequency detail. However, when the sighal is very weak this is usually a worth while step. To realign a set to cut down on the band width and increase the gain, you should have a sweep signal generator and a cathode-ray oscilloscope in order to see exactly what you are doing. It would not be advisable to attempt realigning a set unless you have the correct test equipment available.

Manufacturers constantly bring out new antennas, and it is probable that antennas will be developed in the future that will be better for fringe installations than antennas available at the present time. It may prove worth while to read one or more of the various radio publications and to glance over the antenna manufacturers' advertisements. Usually, when a manufacturer announces a new antenna, he will be glad to supply technical details. By obtaining information of this type and keeping it on hand, you will be able to keep up with the latest developments in antennas and be assured of the best possible results in each installation you make. Antennas illustrated in this article are not available from NRI. For further information, write direct to the manufacturer.

Read How NRI Graduates Are Forging Ahead In Radio and Television

$2,500 Net in One Year From Spare-Time Servicing

"I fixed my first radio after my twentieth lesson and have done service work ever since. At first I earned about $10 per month in spare time service. Last year I netted a little over $2500 in spare time work. I have made a little over $500 the first 3 months of this year.

"I still have a salaried job with a Research and Development Company. Most of our work is electronically controlled so my radio course has helped me a lot in this work. I work nights in the Lab. and do service work in day time."

WILLIAM G. MEITER
445 Hester
Alliance, Ohio

n r i

Knew Radio, but Was Groping in the Dark Until Trained by NRI

"I work on Radio in my spare time. I have my own business. I was working in Radio but I soon realized that my work was like that of a blind man. I made no real profit working that way. Now, my work is very easy.

"The troubles are usually the same, a tube, a resistor or a condenser, sometimes a power transformer.

"For the last 12 months I made a spare time profit of $400 to $500 in a little town of 2000 population."

BENOIT PARENT
St. Isidore Dorchester
P.Q., Canada

n r i

Has All the Radio-TV Work He Wants To Do

"I am doing fine since I finished your course. I have a contract with two car dealers and all the TV and Radio work I want to do, thanks to the National Radio Institute."

WILLIAM H. BROADY
2315—40th Pl., N. W.
Washington, D. C.

Services Are Much in Demand. Has Had Many Offers

"I have been getting along nicely ever since I took your course in Radio and Television.

"I was employed by Capital Television as an installation man on TV antennas. I've had many offers since taking your Radio and TV course."

NICHOLAS J. COSTA
343 Chauncey St.
Brooklyn, N. Y.

———*n r i*———

Was Offered Job Before Graduating. In Spare Time Is Building Business of His Own

"Before I enrolled with NRI I was doing all types of work such as taking care of lawns, and working on radios if I could get an old one which wasn't much good. After looking through the literature I enrolled with NRI. From the time I enrolled to the time I graduated I had made about $275.

"Before I had graduated I was offered a job at Anderson Electric. Here I helped wire up stoves and also repaired some of the radios which came in. This job I am still holding, only now I am doing Television and Radio servicing, which includes going out and repairing some of the sets in the homes. In my spare time I go out and pick up radios which I repair on my own accord. The business I have started is picking up more every month, and by next year I hope to have a large business started. Have completed my shop in my home."

HAROLD SCHAEFER
317 Maple Ave.
Columbus, Wisc.

Was 16 When He Enrolled. Advises Young Men To Get Started

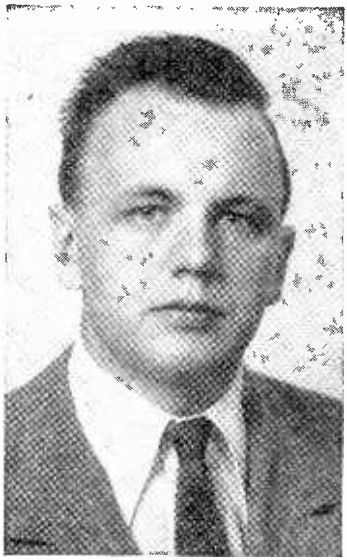
"I wish to take this opportunity to thank you for the world of wonderful opportunities you have opened for me. Although I was only 15 when I enrolled in the NRI course I have found it to be of inestimable value. I received much advice shortly before enrolling and most of its was 'don't do it—you'll find that when you've invested your money, you won't know anything, anyway.' It makes me feel good inside to have these same people come to me now to have their radios fixed.

"I would advise any young boy that has looked at the NRI advertisement with longing, to take advantage of that feeling and transform it into a feeling of success."

CHARLES WEISPFENNING
Box 108
Fredonia, North Dakota

As space permits, from time to time, we plan to devote a page or two in NR-TV News to short success stories such as above. They are taken from testimonial letters we have on file. Photographs and letters of this kind are always greatly appreciated by us. We feel we should pass them on to our readers for the inspiration to be gained from a reading of them.

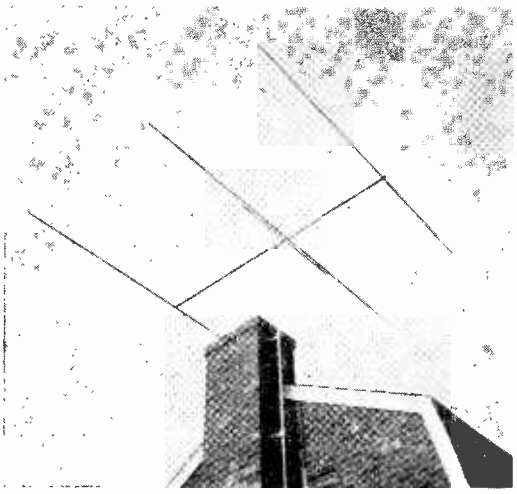
A Practical, Inexpensive Three-Element Rotary Beam for 10 Meters



Ernest B. Mullings

By E. B. MULLINGS
W4MKZ
NRI Consultant

NO doubt many amateurs have been deterred from having a rotary beam for 10 meters because of the cost and difficulty of building one according to current design—which is largely the result of their complexity of construction. However, intricate lattice-work and cross-bracing, cast aluminum joints, ladder-type construction, all can be eliminated without sacrificing electrical characteristics, physical appearance, or ruggedness. The simple, three-element beam described below can be built with a minimum expenditure of time, effort, and money, using materials that are readily available and at a reasonable price. The fellow who doesn't have a beam for 10 meters because he feels that it would cost too much or would be too difficult to build no longer has any reason to hesitate. This is a beam that anyone can easily construct and erect at a cost that is surprisingly low.



The beam consists of a boom made of two-inch Dural tubing, elements of one-inch Dural tubing, and inserts of ⅞ tubing at both ends of the elements. The tubing has a wall thickness of .049 inch, which is adequate to withstand any stress or strain that the beam will be subjected to under ordinary circumstances. Sagging of the elements or boom is negligible. Heavier tubing can be used, but it is not as easy to work with, and it will add to the weight and cost of the beam. The beam made with .049-inch tubing weighs only fifteen pounds and its ruggedness is evidenced by the fact that the entire beam can be lifted off the ground by the end of one element.

A twelve-foot length of two-inch tubing was used for the boom, giving length enough so that the elements can be widely spaced. The boom should be slotted to receive the elements as indicated in Fig. 2. The elements are attached to the underside of the boom to keep the top surface of the two-inch tubing unbroken, which will increase its strength. Dimension A in Fig. 2 should be ⅝ inch to allow the three twelve-foot lengths of one-inch tubing to fit deep enough into the slot to prevent them from moving laterally. Making the slot any deeper might weaken the

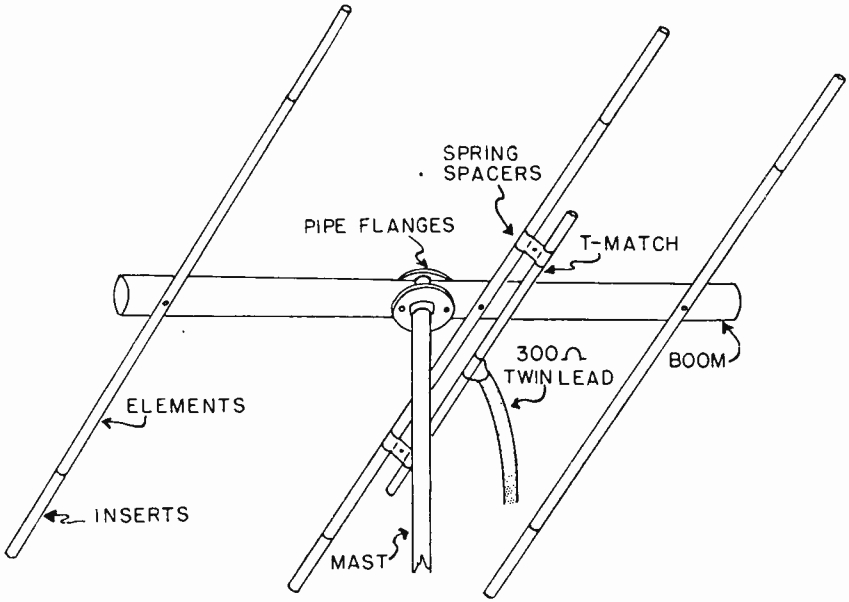


Fig. 1. The boom is made of 2-inch tubing and the elements and the T-match are made of 1-inch tubing. The inserts at the ends of the elements are made of 7/8-inch tubing.

boom. This dimension can be marked off by laying out the distance between the ends of the slot on the circumference of the tubing. Careful inspection of the tubing will reveal lines running the long way of the boom which can be used as a reference, so that all three elements will be on the same plane. The distance between the ends of the slots, as measured with a flexible rule around the circumference, should be approximately two and one-quarter inches. Dimension B, of course, should correspond to the diameter of the element tubing. It is recommended that dimensions A and B be undercut and then filed to the final size to insure a good fit. A half-round file should be used on the ends of the slots.

The slots can be easily cut with a hacksaw. Make the crosswise cuts first, and then saw a diagonal across the slot. The ends of the slot can be roughed out by simply bending the cut-out pieces back and forth until they break off. Filing to final size should be done after all three slots have been cut and the elements can be lined up with each other. The slots for the director and reflector should be at least ½ inch from the ends of the boom.

The elements are held in the slots by means of ¼-inch bolts (Fig. 2) that are passed completely through the element and the boom. Two twelve-foot lengths of 7/8-inch tubing are then cut into six four-foot lengths and slipped into the ends of the elements to make them adjustable from twelve feet to about eighteen feet. These inserts are usually a push-fit, but the ends of the one-inch tubing can be pinched slightly if the 7/8-inch tubing slides in and out too easily.

The method of mounting shown in Fig. 3 eliminates towers, guy wires, or other unsightly arrangements that require special materials, tools, or mechanical ability. It requires only standard pipe fittings that can be obtained at a neighborhood hardware store or at a plumbing supply house, and gets the beam up in the air with minimum labor and expense. Note that the weight of the mast and the beam itself rests on

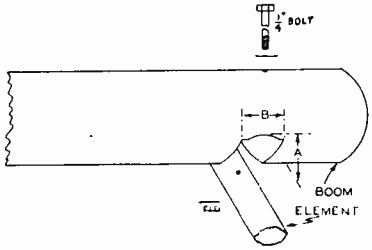


Fig. 2. The boom should be slotted so that the elements can be fastened to it with ¼-inch bolts.

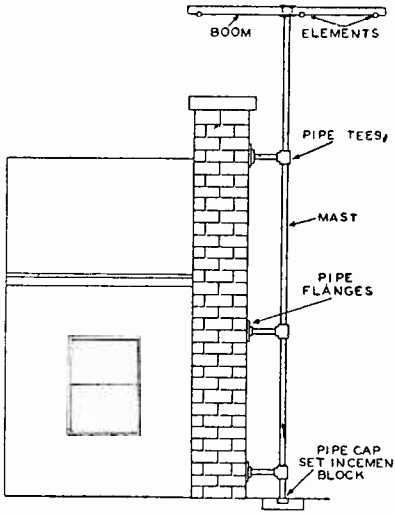


Fig. 3. The bottom of the mast rests in a pipe cap in a cement block. The over-size pipe tees form the bearings and the mast is free to rotate. The braces are fastened to the side of the house or the chimney.

the ground. Lightning protection is also afforded by having the mast securely grounded.

The braces are attached to the side of the house (brick, stone, or frame) or on the chimney, since it is usually taller than the house. With the weight of the beam resting on the ground, there is a minimum amount of strain on the braces. A short length of pipe at the bottom of the mast can be removed by means of the coupling or union, and the beam can be lowered to roof level for any adjustments that may be necessary.

One-inch galvanized pipe was used for this mast, although ordinary black iron pipe would do just as well if painted to prevent rust. The actual outside diameter of one-inch pipe is 1⅜ inches. A smaller size pipe is not recommended as it will not be rigid enough to allow the beam to be raised more than a few feet above the top brace. One-inch pipe, however, permits raising the beam six to ten feet above the top brace without danger of the pipe bending in the wind.

A six-inch length of *1¼-inch* pipe was used for the braces *with 1¼-inch pipe flanges and pipe tees.* One-inch pipe fits freely through a 1¼-inch pipe tee which acts as a bearing so that the mast rotates easily. A 1½-inch lathe dog can be used to lock the mast in any position, as shown in Fig. 4. A pipe strap or heavy wire should be used to fasten the tail of the lathe dog to the lowest brace. Another locking method would be to drill and tap the bottom pipe tee so that the mast can be locked in place by means of a set-screw.

The flanges of the braces can be attached to a frame house with large wood screws. The braces should be located so that at least two of the screws penetrate the heavier house framing behind the siding. For a brick or stone wall or chimney, holes should first be drilled in the brick or stone (not the mortar), and lead anchors inserted in the holes so that the flanges can be attached with large wood screws or lag bolts. A rawl drill will be found more satisfactory for drilling these holes than a star drill. The top brace should be attached at the highest possible point on the wall or chimney and the other braces (two or more) should be appropriately spaced down to the ground level. The bottom of the mast should rest in a 1¼-inch pipe cap that is embedded in a cement block in the ground. This does not ground the mast electrically and a No. 6 bare copper wire should be attached to the mast with an approved electrical ground clamp. The wire should then be connected to a cold water pipe with another ground clamp. Still another locking method would be to use the lathe dog just above the pipe cap at the base of the mast. The tail of the lathe dog can then be embedded in the cement block.

The center of gravity of the beam should be located by balancing it, and the mast should be attached at this point with two one-inch pipe flanges as indicated in Fig. 5. One flange is placed on top of the boom and the other underneath. Two ¼-inch bolts are then passed through both flanges and the boom. The other two bolts pass through both flanges and the spacers on either side of the boom. The spacers should be slightly less than two inches high so that the flanges can be pulled down tight on the boom. These spacers can be made from short pieces of one-inch or ⅞-inch tubing. It is more convenient to attach the flanges to the beam first, so that it can be mounted by simply screwing the mast into the bottom flange.

A beam installation such as this lends itself to any one of many mechanical and electrical rotating arrangements, so the possibilities are almost unlimited. The beam can be turned manually from the ground level or from a higher location if a window is convenient to the mast.

A T-match for this beam is shown in Fig. 7. Two sections of one-inch tubing three feet long are joined in the center by a length of lucite or polystyrene rod. The ends of the rod should be turned down to a diameter that will make a push-fit in the tubing. If no means of reducing the ends of the rod so that it will fit into the one-inch tubing is available, a ⅞-inch rod can be used, and the ends of the tubing can be pinched together to make a tight fit. A small bolt is passed through the tubing and the rod as indi-

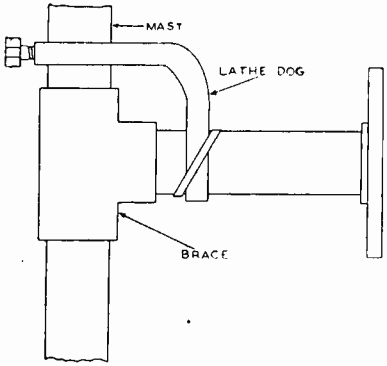


Fig. 4. A lathe dog on the bottom brace makes a very fine lock for the mast.

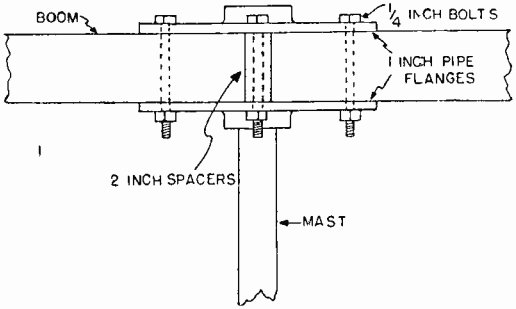


Fig. 5. The mast is attached to the boom by means of two pipe flanges and four bolts. The two-inch spacers are made from short pieces of the aluminum tubing.

cated in Fig. 6. A soldering lug under the head of each bolt serves as a soldering point for the transmission line. Spring spacers cut and bent from sheet aluminum fasten the T-match to the driven element. A small bolt passed through these spring spacers clamps them on the tubing. The space between adjacent surfaces of the driven element and T-match should be two inches.

The total cost of this beam and the mounting should run between fifteen and twenty dollars, depending on the cost of the materials in your locality. The Dural tubing can be obtained from advertisers in popular radio magazines if it is not available in your local community.

The elements should be spaced with the director about five feet from the driven element and the reflector seven feet from the driven element. Element lengths for the best front and back ratio with a minimum sacrifice in forward gain at 29.2 mc were found to be as follows: Director—15 ft. 4 in., driven element—16 ft., and reflector—16 ft. 8 in. The spring spacers on the T-match should be positioned about 24 inches on either side of center to match to a 300 ohm line.

The element length and spacing vary with frequency. However, with the length and spacing given here the beam will be satisfactory for use in the 10 meter phone band. Some standing waves will be present at the extreme ends of the band unless the length and spacing are changed. Because maximum front-to-back ratios are not the same for transmitting as they are for receiving, the actual element spacing is a compromise which favors the best transmitting results.

The impedance of the feed line also determines the spacing between clips of the T-match. For 72-ohm line the clips should be moved in toward the center and for higher impedance line they would be moved out from center. The spacings in this article are correct for 300-ohm line.

Where the beam is to rotate only 180 degrees, it is relatively simple to bring off the feeders, just where they leave the mast. Enough slack should be left so that there is no danger of breaking or twisting. Stops should be placed so that it

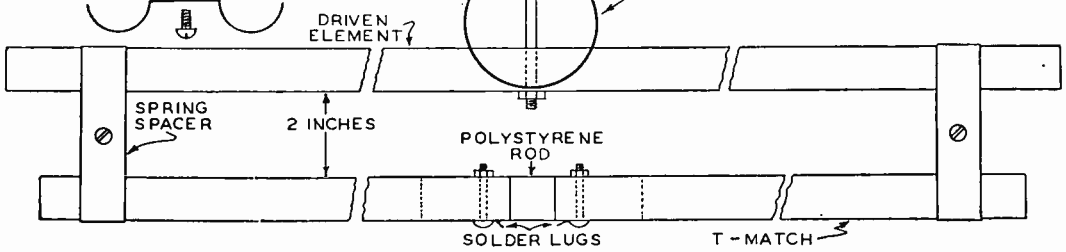


Fig. 6. The T-match is made of the same size tubing as the elements. It is spaced two inches from the driven element by means of the spacers made from 1/16-inch sheet aluminum. The transmission line is soldered to the lugs near the center of the T-Match.

will be impossible to rotate the mast enough to "wind up" the feed line. This method can also be used with antennas that rotate a full 360 degrees, but it is necessary to use stops to avoid winding the feeders around the mast. If continuous rotation is used some sort of sliding contact will be necessary in order to connect the feeders to the antenna.

Time and effort spent on this project will be rewarded by the acquisition of a three-element rotary beam that any radio amateur will be proud to own.

PARTS LIST

Quantity	*Description*
1	12 ft. length of 2-inch Dural tubing. (.049-inch wall thickness)
3	12 ft. lengths of 1-inch Dural tubing. (.049-inch wall thickness)
2	12 ft. lengths of ⅞-inch Dural tubing. (.049-inch wall thickness)
1	6 ft. length of Dural tubing for T-match (.049-inch wall thickness)
1	2 x 6 inch piece of sheet aluminum (approx. 1/16 inch thick)
1	6 inch length of lucite or polystyrene rod (1 inch or ⅞ inch dia.)
2	1-inch pipe flanges
1	1-inch pipe union
1	1¼-inch pipe cap
2	2-inch spacers (section of 1-inch or ⅞-inch tubing)
3*	1¼-inch pipe flanges
3*	1¼-inch pipe tees
3*	6-inch lengths of 1¼-inch pipe
2*	lengths of 1-inch pipe (21 ft. lengths are standard)

*Also misc. screws, bolts, nuts, washers and lead anchors required for the installation.

*The quantity of these items will depend on the height of the mast and the number of support braces required.

———*n r i*———

Before our innate faculties for goodness can be put to use we must realize the goodness that is innate in others. Before others will like us, we must like them.

—JAMES A. DECKER in *Weekly Unity*.

———*n r i*———

Spirit and enthusiasm and eagerness are wonderful qualities—but they need wise management, as a spirited race horse needs a jockey to control him and conserve his energy. Their jockey is wisdom.

—AVERY HILLIS in *Good Business*.

I just called, Jim, to tell you not to let the children disturb your sleep while you're on that night job!

Our Cover Photograph

Our cover photo is an unusual view of the Cisco-Butte, California station, which is one of the 107 radio relay stations on the route between New York and San Francisco. This particular station is located in a valley high in the Sierra-Nevada Mountains. The New York-San Francisco system is called the Long Lines transcontinental Radio-Relay System, and is owned by the American Telephone & Telegraph Company.

Television viewers were introduced to transcontinental telecasts via this new Radio-Relay System on September 4, 1951 when facilities were provided temporarily at the request of the State Department to permit transcontinental telecasting of President Truman's opening address to the Japanese Peace Treaty Conference in San Francisco. Initially the system provides one TV channel, and provides for thousands of simultaneous telephone conversations. Later a second TV channel will be available.

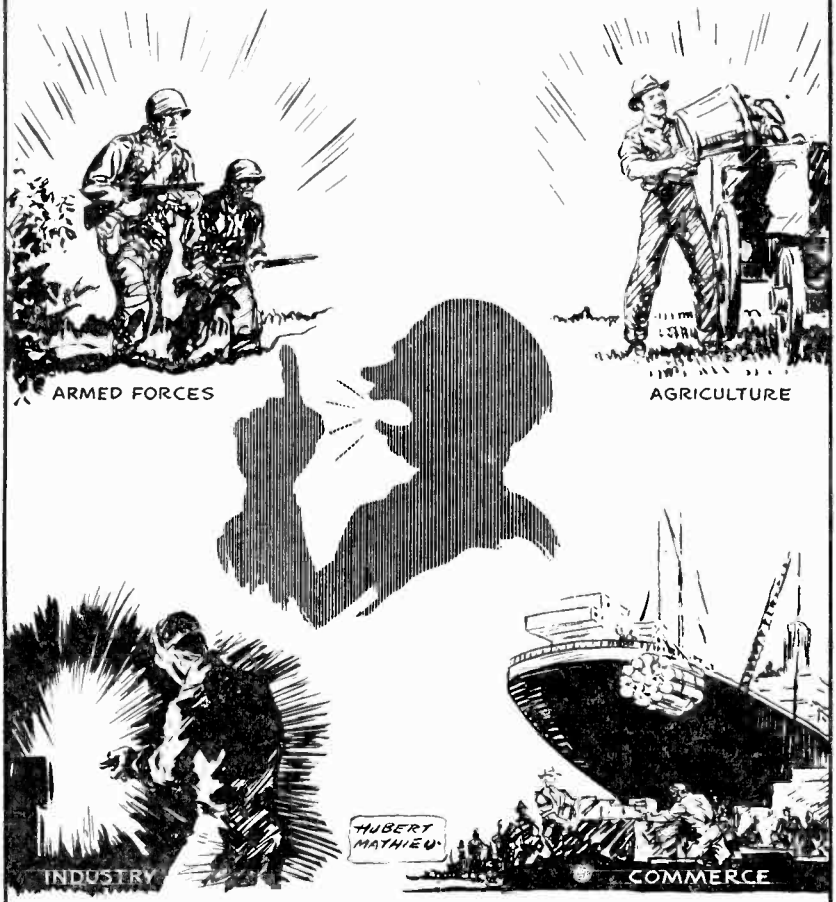
The new radio-relay route becomes the seventh telephone highway to cross the great western expanse of our country. The system does not replace, but supplements other types of communications now in use.

The first transcontinental telephone system was an open wire line, opened for service in 1915. On that occasion, Alexander Graham Bell, in New York, spoke to his one-time assistant, Thomas Watson, in San Francisco. Since then, three other open wire lines, capable of carrying dozens of calls simultaneously, and two cables, each containing hundreds of circuits, have spanned the continent over diverse routes. The first transcontinental telephne cable began service in 1942, and the second, a coaxial cable, was completed in 1947.

OUR DEMOCRACY — by Mat

SHADOW- and SUBSTANCE

"SWEET IS THE NAME OF LIBERTY– BUT THE THING ITSELF IS BEYOND ALL TREASURE. THEREFORE, IT BEHOOVES US TO TAKE CARE, LEST WE, CONTENTING OURSELVES WITH THE *NAME*, LOSE THE *THING*. —PETER WENTWORTH



IT ISN'T BY "SHOUTING THE BATTLE CRY OF FREEDOM" THAT WE WIN LIBERTY, BUT BY BEING EVER ALERT TO MAINTAIN IT– AND BY FIGHTING TO HOLD IT IF NECESSARY.

LIP-SERVICE TO LIBERTY IS NOT ENOUGH–. "THE THING ITSELF" DEMANDS SERVICE OF THE HEART, THE HAND AND THE SPIRIT.

Louis E. Garner, Jr.

GADGETS SPEED SERVICING

By LOUIS E. GARNER, JR.

NRI Consultant

OVER a number of years Radio-TV servicemen have developed many tools or "gadgets" for doing special jobs. In many cases, necessity has required that a particular tool be developed. In others, the special tool has been designed to speed regular work.

At the present time, there are quite a number of these gadgets on the market. Almost all of them are useful for the job for which they were originally designed and several have other applications as well. However, the serviceman or technician must exercise a certain amount of discretion in obtaining these gadgets—otherwise, his tool box will become so filled with gadgets, there will be little room for regular tools. Also, many have such a specialized application that they are only rarely used.

In this article, we will try to discuss some of the gadgets now available on the market which we here at NRI have found particularly useful. *NRI does not have any of these for sale.* If you are interested in buying any of these items, contact your nearest wholesale distributor or one of the mail order supply houses.

Tube Gadgets

In Fig. 1 are shown four items that are useful in handling or working with tubes.

Tube Tapper: The type shown in Fig. 1 is a special pencil with the rubber eraser mounted at right angles to form a small hammer. (An ordinary pencil can also be used.)

The tube tapper is used to tap or gently strike tubes in a receiver or amplifier to determine which tubes have loose elements and are microphonic. A howl or ringing noise will be heard when such a tube is struck. It may be used not only for tubes but for any other component suspected of being microphonic.

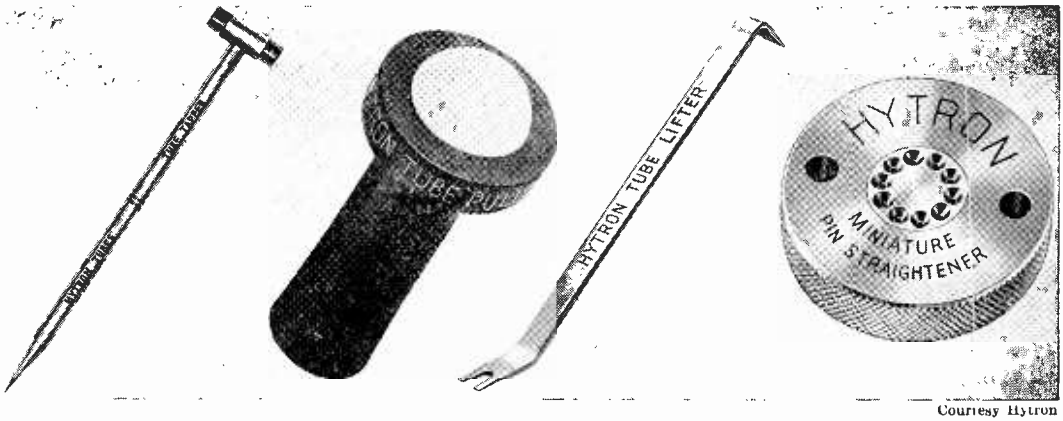
Tube Puller: There are several different kinds of tube pullers on the market, with some selling for as much as $1. The one shown in Fig. 1 is made of molded rubber, which is thick enough to permit handling hot tubes without burning the fingers. The open end of the tube puller fits over miniature tubes. Tubes are released by pressing the rubber button.

The rubber insulation not only protects the fingers from directly touching the tube and thus prevents burns, but, in addition, provides better friction, making it easier to pull tubes that are tight in their sockets.

Tube Lifter: (Fig. 1). This consists of a small strip of stainless steel bent to form an angle at each end. It is used primarily to loosen tubes that are tight in their sockets and works equally well with loctal, octal, or miniature tubes.

One end of the gadget is slipped between the edge of the tube base and the socket. The tube lifter is then rocked back away from the tube, forcing the tube out of its socket. At the same time, the tube is pulled directly out. In most cases, only a moderate amount of pressure is needed on the tube lifter, regardless of how tight the tube is in the socket.

Pin Straightener: The pins of miniature tubes, being of small diameter, are easily bent. Sometimes the pins are bent so severely that it is



Courtesy Hytron

Fig. 1. Handy gadgets for use in working with vacuum tubes. From left to right, a tube tapper, tube puller, tube lifter, and a miniature tube pin straightener. These items are manufactured by the Hytron Radio and Electronic Corporation, Salem, Mass., and are available from local wholesale houses and mail-order companies.

impossible to replace the tubes in their sockets until the pins are straightened. Often, when an attempt is made to straighten the pins by hand, the glass envelope is cracked. Small inexpensive pin straighteners do an excellent job of straightening the pins and are much faster to use than straightening the pins individually by hand.

They are available in two models and in many different styles. One type is shown in Fig. 1. It consists of a die with holes corresponding to pin positions for miniature tubes, mounted in a metal or plastic holder. The pin straightener may be either held in the hand or screwed permanently to a work bench or tool board. It is available in styles for both the 7- and 9-pin miniatures.

The tube is held firmly in the hand so that its pins more or less line up with the holes in the die and then pressed down into the die in the same way the tube would be placed in a socket. The beveled edges of the die holes force each pin into the proper position and straighten bent pins.

Another popular type rubber tube puller is illustrated in Fig. 2. Either end of the tube puller can be used, depending on tube size. The puller can be used on glass, metal, 7-pin miniature, and 9-pin miniature tubes.

Tweezers

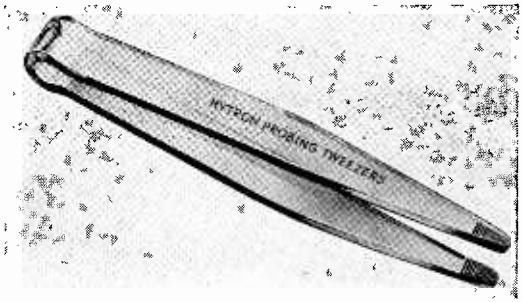
Tweezers of various types have long been used by servicemen. A conventional pair of tweezers is quite handy for picking up small parts, for reaching into a radio or amplifier chassis and moving small wires, or removing small nuts or screws that have fallen into the wiring, and in similar work. There are several kinds of tweezers that are particularly handy for specialized jobs. (See figures 3 and 4.)

Plastic Probing Tweezers: In Fig. 3 is shown a pair of plastic probing tweezers. These are made of clear polystyrene, having a good insulation factor as well as low dielectric losses. The tweezers are fairly large, and are used primarily to probe and to move large parts and wires in a chassis. They can be used with equal facility on a "hot" chassis or one that has had the power removed. These tweezers are handy for wiggling parts or wires to determine a loose connection or intermittent part. Even large paper condensers can be easily grasped and moved.

Normally Closed Metal Tweezers: The tweezers illustrated in Fig. 4b are similar to conventional tweezers except that the action is reversed. In-

Courtesy General Electric

Fig. 2. A rubber tube puller which is manufactured by the General Electric Company, Syracuse, N. Y.



Courtesy Hytron

Fig. 3. Hytron plastic probing tweezers.

stead of the tweezers normally being opened, they are held closed by a spring and it is necessary to squeeze in order to open them. They are particularly handy for holding a part or wire connection in place temporarily, either for test purposes or in order to make a temporary lap joint.

Screw and Nut Gadgets

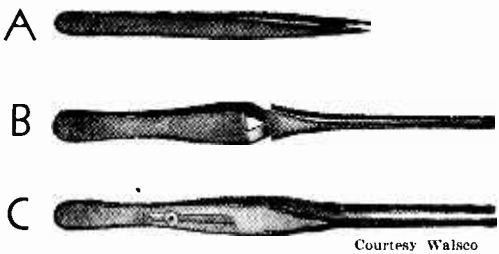
In Fig. 5 are shown three gadgets useful for handling machine screws and nuts.

Screw-Holding Screwdrivers: Two screwdrivers are shown that can be used to hold a screw so it can be properly started. Both types can be obtained from most wholesale distributors.

The screw-holding screwdriver shown in Fig. 5a operates on a wedge principle. The blade is split diagonally across into two halves. Fastened in position over the blade is a small metal sleeve which can be slid forward to force the two halves of the screwdriver blade apart. The blade of the screwdriver is inserted in the slot of the screw. The sleeve on the blade is then slid forward, forcing the two halves of the blade apart so the blade tip wedges tightly in the slot, holding the screw firmly.

The screw-holding screwdriver shown in Fig. 5b operates on a different principle. The blade is fixed and similar to the blade of an ordinary screwdriver. Fastened over the blade, however, is a small movable sleeve in which are fixed two flat springs with hooks in the ends. The screwdriver blade is fitted into the slot of the screwdriver. The sleeve on the screwdriver blade is then slid forward, and the hooks on the ends of the flat springs are fitted over the head of the screw, holding the screw tightly against the blade.

Once the screw has been properly started with either kind of screwdriver, it is easy to disconnect the screw-holding device. With the first type of screwdriver shown, the sliding sleeve is simply moved back, allowing the blade of the screwdriver to spring back to its normal position and release its grip on the screw. In the second, the screwdriver is pushed to one side, so the flat spring hooks slide off the head of the screw.



Courtesy Walsco

Fig. 4. Metal tweezers manufactured by the Walter L. Schott Company (Walsco), Los Angeles, California.

Finger Wrenches: How often have you attempted to hold a small nut under a chassis or behind a condenser or other component, while at the same time trying to tighten a screw going through the chassis to the nut? Or maybe you tried to loosen a particularly tight nut and were unable to reach the nut with a pair of long-nosed pliers or a wrench. In any case, it is not good practice to try to hold a nut using a pair of long-nosed pliers—you are liable to spring the pliers. The average technician usually ends up trying to keep the nut from turning by holding his finger against it. Often this does not prove satisfactory.

The gadgets shown in Fig. 5c simplify the task of holding a nut in a tight place while it is being tightened or loosened. They fit over the tip of a finger. There is a hole in the gadget punched to fit the standard hex nuts common in radio work.

Soldering Aids

The job the radio technician does most is soldering—he solders wires, and the leads of resistors, condensers, and other components in place, unsolders defective components, and keeps the soldering iron in almost continuous use during the day. In almost every repair job, except those requiring replacement of tubes only, a certain amount of soldering will be necessary. The gadgets shown in Fig. 6 help make the soldering job easier.

Soldering Aid: This interesting tool is merchandised by one of the large tube manufacturers through wholesale distributors. As shown in Fig. 6a, it consists of a wooden handle with metal projections at each end. The slotted tip can be used for straightening out leads or for twisting wires in position to make temporary or permanent hook-joints. It can be used for threading leads through soldering lugs or terminals and is handy for moving wires about on a chassis. The pointed end of the tool can be used for opening

a hole in a soldering lug that is filled with solder or for moving the wires in a lug so that an additional wire can be inserted.

This tool is made of a kind of metal to which hot solder does not readily adhere. Because of this, it can be used while the solder is still soft or while a joint is being heated.

Soldering Iron Extension: Occasionally the service technician finds it necessary to solder fine wires or to reach into an awkward corner of a chassis to solder a connection. In many cases, there is not enough room for the soldering iron and tip to be properly placed in position. In such cases, a simple extension can be made (as shown in Fig. 6b) by first straightening a piece of heavy copper wire and then coiling it around the copper tip of the soldering iron. The free end of the wire is then extended and filed on one side to form a beveled tip.

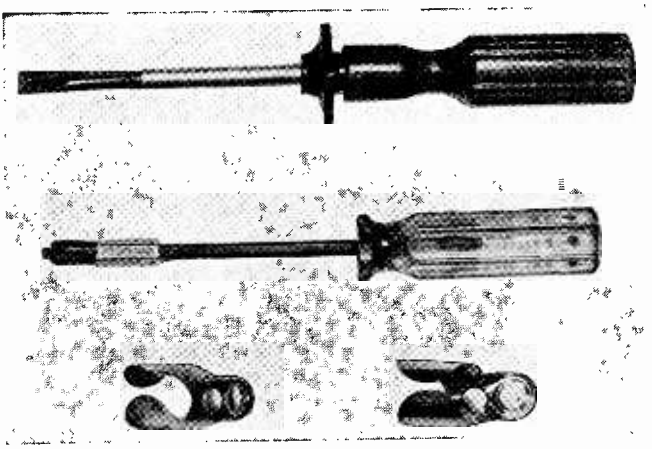


Fig. 5. (a) "Quick-Wedge" screwdriver; (b) "Hold-Ezee" screwdriver, manufactured by Upson Brothers, Rochester, New York; and (c) "Finger-Wrenches," which are offered by the Radio Corporation of America through their local distributors.

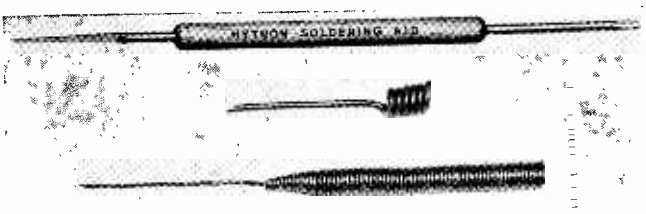


Fig. 6. (a) The Hytron Soldering Aid ; (b) Home-made Soldering Iron Tip Extension; and (c) Home-made Soldering Pencil.

The heaviest copper wire available which can be easily shaped should be used. The extension shown in the illustration was made with No. 10 tinned copper bus bar. Before using, the copper tip of the soldering iron on which the extension is formed should be filed and rubbed clean with steel wool to permit maximum heat transfer from the iron to the wire extension. The wire should be kept as short as practicable for the particular job. In general, only one or two small wires can be readily soldered with such an extension—heavy soldering lugs or chassis connections are difficult to solder since there is not sufficient heat transfer along a wire of such a comparatively small diameter.

Solder Pencil: Another gadget which the technician can make himself is a solder pencil, which is made up of a piece of ordinary solder. The solder is wound along the length and then down along the tip of a sharp lead pencil in the general shape shown in Fig. 6c. The pencil is then removed and the free end of the solder, at the back end (away from the point) is then fed through the length of the pencil and out through the narrow end.

This coil of solder is easily held and used. As the solder is used from the end, it is simply pulled through with a pair of long-nosed pliers.

Switch and Control Tools

Hypodermic Injector: The small hypodermic type injector shown in Fig. 7 can be used to inject carbon tetrachloride into a volume control for cleaning purposes.

The plunger is depressed, the tip of the injector is inserted in a bottle of carbon tetrachloride or similar fluid, and the plunger raised, and the injector fills with the carbon tetrachloride. The fine needle is then inserted in any one of the many openings in a volume control or tone control or can be used to squirt the carbon tetrachloride along the shaft of the control. The control is rotated vigorously, and the carbon tetrachloride acts to clean the element and to make the control less noisy.

The hypodermic injector is also handy for oiling hard-to-reach points in mechanical systems, such as the pulleys in dial cord mechanisms, bearings

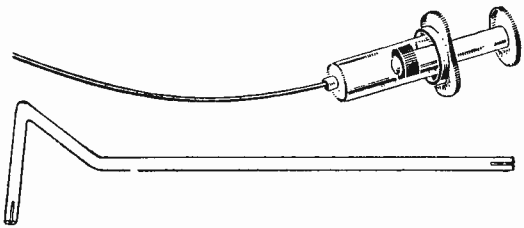


Fig. 7. (above) Hypodermic type injector, offered by Walsco; (below) Contact Adjuster, offered by several companies, including the General Cement Company, Rockford, Ill.

of variable condensers, etc.

Eye Dropper: An eye dropper (not illustrated), obtainable at any drug store, can be used like the hypodermic injector. However, it does not permit quite as good control over the cleaning fluid or oil, nor can it be used in as tight a place. However, it is useful when larger amounts of liquid are desirable, if you wanted to saturate a switch with carbon tetrachloride for cleaning purposes, for example.

Q-Tips: These are obtainable from any drug store, and consist of a small piece of wood about the size of a match stick with a wad of cotton on each end (not illustrated). They are useful for cleaning the flat metal part of wafer switches or for any flat sliding contact. Simply dip the end in carbon tetrachloride or similar cleaning fluid. The cotton tip is held against the rotating contact, which is then moved rapidly back and forth so that a scrubbing motion against the swab results.

Contact Adjustor: Another specialized tool useful when working with switches or controls is the contact adjustor shown in Fig. 7. It consists of a piece of heavy steel bus bar bent as shown in the illustration with a thin slot at each end. It can be used to reach in and adjust the small spring contacts on wafer switches where these contacts are bent out of shape or twisted in position. It is also useful for bending the plates of a variable condenser when adjusting the condenser for proper tracking or in order to separate the plates to prevent shorts.

Other Useful Gadgets

Knob Puller: Some radio receiver knobs are held in place by spring tension. These knobs usually pull off easily, but may have been placed on the receiver very tightly. Sometimes it is difficult to pull the knobs off by hand and other means must be used. One technique is to fit a piece of cloth or handkerchief around and behind the knob and pull forward on the handkerchief. In some instances, the handkerchief will slip off, or it may be difficult to get the handkerchief behind the knob. Occasionally, servicemen will use a screwdriver blade to pry the knob off the shaft, but this generally results in scratching the cabinet or front panel of the receiver.

The tool shown in Fig. 8a is designed particularly for this task. It is simply slipped over the knob, with the cut-out ends fitting on the shaft. The knob puller is then held firmly and pulled forward, removing the knob. When using the knob puller or any other metal object near the wooden or plastic panel of a receiver, be careful! It is easy to scratch a wood or plastic panel with a metal tool.

Inspection Mirror: This tool is useful for checking soldered connections and wiring in tight spots or in positions not easily seen. It is simply a small mirror held at an angle at the end of a long handle (Fig. 8b).

Dial Cord Adjustor: The tool shown in Fig. 6c is for re-stringing dial cords. The specially shaped hook at the end of the handle permits putting the dial cord through small openings.

Fig. 8. (a) Radio Knob Puller; (b) Inspection Mirror; (c) Radio Dial Cord Restringing Tool. These items are offered by the General Cement Company.

Some servicemen also find this tool useful for adjusting lead dress in a receiver. Because of the shape of the hook, it can be used for pushing or pulling wires into position.

Snap-on Fuse Clamp: This gadget (not illustrated) is a comparatively new one and is used primarily in television.

Many modern TV receivers use fuses in the primary circuit of the horizontal output transformer. Since the horizontal output transformer is also used in the high voltage circuit, this transformer, together with its associated circuit, is usually placed in a separate shielded compartment in the receiver. In many of the sets containing these fuses, the fuses are wired more or less permanently in place, using pigtail leads, and it is sometimes difficult to reach the leads so the fuse can be removed for replacement. Moreover, it is often difficult to get fuses with pigtail leads for replacement purposes, since these fuses are not always stocked by local wholesale

distributors. Because of this, the snap-on fuse holder was placed on the market. It snaps over the old fuse and permits a conventional fuse to be used, by permitting it to be connected in parallel with the burnt-out fuse.

From the technician's viewpoint, it makes the job quicker and easier, since it is not necessary to completely remove the high voltage shield and wire in a fuse in order to put in a replacement. This saves time on the repair job and the time saved often will more than pay for the cost of the special fuse holder.

Summary

In this article we have not attempted to discuss all possible uses of each tool shown. Nor have we attempted to cover all the gadgets which may be encountered in service shops. There are many other specialized tools that are in use and there are even more that have been invented by individual servicemen.

However, we have tried to cover some of the more useful gadgets. Each gadget is really a specialized tool designed primarily for a special application. While the average service shop may be able to use all of the gadgets described in this article, there are many servicemen who would seldom need a particular gadget. For example, a serviceman working in a neighborhood where there is no television and where mostly older sets are found, would probably find little use for either the snap-on fuse holder or the miniature tube pin straightener.

Some of these gadgets, however, once they are available and are used by the service technician, become almost indispensable. Tools like the soldering aid, the probing tweezers, the hypodermic injector, the tube puller, the tube lifter, and the finger wrenches, are invaluable in the average service shop.

Remember, NRI cannot supply these gadgets. The items illustrated in this article are only a sample of the many servicing gadgets which can be purchased from local radio wholesale houses or from mail order radio supply companies.

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EMPLOYMENT OPPORTUNITIES

BENDIX RADIO COMMUNICATIONS DIVISION, Baltimore, Md., has a considerable number of openings in their Engineering Department for young men with basic radio theory and some practical experience in use of hand tools and measuring equipment. Openings are in the Test and Inspection Department. For information write to Albert H. Ford, Eng. Personnel Supervisor, Bendix Radio Communications Division, Bendix Aviation Corporation, Baltimore, Maryland.

JOHN MECK INDUSTRIES, INC., Plymouth, Ind., has openings for television or radio technicians in line training program consisting of three to six months of familiarization with radio and television products in actual analysis and repair of sets in process. Starting rate for trainees is $1.65 per hour with periodic increases and opportunities for overtime. Includes paid annual vacation and Group Insurance benefits. Plymouth is a clean, small town, where housing and cost of living are said to be reasonable. NRI men interested should write or call A. C. Boardman, Personnel Director of JOHN MECK INDUSTRIES, Plymouth, Ind., for an interview.

CIVIL AERONAUTICS ADMINISTRATION has openings for qualified Aircraft Communicators in the territory of Alaska and the Pacific area, and Radio Maintenance Technicians in Alaska. Write to Personnel Section, CAA Aeronautical Center, P. O. Box 1082, Oklahoma City, Okla., for further information.

TRANSCONTINENTAL & WESTERN AIR, INC., Kansas City 6, Missouri, need men having a 2nd class Radiotelephone license and 35 wpm. typing speed to fill positions as ground operators.

BROADCASTING STATIONS WHICH HAVE RECENTLY REQUESTED MEN HOLDING A 1ST CLASS RADIOTELEPHONE LICENSE are:

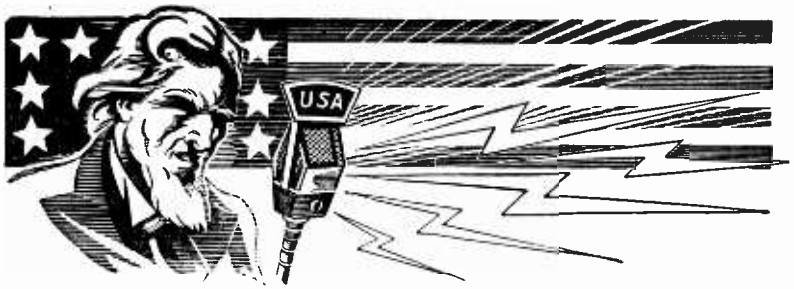
Station WLOW, Norfolk, Va.
Station WBCU, Union, S. C.
Station WTWA, Thomson, Ga.
Station WGET, Gettysburg, Penna.
Station WOXF, Oxford, N. C.
Station WHLN, Harlan, Ky.
Station KWOC, Poplar Bluff, Mo.
Station KCOW, Alliance, Nebr. (announce & opr.)
Station WFUN, Huntsville, Ala. " "
Station WNAG, Grenada, Miss. " "
Station KRAL, Rawlins, Wyoming.
Station KWBW, Hutchinson, Kansas
Station WCOH, Newnan, Georgia

A. & M. RADIO STORE, 217 Wisc. Ave., S. W., Huron, S. D., needs experienced radio serviceman (A.M.) holding 2nd radiotelephone license.

TELEVISION SERVICE CO., 249 N. 48th St., Lincoln, Nebr., has opening for a television technician. No experience necessary. Salary based on individual.

POINT PLEASANT TELEVISION, RADIO & APPLIANCE CO., 518 Bay Ave., Point Pleasant, N. J., has an opening for a TV serviceman.

NRI men interested in the above job opportunities should contact the prospective employer direct rather than through NRI to save time.



THE VETERAN'S PAGE

Devoted to news items and information of special interest to veterans taking NRI courses under the GI Bill of Rights.

A Look at the GI Bill

AS practically every GI student has been made well aware, July 25, 1951, marked a definite milestone in the Servicemen Readjustment Act of June 22, 1944, better known as the "GI Bill."

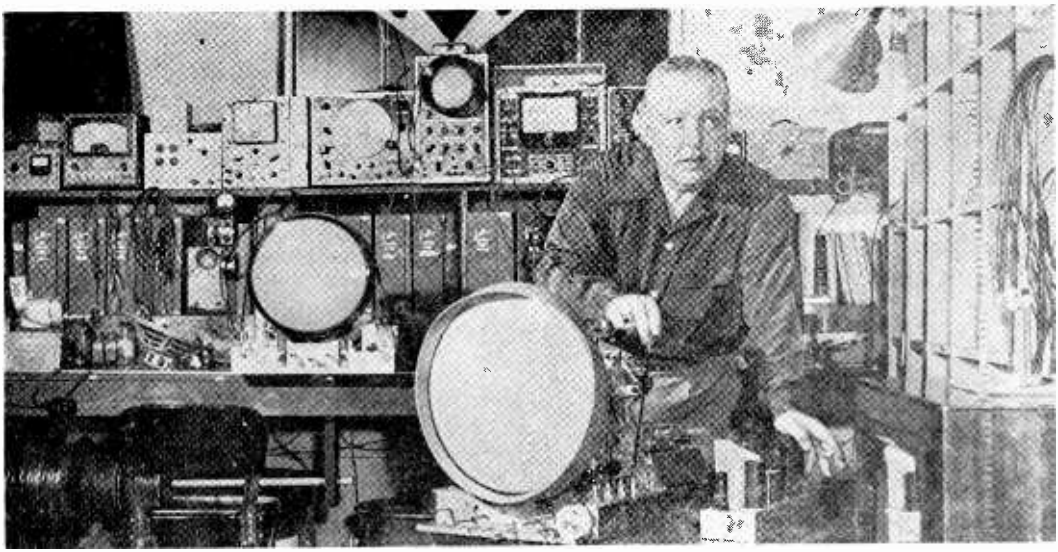
For most veterans of World War II, July 25 was the last date on which they could enroll for GI training.

This educational program has been a bold and far-sighted experiment without precedent in this country or anywhere in the world. With few exceptions, it permitted any veteran to secure education and training which he felt qualified to take, in the field of his choice.

The results were overwhelming. Millions of men and women were found eligible and entered into training. A large percentage of these completed their courses. In the last week during which courses could be started, as long as five to seven years after they became eligible for GI training, thousands of veterans swamped schools and Veterans Administration Regional Offices in an effort to be enrolled before the deadline date.

NRI is proud of the part it has played in this epoch-making program, and will continue to play until the last GI student has completed his course.

To those of our men who have graduated, "Congratulations on a job well done." To those students now in training, including the large number only recently started, our strongest encouragement to stick to your task until completion. By staying in training—studying your lessons and sending in your answers regularly—you get the fine educational benefits which a grateful Government has seen fit to bestow upon its veterans of World War II.



An Interesting Letter from A Successful Graduate

Dear Mr. Smith:

"Here is a little story that expresses much of how I feel toward NRI:

"Once the Emperor of Japan gathered his ministers around him and said to them, 'Go search the width and breadth of Japan until you find the wisest of my subjects, and bring him to me.

" 'He shall sit at my right hand and advise me and great honor shall be his.'

"The ministers searched until they found one man more learned and wise than all the others. They brought him to the Emperor and with him was another man.

"The wise one brought riches and great wisdom to Japan and she prospered in all her dealings with other nations. There was a long period of peace and happiness ruled the hearts of the people.

"One day the Emperor summoned the wise one saying, 'Your learning has made me great among the Kings and I am grateful, but I am also curious to know who the man is who is always with you, and never for a moment leaves your side, yet whom I do not know.'

"Whereupon the sage smilingly said, 'He, sire, is my teacher—the fountain-head of all my wisdom.'

"To you sir, and your excellent staff of fine teachers my sincere appreciation for a fine start in Radio-Television and for the fact that my business continues to grow, and GROW and G-R-O-W."

Your student and friend,

KARL E. MCDOWELL,
131 E. Main Street,
Mason, Ohio

N.R.I. ALUMNI NEWS

Alex Remer of New York and Norman Kraft of Perkasie, Penna., Are Candidates for President To Serve Our Alumni Association During 1952

At the close of the polls on August 25 a count of the ballots showed Alex Remer of New York and Norman Kraft of Perkasie, Pennsylvania, to be the two leading candidates for President. By reason of this result Mr. Remer and Mr. Kraft are declared nominees for President.

Both are well known to members of the NRI Alumni Association. Mr. Remer has long been active in New York Chapter. He was a National Vice President for several terms and a candidate for President last year. Mr. Kraft is now a National Vice President and is also chairman of Philadelphia-Camden Chapter with which organization he has been associated for many years.

Kraft is the fellow who makes the sixty-mile round-trip from Perkasie to Philadelphia with regularity in order to attend chapter meetings.

Remer has distinguished himself as a hard working officer in New York and, in a large measure, is responsible for the fine corps of lecturers they have in that local. Alex has been coaching members who are good radio and TV men but who were hesitant to get up before a group to talk. The development in some of these men has been remarkable.

It is now up to the members to make their choice of Remer or Kraft for President of the NRI Alumni Association to serve during 1952.

An interesting result of the balloting for nominees for offices in our Alumni Association this year reveals that all of the candidates are located in the east. This is a rather unusual result even if not entirely pleasing. It would give better balance to have some candidates from the middle west or far west. This would give us better geographical representation. That is something to be considered in the balloting next year.

Eight men have been nominated for Vice Presidents. Four to be elected. F. Earl Oliver of Detroit is easily re-nominated. Certainly he is deserving having been a member of our Alumni Association since 1932. Oliver is an extremely hard and loyal worker in Detroit Chapter. Claude Longstreet of Westfield, New Jersey, who has no chapter affiliation, has been re-nominated. This is a pleasing result.

Harvey Morris, who has served as President of our National organization and who is well known in Philadelphia as an outstanding television technician, likewise is a candidate for Vice President. Louis J. Kunert, another past President, and now Secretary of New York Chapter, has been nominated for the office of Vice President.

Charles J. Fehn of Philadelphia, another past President, has been nominated for the office of vice president. Elmer Hartzell of Allentown, Pennsylvania, was a candidate for Vice President several years ago and has again been nominated. Mr. Hartzell has been a member of our Alumni Association since 1933.

John B. Gough of Baltimore, who was a candidate for Vice President last year, has been nominated for 1952. Mr. Gough has been a member of our Alumni Association since 1932. Harry R. Stephens, hard-working chairman of Detroit

Chapter and past President of our National organization, completes the list of eight nominees.

The four candidates among these eight who receive the greatest total of votes will be declared elected Vice Presidents.

It was gratifying to have so many of our Alumni members vote in the primary. We hope you will now take time to cast your ballot for officers to serve during 1952 making your choice from among the nominees. Only members of the NRI Alumni Association are eligible to vote. The ballot will be found on this page. Remember the polls close at midnight on October 25, 1951. Your ballot must reach us before that time. Please do not wait—vote now.

CHAPTER CHATTER

New York, Detroit, and Chicago Chapters suspended meetings during July and August. Except for some informal meetings by the officers there is no activity to report. However, these Chapters have made plans for a very active Fall and Winter season getting under way at once. . . . All members of these Chapters are requested to report to the Chapter on regular meeting nights to acquaint themselves with the programs that have been mapped out for the next several months.

Baltimore Chapter continued to hold meetings right through the Summer. In this Chapter there is a group of members who feel it important to get together every week or so. During the past few months there was much discussion regarding the bill passed by Baltimore County which requires all Radio and Television Servicemen to be licensed as Electricians. The law, now in effect, has been vigorously opposed by many groups as being too broad in its restrictions. . . . All NRI men in Baltimore County should take an interest in a matter of this kind. Attend meetings. Your views are helpful in forming opinions.

Recent visitors were C. W. Gouldin, Thomas Monohan, and Wilton Shaw. . . . NRI students and graduates are always welcome at meetings which are held on the second, third and fourth Tuesday of each month at Redman's Hall, 745 W. Baltimore Street, Baltimore. Anyone desiring information regarding the meetings is invited to contact Mr. Arthur M. Lutz, Secretary, 1101 Overbrook, in Baltimore.

Philadelphia-Camden Chapter, in spite of warm weather, continued to meet right through the summer and much was accomplished. Good reports from Secretary Jules Cohen. Norman Kraft making a fine Chairman.

Mr. Henry Whelan, an NRI graduate, owner of

Election Ballot

All NRI Alumni members are urged to fill in this ballot carefully. Mail your ballot to National Headquarters immediately.

FOR PRESIDENT (Vote for one man)

- ☐ Alexander Remer, New York, N. Y.
- ☐ Norman Kraft, Perkasie, Pa.

FOR VICE PRESIDENT (Vote for four men)

- ☐ F. Earl Oliver, Detroit, Mich.
- ☐ Harvey Morris, Philadelphia, Pa.
- ☐ Louis J. Kunert, New York, N. Y.
- ☐ Elmer E. Hartzell, Allentown, Pa.
- ☐ Harry R. Stephens, Detroit, Mich.
- ☐ Charles J. Fehn, Philadelphia, Pa.
- ☐ J. B. Gough, Baltimore, Md.
- ☐ Claude Longstreet, Westfield, N. J.

SIGN HERE:

Your Name .....

Your Address .....

City ..... State .....

Polls close October 25, 1951. Mail Your Completed Ballot to:

C. ALEXANDER, BOOKKEEPER
NATIONAL RADIO INSTITUTE
16th and U Streets, N.W.
WASHINGTON 9, D. C.

Mr. Jack Hirst of the Stuart Lockheim Co. (at right), addressing a recent meeting of the Philadelphia-Camden Chapter, NRI Alumni Association.

the Whelan Radio and TV Company of 4745 Penn St., played host to the Chapter at his place of business. Mr. Whelan, who is also a member of the Chapter, treated the members royally with refreshments, four door prizes, and valuable Radio and TV literature such as Radio and TV schematics on Delco, Philco, and other well-known products for which Mr. Whelan is distributor. . . . Our own Harvey Morris, who is service manager at the Whelan establishment, assisted in making all members feel at ease. Mr. Whelan had a number of his own men show the members of the chapter how an up-to-date service shop operates, efficiently and quickly, with all the modern equipment he has. . . . Mr. Whelan also donated and installed a TV antenna for use at our Chapter meetings. The generosity of some of our members knows no limit. . . . As put by Secretary Cohen, "We are pretty lucky to have Mr. Whelan in our group."

The secretary reports that the meetings will be more varied during the Fall Season. Heretofore, much emphasis has been placed on TV, but for the coming months, there is going to be a better balance between Radio and Television.

Philadelphia-Camden Chapter meets on the second and fourth Monday of the month at K of C Hall, Tulip and Tyson Sts., in Philadelphia. Anyone desiring information regarding Chapter activities is invited to telephone Mr. Jules Cohen, Secretary, at BA-9-2075.

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On a rainy day a lady in a sable coat got on a New York street-car. "I don't suppose I've ridden on a street-car in two years," she said to the conductor, a gloomy fellow, as she gave him her fare. "I ride in my own car," she explained.

The conductor rang up the fare.

"You don't know how we've missed you," he said.

World's Largest TV Picture Tubes

The Du Mont 30" Teletron, world's largest TV picture tube, is now being offered through Du Mont distributors. The giant 30BP4 presents a usable picture area of approximately 536 square inches, or over twice the area of a 20" rectangular tube. Short over-all length is achieved through the use of a 90 degree deflection angle. The over-all length is 23 9/16", or approximately 2" longer than the 20" tube.

For maximum contrast as well as rejection of ambient light, the 30BP4 employs a Du Mont gray-filter face plate. Sharp edge-to-edge focus is made possible by the exclusive Du Mont gun design. The anode is designed to operate at 20,000 volts. A single-magnet ion trap prevents ion burns.

———*n r i*———

A chemist says that the first alcohol was distilled in Arabia, which may explain those nights.

———*n r i*———

Here And There Among Alumni Members

Mr. Ellis Rice of Glasgow, Ky., now employs three servicemen. His business shows a steady growth. Has been doing considerable two-way communications service work in his community. Mr. Rice reports he now has a Radiotelephone ticket to add to his accomplishments.

———n r i———

Thirty-one years ago Mr. E. L. Chambers of Cincinnati, Ohio, graduated from NRI. Since that date he has been continually engaged in Radio —from engineering developments and design to the final merchandising of the product. For the past 22 years Mr. Chambers has operated a wholesale distributing business in Radio—and now TV. Their activities extend into three states. Mr. Chambers says approximately one-half of their best Radio technicians dealers are NRI graduates. Everybody in Cincinnati, who has anything to do with Radio-TV knows the large and ever-growing firm headed by Mr. E. L. Chambers.

———n r i———

Norman Kraft, Chairman of Phila.-Camden Chapter and candidate for President of the NRI Alumni Association was active in organizing a group of members of his church who presented their pastor with a television set—completely installed by Mr. Kraft.

———n r i———

Wallace G. Baptist, who is in the Radio and TV Parts business in Jacksonville, Ill., is again conducting Radio-TV classes to a group of young men in the local high school. This is a fine service. The community spirit of Mr. Baptist is worthy of special mention.

———n r i———

Charles W. Crowell writes from San Diego, Calif., that he is very happy in his Radio and Television business and doing very well financially. Being his own boss and doing the kind of work he likes agrees with Mr. Crowell.

———n r i———

A. M. Patrick, who operates Home Appliance, Inc. of Tampa, Fla., writes that the business has expanded considerably. They now are franchised dealers in two major appliance lines. Mr. Patrick graduated in 1937.

———n r i———

Earle M. Dennis of Vallejo, Calif., is employed in the motion picture repair department on Mare Island, working for the U. S. Government. He does all Radio Motion Speaker repair work. He also works on strip film projectors used by the Government for instruction purposes. Sounds interesting.

There is a very unusual demand for graduates who have a radio phone 1st class license. Good jobs are open in all parts of the country, chiefly in broadcasting stations. Anyone interested who can qualify should contact NRI.

———n r i———

Bill Delzell of Central City, Nebr., was formerly a musician. Sends us a swell photo which was used as a publicity shot before he enrolled with NRI. Made good spare-time money servicing radios while studying the NRI Course. Now he is studio engineer at KMMJ in Grand Island, Nebr. All in one and a half years starting from scratch.

———n r i———

A graduate of 1931 writes us on a very imposing letterhead. He is Cecil K. Kennedy who did general Radio servicing until 1937 when he went into the wholesale distributor business and now has his own three-story brick building with five employees, including his wife and self.

———n r i———

Graduate John Armstrong Monell of New York City has a shop to be proud of. Nice photo.

———n r i———

Dick's Radio Service is the name of the shop owned by Richard O'Hara of Gorham, N. H. He is doing well with Radio and TV too, in spite of the fact he is about 100 air miles from the nearest TV station. Gets fairly good TV reception notwithstanding the distance.

———n r i———

Daniel B. McDonald of Los Angeles, Calif, is doing full time Radio and TV work. He also sells Radios, Television sets and appliances. He is well on the way to bigger things.

———n r i———

Glad to know Albert A. Herr, of New Cumberland, Penna., is feeling quite well again. Had his appendix removed last fall just as he was about to move into his new home. Had to take it easy for a while. Mr. Herr is transmitter operator at Station WKBO, Harrisburg.

———n r i———

Lester W. Pearce of Battle Mountain, Nev., is Chief Aircraft Communicator in charge of a station for Civil Aeronautics Authority. Now he gets $5,100.00 a year. Had no knowledge of radio when he enrolled with NRI some years ago.

———n r i———

Norman P. Fornoff of Pekin, Ill., is now in his 10th year with Sears, Roebuck and Co. and likes his job better than ever—especially the people by whom he is employed. Says their profit-sharing, insurance, hospitalization plan are tops. These have been a great help to Mr. Fornoff, whose little girl has been very sick with Leukemia. At last report the child was showing improvement and was discharged from the hospital but she still needs attention from a Chicago specialist for some time. We add our prayers for her complete recovery.

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