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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, upon hard work, and most important of all, upon 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 those sunny summits of success waiting 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.*

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Noise Elimination In Radio Servicing

By Leo M. Conner

NRI Consultant

NOISE elimination work is important in practical radio servicing. Therefore, we should know something about how noise may originate, how it may be kept from entering the radio through the power line circuit and how the noise may be reduced by means of modern antenna systems.

Noise, in general, may be produced whenever we have a sparking device in an electric circuit. For example, in Fig. 1, an electric vacuum cleaner with a series-wound motor and sparking brushes may generate a considerable amount of noise. This noise may be transmitted over the power line to the radio and get into the radio receiver signal circuits by coupling to the power line.

The direction of the noise signals is shown by the arrows in Fig. 1. M is the motor or electrical device which produces the noise. In order to cut down the noise, we may apply a filter at the device or machine and prevent noise entering the power line. This is shown in Fig. 2. The filter prevents transmission of the noise signal from the motor or device into the line circuit. However, if there are a great many motors or electrical devices on the power line we would very likely find it impractical to filter each and every device and to cut down on the noise in an economical fashion. We may apply the filter directly to the radio. Thus, as shown in Fig. 3, the noise filter blocks noise signals which otherwise would enter the radio through the electric circuit or power circuit. (**In both Fig. 2 and Fig. 3 the filter is marked F.**)

Now, what does a typical filter consist of in practice? Referring to Fig. 4, a simple filter which may be applied to a radio receiver is shown. Essentially, it consists of two condensers in series with the mid-point grounded. Thus, each side of the line is by-passed to ground. The condensers are relatively large and have low impedances at r.f. frequencies.

From a simplified viewpoint, any noise which exists in either of the conductors is by-passed to ground through either C1 or C2. Essentially, the filter simply keeps noise out of the power circuit of the radio.

Connecting the filter is not difficult at all and suitable, commercially manufactured filters may be purchased from radio distributors. If the filter is applied to the electrical device, the plug of the vacuum cleaner or other electrical device may be

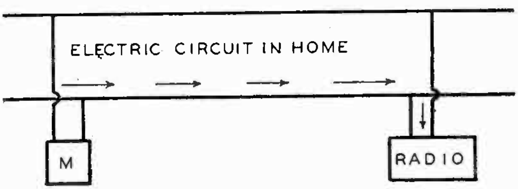

Fig. 1

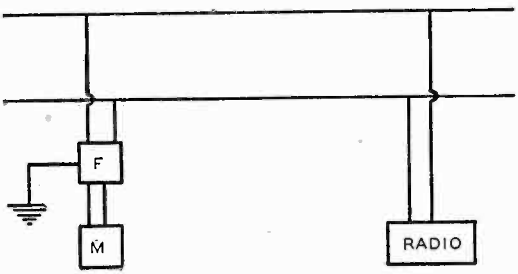

Fig. 2

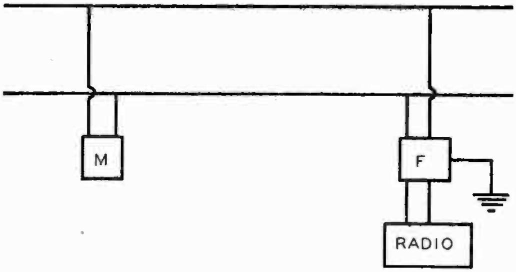

Fig. 3

inserted in the receptacle in the filter and the plug of the line noise filter is then inserted in the electric outlet. *A ground wire must be attached to the filter.* Usually, a ground post is provided on the filter for easy connection of a ground.

In some cases, applying a filter to the electrical device is not practical at all because noise radiation occurs from the wires of the device into the air and through the air to the radio antenna. For example, an electric razor, as shown in Fig. 5, may spark and produce a great deal of electrical interference when the device is in operation. The noise signal may be radiated just as an ordinary radio wave would be radiated through the air to the receiving antenna where it is picked up and introduced into the signal circuits of the set. Noise is then produced by the radio and the noise may be very intense in character. Applying even a heavy duty line noise filter at the electric razor very often is of no value whatever.

Some of the noise radiation may strike the flat top of the antenna and induce noise voltages in the antenna circuit. Most of it, however, will intercept the lead-in and introduce noise voltages in this section of the circuit. How, then, can we cut down on the amount of interference picked up? Reasoning would indicate that if by some means we can reduce the amount of signal and noise pick-up of the lead-in that the amount of noise induced in the antenna will be relatively small and accordingly we should be able to get a better signal to noise ratio. Also, we should remember that the lead-in will be in the field of the power cord of the radio which connects the receiver to the electric outlet. Therefore, any noise in the line circuit may be induced through coupling to the ordinary antenna lead-in into the input circuit of the set. This is still another reason why we should want to employ some means of reducing the noise pick-up of the lead-in in the antenna system.

One practical way of doing this is to employ a doublet noise-reducing antenna as shown in Fig. 6. Antennas of this kind may be obtained in kit form from your radio distributor. It is important to locate the flat top as far distant as possible from any possible source of noise interference. For example, don't hitch one end of the flat top on the part of an apartment building in the immediate vicinity of an electric elevator. Noise in the elevator circuit may be induced in the antenna and defeat the purpose of the antenna system if a proper location is not carefully selected.

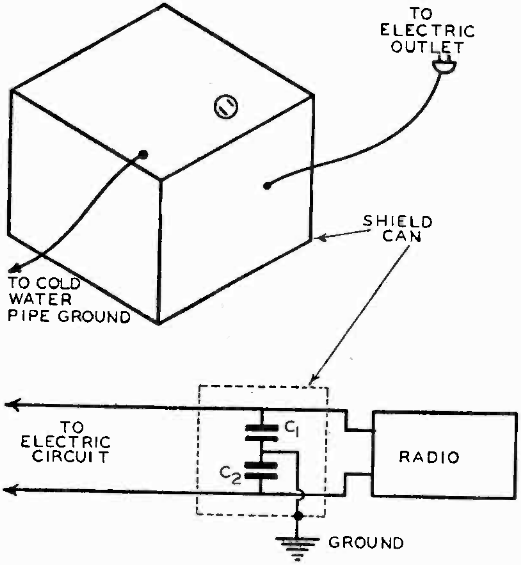

Fig. 4

In Fig. 6, noise voltages induced in the doublet circuit may cause noise currents to flow in the line. As the currents are opposite in phase, a balancing out action will occur and a relatively noise-free signal will be induced in the secondary circuit of the coupling transformer T-2. The impedance at the center of the antenna is matched to the special transmission line or doublet lead-in by means of a transformer, marked T1 in the sketch. The transmission line, in turn, is coupled to the input circuit of the receiver using a second impedance matching transformer.

The lead-in line impedance may be fairly low, 72 to 120 ohms, while the antenna impedance of the set, of a receiver designed for service with an inverted L antenna, may be fairly high, 200 to 600 ohms. The impedance matching transformer, T-2, performs two important functions: matching the transmission line impedance to the antenna input circuit of the set and, secondly, permitting a balancing out action of the noise signals.

The location of the flat top section of the antenna is important. For example, if overhead telephone or power wires are encountered or an overhead railway system is situated in the vicinity, run the flat top at right angles to the line of direction of the power wiring as shown in Fig. 7. Height

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is important in erecting the antenna. Strive for maximum height to pick up a strong signal and also to increase the distance between the antenna and sources of noise.

A.C.-D.C. receivers usually have no provision for a ground connection. A.C. sets, however, may be equipped with a ground terminal which permits connecting to a ground. However, a ground connection is not always helpful in reducing noise. For example, in Fig. 8 a connection to an ordinary radiator in an apartment building is shown. If the owner of the set lives in an apartment which is several floors above the street level, the impedance of the ground system may be appreciable. The reason is that we may have a number of pipes and coupling links between the ground connection at point G1 and an actual earth ground at point G2. As a result, stray noise voltages may act in this circuit, giving us a net noise potential E_N which will act in series with the antenna input circuit of the radio. Leaving off the ground connection, in a case of this kind, may result actually in a reduction of the noise input to the radio. Therefore, try the ground connection. If the noise is cut down by the addition of the ground, leave the connection present in the circuit and if the noise rises when the ground connection is made, simply leave the ground off the radio.

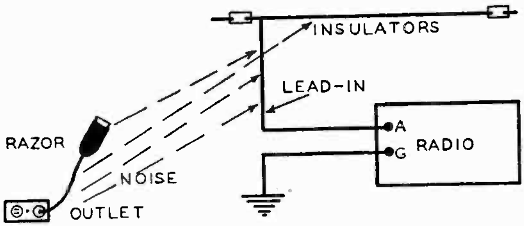

Fig. 5

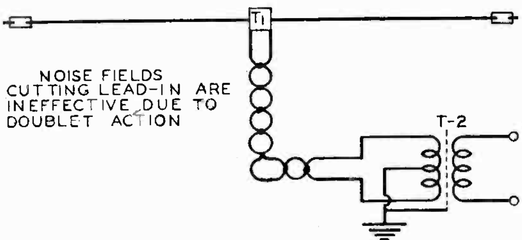

Fig. 6

When the receiver has a loop antenna, the noise picked up inside the home may be appreciable, depending on the circumstances. A typical loop antenna is shown in Fig. 9. When a radio wave intercepts the antenna a signal potential may be induced in the loop. A voltage difference, for example, may exist between points 1 and 2 in the loop circuit. As a result, the resonant circuit is "excited" and the induced signal voltage may be built up by a resonant action as in any tuned circuit. If, however, the radio wave is traveling so that it is in a direction as shown by the arrows at the right of the drawing, or at right angles to the plane of the loop, a minimum amount of signal voltage will be induced in the loop.

We may take advantage of this fact in locating the receiver in the home. If the loop is one which is adjustable, which is often the case in large consoles, try moving the loop to a different position experimentally until minimum noise is picked up. If the loop is not adjustable, try moving the radio, if possible, to a different position in the home and in that way you may be able to cut down on the electrical interference voltages induced in the antenna circuit.

Some modern console receivers have a special loop antenna which makes use of an electrostatic shield. As a result, only magnetic flux is effective in inducing a signal voltage in the antenna circuit of the radio. The noise pick-up characteristic of a loop antenna of this kind is considerably better than that of an inexpensive loop which does not have the electrostatic shield feature. An electrostatic shield is illustrated in Fig. 10. It often consists of a fine copper screen or mesh which completely encloses the loop except at the top where an open space is provided. If the loop were totally enclosed, the losses in the circuit would be very great and the mesh would not function as a true electrostatic shield.

Even in this type of loop antenna circuit we may

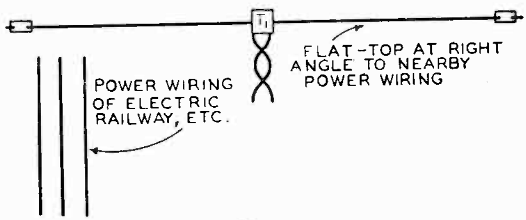

Fig. 7

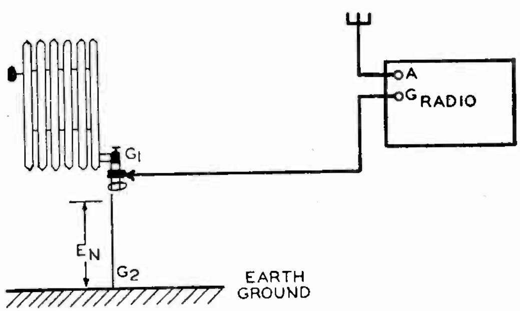

Fig. 8

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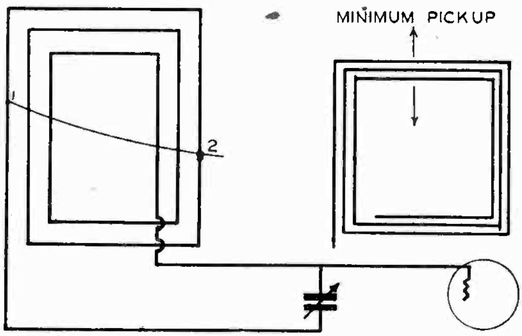

Fig. 9

find it necessary and desirable to take advantage of the directional characteristic of the loop to minimize noise pick-up. In many typical General Electric receivers the so-called "Beam-O-Scope" is used and may be adjusted for minimum noise pick-up. This loop is one having an electrostatic shield.

Adding a shield to the loop antenna circuit of an ordinary radio would not be at all practical and definitely should not be attempted. Removing the loop antenna of a set and attempting to use a doublet noise-reducing antenna is not practical because of the fact that the loop is an important portion of the tuned circuit of the radio.

In locations where the loop antenna of the set is ineffective in picking up a strong signal, the addition of an outside antenna to the circuit may help in getting a better signal to noise ratio. Many sets of the kind having a built-in loop antenna have provisions for connecting an external antenna and ground. If terminals are provided, use them. If the set is not equipped with an antenna terminal, and the radio does have a loop antenna, you may couple an outside antenna of the inverted L type to the receiver as shown in Fig. 11. Coil a few turns of the antenna lead-in into a coil about ten inches in diameter. Leave the coil open circuited, attaching the lead-in to one terminal of coil. Place this coil near the loop antenna so that a signal can be injected into the receiver's loop antenna circuit. Connecting an ordinary doublet antenna to the loop antenna receiver would not be at all practical and is not recommended.

It may be necessary, in some cases, to point out to the owner of the radio the limitations of the set and to suggest that a receiver which will function under the extreme conditions of noise encountered should be purchased. Preferably, the radio should be one equipped with a stage of r.f. before the mixer, for good signal to noise ratio.

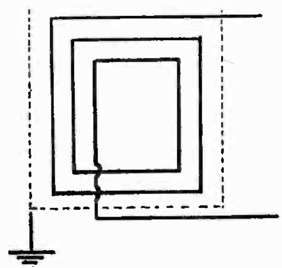

Fig. 10

In some cases, for example certain office buildings in large cities, d.c. power may be used. D.C. motors connected to the power line may produce appreciable interference. Under certain conditions, the battery portable type of receiver which has no connection whatever to the electric circuit may work out advantageously and a set of that kind can be tried out.

In an automobile radio receiver, the conditions are somewhat different than they are in the home. A typical auto radio circuit, so far as the power system is concerned, is illustrated in Fig. 12. In this circuit, the storage battery E supplies a d.c. voltage to the primary L1 of the spark coil through switch S3 and ammeter A. The voltage is interrupted and the circuit continuity is made and broken by a special switch, S2, which we may call an interruptor. As a result, we have a varying current flowing in L1 and a varying voltage is induced in L2. Because of the extremely high set-up turns ratio of the transformer, or spark coil, we get a very large value of voltage across L2. This voltage is distributed to the various spark plugs by the distributor, switch S1. As each spark plug is supplied voltage, the gap between the plug electrodes is broken down and the gas in the cylinder is ignited. The sparking action and the change of current in the circuit may result in large noise voltages being produced which may be induced in the antenna circuit of the set unless proper precautions are taken.

First, we locate the antenna as distant as possible from the ignition circuits in the car. Secondly, use shielding as shown in the sketch to cut down on the coupling between the lead-in and the ignition system. In addition, by-pass condensers C1 and C2 help in cutting down interference. C1 bypasses noise signals in the ammeter circuit to ground, helping to keep them out of the power circuit of the radio. Condenser C2, across the generator, reduces noise voltages at this point in the circuit, helping to cut down the general noise level.

Switch S4 is in series with the starting motor M and since the starting motor produces noise only when the automobile is started, filtering this sec-

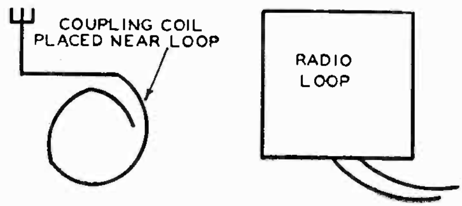

Fig. 11

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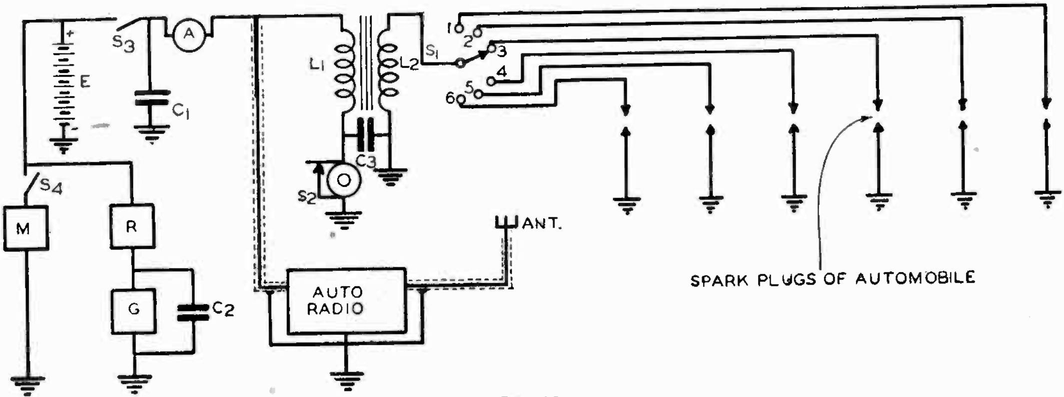

Fig. 12

tion of the circuit is not required.

Using an auto radio system of this kind, it may be found that a certain amount of noise is still picked up. We cut it down further by installing, in series with the lead to the arm of S1, a suitable noise suppressor which may be obtained from a radio parts distributor. If this doesn't cut out the interference or reduce it greatly, to the point where it is not troublesome, we may find it necessary to install additional suppressors in series with each spark plug. The suppressor may be in the form of a small carbon resistor or R.F. choke. These suppressors, and information on installing them, can be obtained from a radio distributor.

Additional information on auto radio servicing and noise elimination in this specialized field of radio is covered in the NRI Course. Here, we want to bring out the similarity between auto radio problems and those in the home, the effective use of shielding, and reduction of noise by means of filters and shielding.

In the auto radio, the metal frame or case of the set itself serves as an effective shield. In the home radio, complete shielding of that kind may not be available. As a result, a certain amount of noise may be picked up directly by the receiver through the air. This noise pick-up cannot be eliminated because it would be impractical to change the original design and construction of the set. However, noise fields in the vicinity of the radio can be minimized by locating the radio in a noise-free area so far as possible and by using suitable antennas and line noise filters.

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Radio—The Winged Profession

What a wonderful profession Radio is! Should you have the slightest doubt, you can convince yourself in half an hour's time. After dinner tonight I took a trip, a marvelous trip in which I visited country after country and came in contact with hundreds of people, each one doing his big share to keep this old world of ours running at full speed. I sat down at my desk, flipped on a switch, grasped the control wheel and away I went.

The first stop was in the broadcast band where I listened to a whole world of entertainment, education and news. From there I went from band to band, from frequency to frequency, stopping for a moment to listen to thousands of amateurs chanting and pounding out their endless "cq's." Then I visited the control tower at LaGuardia Field. Planes came in and took off and winged through the night guided and directed by Radio. I paused in the ship-to-shore band and visited with a tug boat captain while he got orders from shore. I took a turn with the captain of a fishing boat off "the Banks," and then sat for a moment in the front seat of a radio prowl car while the cop at the wheel stepped on the gas to intercept a housebreaker. . . .

I listened for a spell to "scramble speech" of a telephone conversation between New York and London on my way up to the higher frequencies in the realm of Frequency Modulation and on into the television band and then right on to the frontiers of Radio where lies the whole brave new world of radar and no one knows what else!

But that is enough, isn't it, to prove to anyone what a really wonderful profession Radio is! There's room for anyone who wants to make it his life work. It's chock-full of romance, adventure, imagination and fun. It offers to anyone a lifetime of hard work full of infinite satisfactions and remuneration commensurate with the skill, knowledge and ambition he puts into it.

Will Whitmore, Editor,
Western Electric Oscillator

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Antennas for the New F.M. Band

WHEN CHANGING YOUR RECEIVER TO HIGHER FREQUENCIES, DON'T FORGET TO BRING YOUR ANTENNA UP TO DATE, TOO

By Tracy Diers

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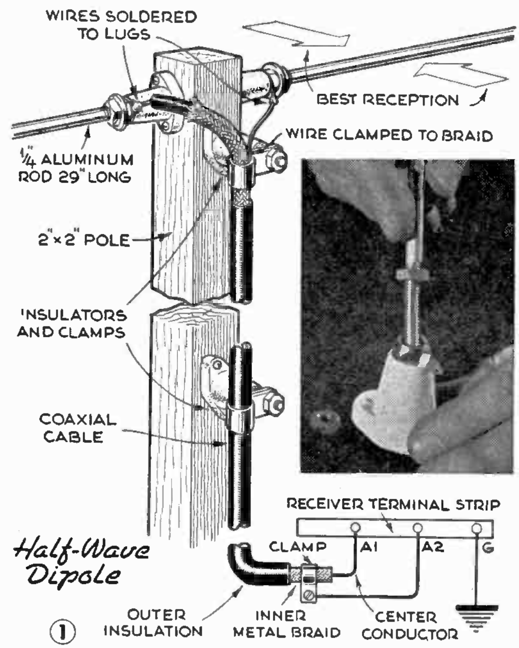
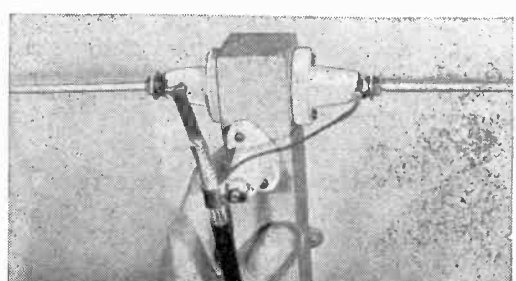
FREQUENCY modulation is moving upstairs in the radio spectrum. The Federal Communications Commission has shoved F.M. out of its old home in the 42- to 50-megacycle band. While the slow moving operation takes place, F.M. continues to sprawl indecisively at two locations. But the future address of static-free reception has been definitely decided: write it down as 88 to 108 mc.





For best results the half-wave dipole should extend at least 10' above the roof of a building. Fig. 1 shows how the antenna is connected to a typical receiver terminal strip. You can use other types of low-loss feeders in place of the coaxial cable. If you do, connect one wire of the pair to each of the dipoles, and one to each of the first two terminal posts. This directional antenna favors signals coming from the directions shown by the blocked arrows.

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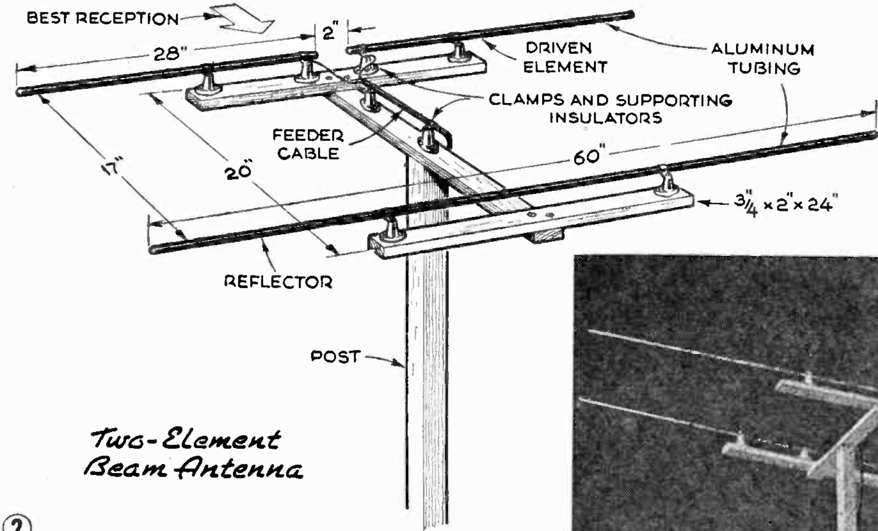

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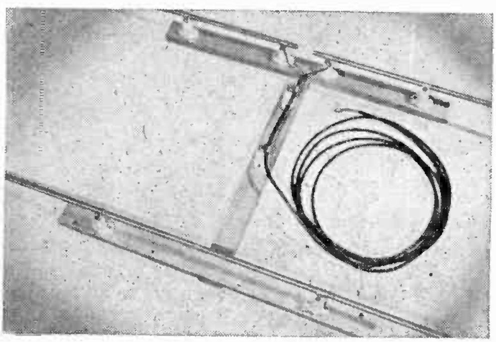

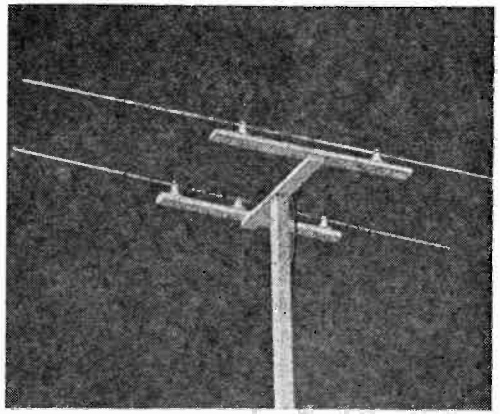

As can be seen in the drawing above, the two-element beam antenna consists of an ordinary half-wave dipole, now called the driven element, and a reflector. The latter has no connection.

A two-conductor feeder cable is illustrated in the photo at the left. One conductor is soldered to each element; the other ends go to A1 and A2.

For all but the most recent F.M. listeners, this means that some changes will have to be made in receiving equipment. You may have your set rewired, use a converter, or buy a new radio. In any case, good reception demands that your antenna fit the frequencies it is supposed to receive.

That goes for all types of F. M. antennas, but when it comes to making a particular choice, you also want to take into account such factors as elevation, neighboring buildings, distance from transmitters, and strength of the signal in your location. If you live close to a broadcasting station, you'll find the easily constructed half-wave dipole efficient.

The dipoles are made of ¼" aluminum rod. After cutting them to length, thread one end of each ¼"-20 and clamp with two nuts into an insulator as shown in Fig. 1. Mount the insulators on opposite sides of a 2" square wooden pole. Several types of feeders, or connecting wires, may be used between the dipoles and the receiver.

Most high-frequency antennas must be correctly aimed for best performance. To position your antenna, rotate it slowly while a helper tunes the receiver and signals to you when all stations can be heard with greatest clarity and volume.

Farther from the center of a service area, an antenna must be more sensitive to pickup from the chosen direction, and capable of cutting off noises from the rear. The two-element antenna above is designed for that job. It can be made of aluminum rod or tubing from ¼" to ¾" in diameter.

Transmission lines generally drop off in efficiency as a result of age and weather. While coaxial cable is quite durable, many F.M. listeners feel that it is too expensive, especially when the receiver is located at any great distance from the roof. You can make a low-cost, long-lasting feeder line of ordinary No. 14 enameled copper wire,

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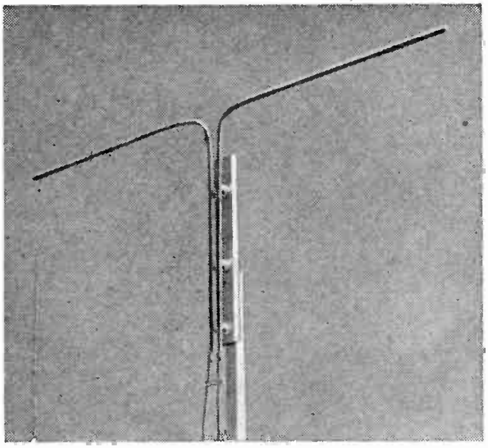
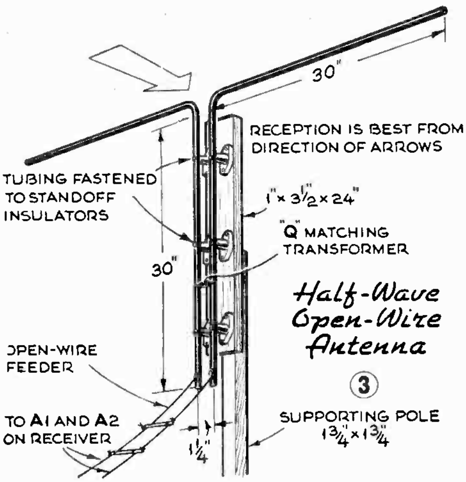
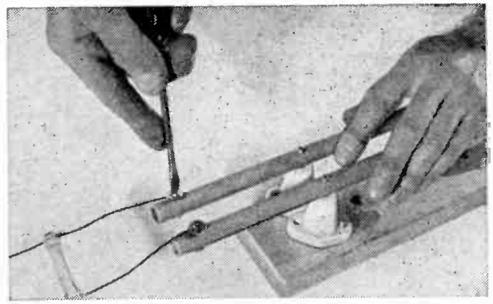


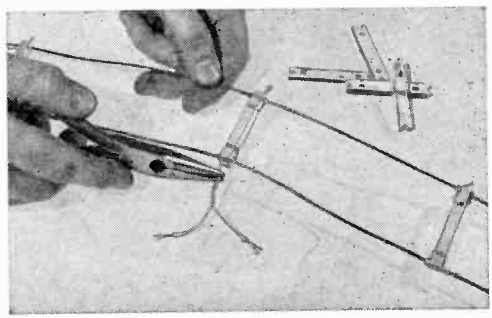


but to link it to the antenna, you will need a simple Q-matching transformer that is nothing more than two vertical legs. The combination is the half-wave antenna, open-wire line, shown in Fig. 3. Bend two aluminum tubes and bolt them to standoff insulators through 3/16" holes drilled in the tube walls. The vertical portions of the tubes must be perfectly parallel, and spaced 1¼" from center to center. Accuracy of the Q-matching depends on this distance.



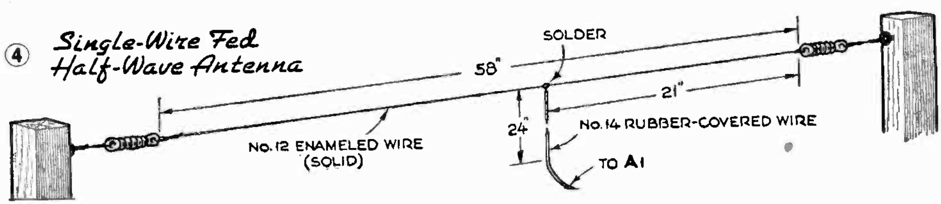
The half-wave open-wire antenna is constructed from two 5' lengths of ½" aluminum tubing. Make a smooth right-angle bend at the midpoint of each tube to form the Q-matching transformer.

Space the open-wire line with a sufficient number of 2" plastic spreaders. Use insulators to keep the line from touching the building on the way down.



Simplicity and low cost are among the advantages of the single-wire fed half-wave antenna illustrated in Fig. 4. Although it is not the most efficient type, it is quite satisfactory in areas where signal strength is high and interference low. The feed line, made of ordinary rubber-covered lead-in wire, must leave the antenna at right angles for a distance of at least 2', and a slightly different method is needed to couple the single line to the receiver terminal strip. Connect the feeder to either A1 or A2, and put a jumper across the other two posts.

The open-wire fed V (Fig. 5) is a country antenna in two ways: if you live far out in the suburbs or country, you may need a rig, with



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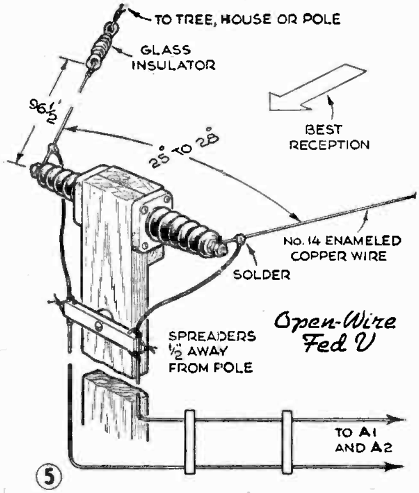
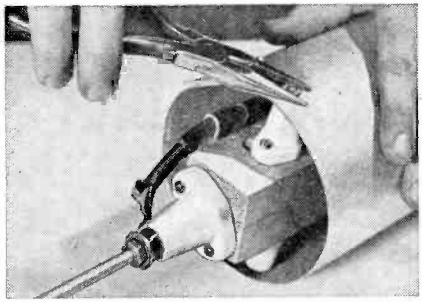


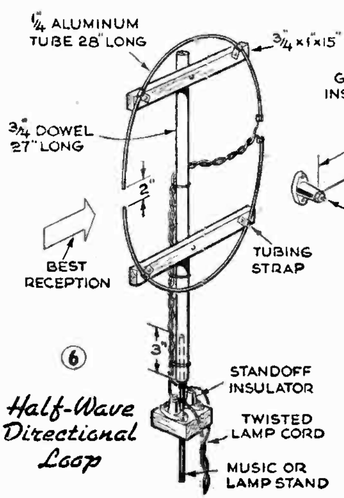


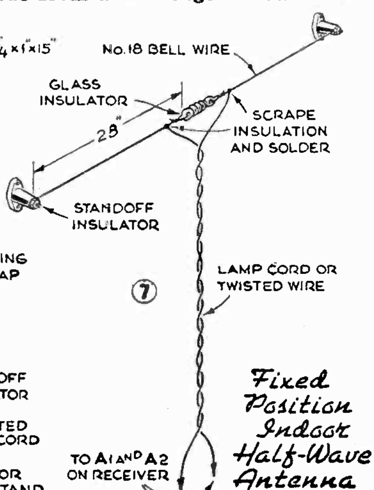
The shield of the coaxial cable should make contact with the aluminum cylinder. A piece of wire inserted between the clamp and the top of the cylinder is recommended.

great directional sensitivity; if you're far enough out to need it, you may have enough space to build it in. Each leg of the "V" stretches 96½' from the central post, but if your premises won't allow such spaciousness, you can cut the legs to 48¼' each. Use No. 14 enameled copper wire for the feed line, and keep it short by locating the post as near the receiver as possible. It is important that the "V" embrace the direction from which the distant signal is approaching.

The most fortunate F.M. listeners are those located near a number of transmitters. For them, any of the following will be satisfactory. Requiring very little space, and no directional adjustments, the coaxial-fed half-wave vertical antenna (at right and above) is made from a 29" length of ¼" aluminum rod. One end of it is clamped into an insulator, which is fastened with screws to the top of a 1½" by 1½" post about 35" or 40" long. Solder the center conductor of a length of coaxial cable to the insulator lug, and fasten the cable along the length of the pole with tubular clamps and standoff insulators.

Next, roll a sheet of aluminum 1/32" by 14" by 29" into a 4" by 29" cylinder and bolt the edges together. Drill holes to coincide with the locations of the standoff insulators, and fasten the cylinder with nuts to the tops of the insulators.





One of the most satisfactory indoor antennas is the half-wave directional loop (Fig. 6), since it can readily be turned to favor any station. Drill a hole 3" in one end of the dowel, and make the diameter of the hole large enough to allow a free fit on top of a music or lamp stand. Twisted lamp-cord feeders are clamped to the ends of the aluminum semicircles. Keep the feeder line under 12' in length.

If the decoration of your home calls for a less conspicuous type of indoor aerial, there is the fixed-position indoor half-wave antenna, shown in Fig. 7. The bell wire can be concealed along the baseboard or molding, or behind a drape. If any choice of position is possible, **make tests to find which is best.**

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VECCIA RADIO SERVICE

342 Union Avenue,

Rutherford, N. J.

This story originally appeared in the Rutherford Republican and is reprinted with permission from that newspaper.

Salvatore Veccia

RUTHERFORD has become the home of one of the most able radio circuit authorities in all of the metropolitan area of Northern New Jersey. He is Salvatore Veccia, radiotrician and teletrician, owner and manager of the Veccia Radio Service, located at 342 Union Avenue.

Mr. Veccia has the most extensive library of radio circuits ever assembled and made available to the trade in this area. There is no marketed radio circuit which comes into his shop that is not carefully checked with the original circuit, as designed, to make sure that repair jobs along the way have not "crossed up" the original circuit in attaining performance which might have been acceptable to the patron.

Model Work Shop

Also, in the workshop of the Veccia Radio Service shop here, the owner has assembled all of the most modern testing equipment.

"We want no guess work in our shop," said Mr. Veccia, "modern testing equipment is used on tube or set in making repairs and replacements and this, plus close attention to original circuit design, never fails to restore any radio set to its full value in performance."

Mr. Veccia is a graduate of the National Radio Institute, Washington, D. C. He was awarded a diploma as a qualified Radiotrician and Teletrician. Study with this school and awarding of the diploma fulfilled an ambition of some 20 years for Mr. Veccia, the past ten years of which has been in the electrical appliance field.

Mr. Veccia, now a resident of Rutherford, is a native of New Jersey, having been born and raised in Hoboken. He attended Hoboken schools and is a graduate of the Hoboken High School. Before coming to Rutherford to establish his business here he conducted a radio service business in Hoboken on Washington Avenue.

Electrical Service and Sales

Veccia Radio Service specializes in both service and sales on radios, washing machines, vacuum cleaners and electrical appliances of all kinds.

"We also are equipped with all modern testing and repair units for the restoration of all kinds of electrical appliances," said Mr. Veccia. "One feature of our service is that we will call for, repair and deliver all radios and electrical appliances—all under a 30-day guarantee of complete satisfaction in performance," he said.

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Don't Mail Cash

We have tried to provide every possible safeguard for the thousands of remittances we handle each year. Occasionally, however, a student notifies us that he did not receive credit for a payment he sent, and we immediately make a thorough investigation.

In most cases the matter can be cleared up quickly because the student used a safe form of remittance that can be traced easily. But if the payment was in *cash* we are completely stumped. There is no way in the world to trace cash lost in the mail.

There are many safe ways of sending money. If one doesn't fit your particular situation, another should. Your post office sells Postal Money Orders and Postal Notes. If you live on a rural route, your mail man should be willing to purchase money orders for you.

Even a registered letter is not a satisfactory substitute for a money order. Registry will only prove you mailed a letter—not that you sent money. Purchasing a money order is just as easy and less expensive than registering a letter.

If it is impossible to get to a post office while it is open, you can probably buy Express Money Orders. They are often sold by drug stores, stationery stores and similar places that stay open late in the evening.

Personal checks offer a high degree of safety. There are some banks that do not insist on a specified balance before opening a checking account. They make a flat charge for each check drawn. You might want to consult your bank about such services. Of course you can always buy a draft or a bank money order in any bank during hours.

Make it a rule always to use one of the safe methods of sending remittances. Remember that cash is sent at your own risk. Be safe—NEVER MAIL CASH!

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WANTED—10 Radio Service Men

Attention NRI men living in or near Milford, Del.; Pittsburgh, Pa.; Rochester, N. Y.; Washington, D. C.; Richmond, Va., and Warrenton, Va. The Chevrolet Motor Co. has openings with their authorized dealers in these cities for ***high quality*** radio service men. A very good fundamental knowledge of radio servicing is necessary, and experience on auto radios will help. Additional training is provided. Salaries are good. If interested write immediately to Mr. L. L. Menne, Director, Graduate Service Dept., National Radio Institute, 16th and U Sts., N.W., Washington 9, D. C.

Our Cover

THIS issue we show on our cover a number of letterheads of students and graduates. This "crazy-quilt" design is to attract attention to various styles, type faces and arrangements that may suggest something to those who are contemplating getting some letterheads. And who does not look forward to the day when he will have his own business. Even if on a small scale there is a thrill in owning your own business—having your own business stationery.

The letterheads shown were picked at random. Notice how many prefer to use their own individual name. Why not? Why not sell yourself? Build a good name for yourself in business circles. Protect your reputation. Deal squarely and honestly at all times. Remember you cannot make a profit on every job, especially if you run into unexpected difficulties. Be fair with the customer. Consider his side too. Get his good-will and keep it. That is the way to sell yourself in your community.

A new customer forms impressions from appearances. Often he has only a letterhead, or billhead, from which to judge. That letterhead or billhead is your agent. Get a good one.

Your local printer will gladly help you prepare a letterhead. Make a rough sketch. This should include your name even if it is incidental to the company name. Your address and phone number, if you have one, are important of course. Some catch-line is helpful and allows for something unique in arrangement.

Notice the letterhead of Baptist Radio Laboratories of Jacksonville, Illinois. It is clean and dignified. Benny's Radio Shop is distinctive. Studyvin's has a nice type arrangement. So have Panek, Berry, Racey, Manchester Radio Service and others. Boyett's use a half-tone illustration. Strothers have an artistic job, neatly done. They use colors in their letterhead. Kenneth C. Sanford uses a rule very effectively. C. F. Smith, Sr., Holland Radio and Refrigerator Company, Godfrey's Radio Service, Barnett Radio Service, Prangers Radio Service, Frank J. Lhotsky and others use clean strong type to excellent advantage.

n r i

Openings for Field Service Engineers

A large Radio manufacturing concern in the Eastern part of the country has need for several well qualified men to fill positions as field service engineers. Requirements: 4 to 5 years' practical experience; sales ability; must be free to travel. If you can qualify and are interested write to Mr. L. L. Menne, Director, Graduate Service Dept., National Radio Institute, 16th and U Sts., N.W., Washington 9, D. C.

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NEW TRAVELING WAVE TUBE

It Amplifies Over a Band 40 Times Wider Than Present Tubes

Reprinted through the courtesy of the magazine "Western Electric OSCILLATOR," published by the Western Electric Company, New York 7, N. Y.

IT looks like an oversize thermometer. But this entirely new and yet surprisingly simple vacuum tube amplifier, known as the traveling wave tube and developed by Bell Telephone Laboratories, may be of far-reaching significance in television and long distance telephone transmission. It may even make it practicable to send television all the way across the country.

Preliminary tests indicate the tube may amplify dozens of full color or black and white television programs simultaneously. Or it could theoretically handle more than 10,000 simultaneous cross-country telephone conversations or over a hundred million words a minute by telegraph.

Over the past three decades in which amplifier engineers have had the vacuum tube to work with, considerable progress has been made in developing tubes and associated circuits capable of amplifying wider and wider bands of frequencies. For example, a band width of about 10,000 cycles at the beginning of the period has been broadened to one of about 20,000,000 cycles (20 megacycles) today.

Breaking sharply with the past, this magic tube promises to amplify voice or television signals over a frequency band 40 times as wide as that of the best tube now in use and to give many times the amplification.

Conservative figures for the new tube show a power gain of 10,000 over a band width of 800 megacycles. By comparison the present pentode tube can give a power gain of only 10 over a band width of 20 megacycles, while a velocity modulation tube, operating in the microwave range, gives the same amplification over a band width of 10 megacycles. Engineers believe that even the above figures for the new tube can be improved, for it has by no means reached its full development.

In addition to these contributions to wideband amplification, the tube is remarkably simple. It is only about 18 inches long and only a few inches across. An entire amplifier hook-up, of which the tube is the heart, occupies a space less than two feet long and a few inches square and it can do the work of a maze of tubes and circuits.

The idea underlying the tube was proposed and was worked on during the war by a British scientist, R. Kompfner of Oxford University's Clarendon Laboratories. Dr. John R. Pierce of the Bell Telephone Laboratories, with Dr. L. M. Field, has solved the electronic problems of the new tube and overcome effects which rendered earlier efforts of little practical value. Together with F. H. Best, also of Bell Laboratories, who has handled mechanical design and construction problems, they have produced a practical, workable device.

Electrons "Blow Past" Wave

The principle of the tube's operation is entirely different from previous type amplifiers. It does not even look much like an ordinary tube for it has a narrow, glass stem about a foot long and then on one end it flares into a bulb.

Inside the stem is the essence of the tube, a long coil of thin wire, or helix, running from one end of the stem to the other. The wave to be amplified is fed onto the coil at the bulb end through a wave guide and then drawn off at the other end in the same way.

The wave travels along the coiled wire at the speed of light but because of the winding of the wire, it moves along the length of the tube at only a thirteenth of this speed. Meanwhile, from the bulb—actually, an electron gun—a beam of electrons is shot through the inside of the coil down the stem in the same direction the wave is moving and at approximately the same speed, i.e., one-thirteenth the speed of light.

The speeds are not exactly matched, however, and on the average the electrons go faster than the wave. They tend to slow down, though, and in so doing, they give up some of their energy to the wave. As a result the wave gains a tremendous amount of energy and becomes many times amplified.

The picture is not unlike that of a breeze blowing past ripples on a pond—the ripples grow larger as the breeze blows them along. In the tube, the electrons "blow past" the wave on the coil and reinforce the wave by transferring energy to it.

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NEWS OF THE RADIO WORLD

BY *H. L. Emerson*

Television signals were successfully relayed over a light beam in a recent public demonstration by Dr. Thomas T. Goldsmith, Jr., Director of Research of DuMont Laboratory. It is hoped that this means of transmission will help to relieve congestion of certain frequency bands in the Microwave region where usual point to point relay apparatus is operated. Present maximum range of the light beam transmission is about five miles. The beam of light may be made invisible by use of filters. This should enable operation through smoke and light fog.

No longer is it necessary to count sheep to enter the slumber state. The latest method is to put on your record player the album known as the Recorded Sleep Inducer. It is reported that a guarantee is issued with each set and testimonials claim good results.

The Bell system recently installed an experimental rural Radio-Telephone circuit connecting eight farms with the Mountain State Telephone and Telegraph Company.

An interesting fact is that the intensity of the human voice decreases to about one-tenth of its normal strength when flying at an altitude of 35,000 feet. As a result, special amplifiers, which automatically increase amplification with an increase in altitude, had to be built.

Retail prices of British Television sets range from $161 to $545, including tax. Listeners pay $8 for a combined Broadcast-Television license. Our Department of Commerce is informed that the British Television industry has set a production goal of 100,000 television sets.

During one recent month, a record output of 21,183,524 radio tubes was produced. Approximately fifteen million went into new receivers and five million for replacement purposes.

The Astatic Corporation, Conneaut, Ohio, announces the type 1-J *nylon* crystal pickup cartridge. Both the chuck and needle are made of nylon, but the needle tip is sapphire.

Make-up necessary for artists in live-talent television shows should prove very interesting. In a recent demonstration of the new image-orthicon type television camera, models wore a very heavy lipstick and green nail polish. The image-orthicon type camera does not respond to the color red. Green make-up seems to be the answer.

The Centralab Corp., 900 East Keefe Avenue, Milwaukee, has announced a new midget volume control. Smaller than a dime, values range from 500 ohms to 5 megs.; design is for pocket receivers and miniature amplifiers.

A new *coin-in-the-slot* video receiver has been developed by Tradio, Inc., who plan to install the sets in homes without charge, collecting on a pay-as-used basis of fifty cents per half hour of entertainment.

According to the Raytheon Mfg. Company, the new Radarange is a boon to housewives. The Magnetron vacuum tube, which is also the heart of Radar, is the key of the Radarange. Raytheon has timed baking a cake at twenty-nine seconds and, for purely historical interest, grilled a hamburger in thirty-five seconds.

Recent experiments by the British Broadcasting Corporation proved that people can be successfully hypnotized by Television. In fact the private experiment was so successful that future public Telecasts of this type have been forbidden in England.

Eighteen thousand radio tubes have been strung together to create an electronic brain which in four seconds solves problems that take a mathematician ten days.

A battery for use with lifeboat and liferaft transmitters, developed during the war, employs ordinary sea water as the Electrolight.

Electrical condensers that heal themselves after they break down have been brought from Germany and eventually will be available for Radio, Radar and other electronic equipment in this country. The Germans produced more than 50,000,000 during the war. They are metallized paper condensers for use in alternating current or direct current circuits. For the metal foil used in conventional fixed paper condensers, the Germans successfully substituted a thin coating of zinc, applied in vapor form directly on to the paper dielectric. The finished product can be reproduced for about 20% less than conventional condensers and is about 40% smaller. After an electrical breakdown, the zinc deposit around the puncture vaporizes and re-establishes insulation. Many breakdowns may occur before the condensers automatic healing ability is destroyed. These condensers may take from 20 to 50% higher voltages than the usual paper condensers.

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Voltage Measurements In Radio Servicing

By J. A. DOWIE
NRI Chief Instructor

THIS article is directed especially to the student and beginner. Practical and detailed information on making voltage measurements in receivers is presented herein with the thought of helping the inexperienced man locate defective circuit components in a specific receiver stage. First, let's study fundamental principles.

The Basic Circuit

What is a d.c. voltmeter? A fundamental or basic circuit is shown in Fig. *1*. When this simple series circuit is connected across a source of voltage to be measured, electrons will flow through the meter M and resistor R, causing a meter pointer deflection. The meter essentially measures current flow. The higher the voltage that is being measured, the larger the current flow through both M and R, and the greater will be the deflection shown by meter M. By calibrating the meter to read volts instead of amperes or milliamperes, the circuit can be used to measure voltage. In a practical circuit, the value of R will be high enough to limit the current flow to a small value, usually 1 milliampere or less.

For example, assume that the meter in Fig. *1* requires 1 milliampere (.001 ampere) to cause a full scale meter deflection. The actual resistance of the meter M is, let us say, 50 ohms. Assume that the value of R is zero. How great a voltage across points 1 and 2 will cause the meter to read full scale? Substituting .001 amp. and 50 ohms into Ohm's Law (E=IxR), it is readily determined that .05 volts will cause .001 ampere to flow through M. This is the value of current necessary for full scale deflection. A voltmeter reading only .05 volts will not be suitable for radio servicing.

To increase the range of this voltmeter, a resistance is inserted in series with M. This means that a larger voltage will have to be applied across points 1 and 2 in order to cause .001 ampere of current to flow through M. By making R in Fig. 1 equal to 1450 ohms, the total series resistance in the series circuit will be 1500 ohms. The full scale reading of this voltmeter is now increased from .05 volts to 1.5 volts, since a voltage of 1.5 volts is now necessary to cause 1 milliampere of current to flow through M.

We now have a voltmeter that will read a maximum of 1.5 volts, and any intermediate values of voltage between zero and 1.5 volts. *If the value of resistance in series with meter M is increased, the maximum range of the voltmeter will also be increased.* The lower the full scale current of the meter the greater the voltmeter sensitivity. Sensitivity is expressed in ohms-per-volt. For example, in the previous paragraph, the series resistance of the 0-1.5 v. voltmeter was 1500 ohms. Therefore its sensitivity is 1000 ohms-per-volt. A voltmeter sensitivity of 10,000 ohms-per-volt is considered a high resistance voltmeter. Its use will not materially change the voltages of the circuit under test. However, for simplicity, in our discussion we'll assume a sensitivity of 1000 ohms-per-volt. In practical radio servicing it is necessary to have several different voltage ranges, higher than the 1.5 volt maximum. Voltages to be measured in a radio receiver will vary over a wide range. For example, the negative bias voltage on certain tubes will vary from $-7\frac{1}{2}$ volts to as great as -50 volts. Plate voltages will vary from $+90$ volts

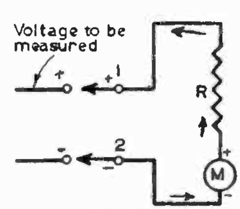

Fig. 1

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to as high as +300 volts. Screen grid voltages on r. f. pentodes and tetrodes will usually vary from +50 to +100 volts, depending on the type of tube and circuit.

By using a multiple selector switch and different values of resistance in series with the meter, a multi-range voltmeter can be designed, as shown in Fig. 2. The various series resistance values are selected by rotary selector switch S. At point 1, the smallest value of R is in series with the meter M, and this is therefore the lowest voltage range. Moving the selector switch from points 1 to 5, increases the maximum voltage that can be measured by the voltmeter, because the series resistance value is increased. The resistance placed in series with the meter is often called a "multiplier resistance" because it multiplies the voltage range. A voltmeter of the type shown in Fig. 2 is sometimes referred to as a "multimeter", due to the multiple ranges. A typical multimeter might have ranges of 0 to 1.5 v.; 0 to 15 v.; 0 to 150 v.; and 0 to 600 volts.

Many other combinations of ranges are possible, but cannot be discussed in the limited space available for this article. It is important that you understand the basic principles rather than specific meter circuits. Operating instructions usually accompany a commercially manufactured multimeter, which aid in learning to read multiple scale meters and selection of proper ranges.

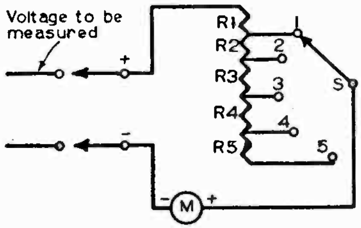

Fig. 2

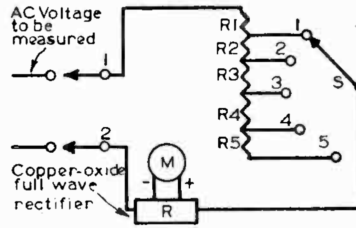

Fig. 3

Basic Principles of A.C. Voltmeter

To adopt a d. c. measuring instrument for a. c. voltage measurements, a copper-oxide rectifier of the full-wave type may be connected between the current meter and source of voltage as shown in Fig. 3. The current in the voltage divider resistors and through terminals 1-2 is an a. c. current and periodically changes. The different a. c. voltage ranges are selected by a rotary selector switch, S. The values of the multiplier resistors in series with the meter must be different than in the d. c. meter circuit because of the rectifier and the fact that an a. c. voltage is being measured.

It is common practice to combine the basic circuits in Fig. 2 and Fig. 3. In a combination a. c. -d. c. voltmeter, or multimeter, the meter is switched from one circuit to the other. The rectifier and proper multiplier resistors are also connected by means of the a.c.-d.c. switch. One such arrangement is shown in Fig. 4. S_1 is used to change the voltmeter from a.c. to d.c. S_2 selects proper d. c. ranges and S_3 selects proper a.c. ranges. This circuit is intended only for illustrative purposes. *Experience has shown that it costs too much to attempt to build test instruments. Buy commercially manufactured, accurate, reliable equipment.*

Voltage Measurements in Power Supplies

A simplified half-wave rectifier circuit is shown in Fig. 5. Typical a.c.-d.c. receivers use a power supply of this type. The half-wave rectifier tube VT acts only as a current limiter on d.c.

Normal line voltage will be approximately 115 volts a.c. Use the a.c. section of the voltmeter for this test, making sure that you select a range high enough to measure line voltage. For example, a 0-150; 0-120; or 0-250 volts a.c. range can safely be used. When in doubt, always use the highest available range first. Then switch to a lower range if it can be done safely. (Note: Polarity of a.c. voltmeter connections may be disregarded since the polarity of an a.c. voltage periodically changes.)

In a circuit like the one shown in Fig. 5, using a type 35Z4 rectifier, this measurement can be easily made by using voltmeter connections V_1. Place one test lead on the plate pin of the tube (pin 5 in this case) and the other test lead on the "on-off" switch. This switch is often found

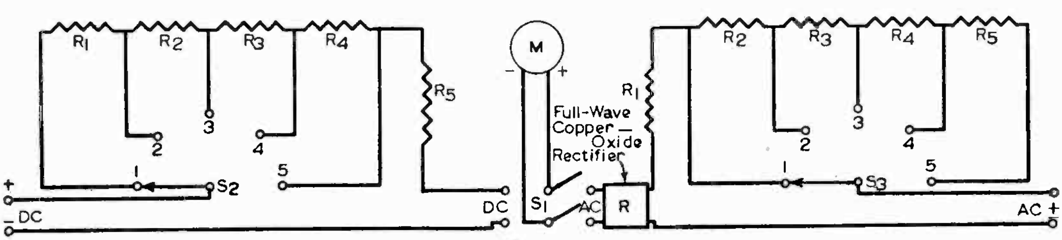

Fig. 4

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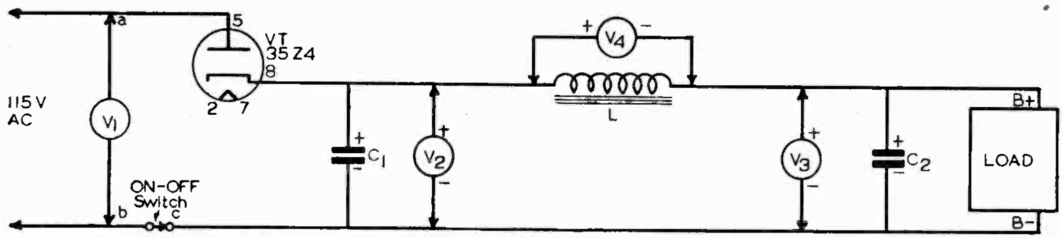

Fig. 5

attached to the rear of the volume control. With the switch in the "on" position, approximately 115 volts should be measured by V_1. Presence of voltage from "a" to "b" and not from "a" to "c" indicates a bad "off-on" switch.

If all tubes light, but a weak rectifier tube or faulty filter components are suspected, a further check must be made. To check d.c. voltage across input filter condenser C_1, use a d.c. voltmeter connected across the terminals of C_1. (Note: Polarity of d.c. voltmeter connections must be as indicated.) A range of 0-150 or 0-200 volts will be adequate. Average readings are 100 to 120 volts at this point. Always try to make voltage measurements from the most convenient point. If the terminals of C_1 are not readily accessible, place the positive test prod on the cathode (pin 8), of the 35Z4, and the negative test prod on the "off-on" switch. Zero reading at V_2 with normal line voltage reading of V_1 indicates a bad rectifier tube, or a short circuit in C_1. If the voltage across input filter C_1 is much higher than normal, suspect an "open" filter choke L. This will be also indicated by a zero reading across output filter condenser C_2, as measured by voltmeter V_3. If readings are higher than normal at both V_2 and V_3, this may be caused by a decrease in power supply loading. Lack of emission of the output tube may cause this, since less current is then drawn from the power supply and the decreased power supply loading results in a rise of B supply output voltage.

Leakage in C_1 will be indicated by low voltage across C_1. A short in C_2 can be detected by measurements V_2 and V_3. A lower than normal voltage at V_2 and a very low voltage at V_3 will be noticed. Placing the d.c. voltmeter across coil L will show a large value. Use the meter polarity indicated at V_4. The positive prod of V_4 goes to pin *8* of the 35Z4 or positive terminal of C_1. The negative prod of V_4 goes to the positive terminal of C_2 or B+. A breakdown of C_2 effectively places L directly across C_1, allowing a large d.c. current flow through L, and draining off of part of the charge of condenser C_1.

Voltage Measurements in Full-Wave Power Supplies

Fig. *6* shows a typical full-wave rectifier circuit. Since a power transformer is used, full-wave rectifiers can be used only in a.c. receivers. (Transformers do not function on d.c.) If no tube filaments light in the set under test, check for input voltage at the primary of the power transformer. This can be measured by connecting an a.c. voltmeter V_L, directly across the primary. If V_L reads zero, check the "on-off" switch and line plug. A normal reading is approximately 115 volts.

If the rectifier tube is all right, and no d.c. voltage is measured across C_1, the high voltage secondary winding of the power transformer may be open. This may be checked by connections V_1 and V_2. An appropriate a.c. voltmeter range must be used for this measurement—at least the 400 or 500 volt ranges should be used. The a.c. voltage across each half of the high voltage winding (across L_1 and L_2) will be approximately 300 to 400 volts for the usual power transformer. The center-tap of the high voltage secondary (B–) is usually connected to chassis or ground. There-

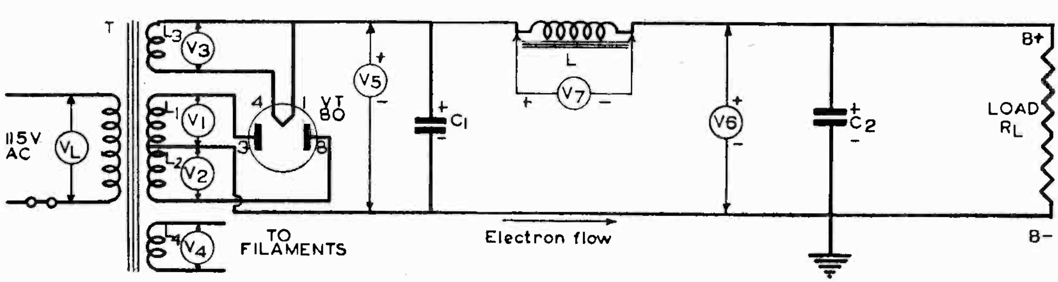

Fig. 6

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fore, **this test can most easily be made by** grounding one test probe and placing the other alternately on each plate pin of the rectifier tube. For a type 80 tube shown in Fig. *6*, the plate pins are 2 and 3. Voltages V_1 and V_2 should be approximately equal. A. C. filament voltage for the type 80 tube may be checked by meter connection V_3. In this case the reading should be 5 volts, a typical value. Make this check directly at the filament pins of the rectifier tube (pins 4 and 1 for an 80).

The remaining filament winding, L_4, supplies heater voltage for the other tubes in the radio. The voltage measured by V_4 is usually about 6.3 volts in modern a.c. sets, but may range from 1.5 to 7.5 volts in older sets, depending on the radio design. If in doubt, refer to a tube manual for correct filament or heater voltages.

The d.c. voltage across the input filter condenser, C_1, can be measured across C_1 by V_5. In a.c. receivers, this voltage is much higher than in a.c.-d.c. sets, and should be approximately 300 to 450 volts. To make this measurement, place the *positive* prod of the d.c. voltmeter on either pin 1 or 4 of the rectifier tube in Fig. *6*, and the *negative* prod on the chassis (B–).

The voltage across output filter condenser C_2 will be lower than that across C_1 due to the voltage drop across choke coil L. (L may be a standard filter choke or the field coil of an electrodynamic loudspeaker.) The d.c. output voltage of the power supply appears across C_2 and is measured by voltmeter V_6. Be sure to observe meter polarity. The positive prod goes to the positive terminal of C_2 and the negative prod goes to the chassis. If the transformer center tap is not grounded to the chassis, the negative meter prod is touched to the negative terminal of C_1 or C_2.

Measuring the voltage across choke L is not difficult if correct meter polarity is observed. Electrons flow toward the cathode of the rectifier tube, and the positive test prod is therefore placed on the + terminal of C_1. The negative test prod is then placed on the opposite terminal of choke L, or a convenient point, such as the positive terminal of C_2. The arrow in the drawing indicates the electron flow through choke L. If the voltage across choke L is higher than normal, and the voltage measured by V_5 is somewhat low, with the voltage at V_6 very low, suspect a short or leakage in output filter C_2. A high voltage across choke L and zero voltage across C_2, can mean an "open" in choke L.

A much lower than normal voltage across C_1 and C_2 may be caused by an "open" in C_1. Condenser, C_1, can be checked by replacing it and repeating the voltage test. As we have seen how power supplies may be checked, let's turn to **signal stages.**

Checking a Power Output Stage

In many receivers, we find an output stage of the simple triode type. The type 45 tube in Fig. 7 is in a typical output stage. Let's see how the grid bias, plate, and filament voltages in this stage are checked.

The grid bias can be checked by means of voltmeter V_1. Connect the negative prod to ground, positive prod to the ungrounded terminal of R_1, the bias resistor. In a typical circuit, the bias value for this type of tube might be about 50 volts. The plate voltage on the tube can be checked by means of d.c. voltmeter V_2. The plate voltage might be in the neighborhood of 250 volts d.c.

The a.c. filament voltage on the tube can be checked by means of a.c. voltmeter V_3, connected directly across the filament. The voltage should be about 2.5 volts a.c.

Suppose, in servicing, that we found that we do not have a normal voltage drop across R_1 but a very low value or no value at all. We would look for a breakdown in condenser C_1. Also, because of the reduced bias, the plate current would rise. This increased current flowing in the resistance of output transformer primary L_3 will cause an increased d.c. voltage drop across the primary. As a result, the reading on V_2 would be lower than normal, indicating reduced plate voltage.

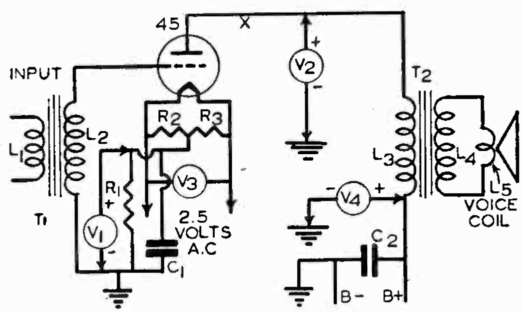

Fig. 7

Also, because of power supply overloading caused by the reduction in the bias, voltmeter V_4 would indicate a lower than normal value of tube resistance by indicating excessive loading and, therefore, reduced B supply voltage. Voltmeter V_4 is a d.c. voltmeter connected across the B supply output circuit and condenser C_2.

A lack of voltage across R_1 and a lack of voltage across V_2 would indicate a probable open in L_3. We could easily check to determine whether or not L_3 is open by breaking the circuit at point X. If a reading is not obtained even on a low range of voltmeter V_2, L_3 is open. If we found

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a decreased voltage reading across R_1 and a much higher than normal plate voltage on the 45, indicated by the meter reading of V_2, coil L_3 in the input transformer circuit might be open. With an open grid circuit, the grid-cathode voltage of the tube would rise to a very high value, the voltage drop across L_3 would decrease because of the decrease in the tube plate current, and voltmeter V_3 would show a much higher than normal indication.

A Pentode Stage

Triode type tubes, however, are not the only kind used in receiver output stages. In modern sets, the pentode output stage very commonly is encountered and a typical circuit is shown in Fig. *8*. Here, VT-1 is the driver tube and VT-2 is the output tube in the output stage. A typical set might use a 6F6 in this section of the circuit.

To check the control grid bias of VT-2, we may use voltmeter V_1, connecting the positive prod to the output tube cathode, and the negative

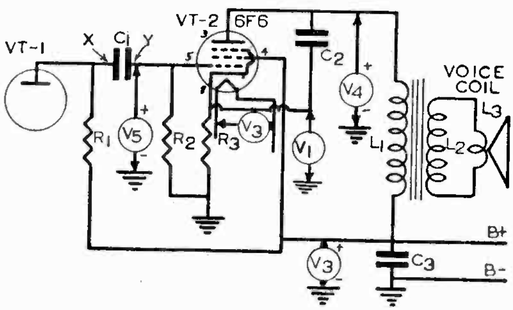

Fig. 8

prod to ground. The voltage value should be about 15 volts in a circuit of this kind. (You may refer to the manufacturer's voltage data covering a particular set for exact information.)

A lower than normal voltage drop across R_3 might indicate a lack of emission in the tube, reduced power supply voltage or a decrease in the value of R_3.

A lack of plate voltage shown by V_4 might indicate an open in L_1. A very much lower than normal voltage accompanied by overheating of L_1 and R_3 would indicate in all probability excessive leakage in condenser C_2.

A breakdown in C_2 would mean a rise in voltage across R_3 and overheating of R_3. Voltmeter V_1 would then show a much higher than normal value of voltage.

The B supply voltage can be checked by means of V_3, connected across the output filter condenser, C_3.

In addition, we may use a voltmeter for checking the condition of the output tube with respect to "gas." If we connect a d.c. voltmeter across R_2 with C_1 disconnected at point X and we obtain an appreciable reading at V_5, between Y and ground, the reading is due to grid current flow and very probably the output tube is "gassy" and it should be replaced.

If we find, however, that the reading is obtained only with condenser C_1 in the circuit, the grid condenser should be replaced since it obviously is leaky and defective.

An Audio Driver and Second Detector Stage

The stage used to drive the output stage, in many sets of the a.c. type, will use a 6SQ7 or equivalent tube. Fig. *9* shows a combination driver and detector stage. The 6SQ7 in this stage is marked VT-1 in the drawing.

The plate voltage on the tube may be checked with a d.c. voltmeter connection V_2 and grid bias voltage with V_1. However, the indicated bias potential for V_1 may be considerably lower than the actual potential in the circuit if an ordinary 1,000 ohms-per-volt meter is used. Using a vacuum tube voltmeter or high sensitivity d.c. voltmeter of the standard type, a reasonably true indication of the actual bias potential will be obtained.

If you find, however, that the negative bias voltage on V_1 is much higher than normal, particularly when tuned to a strong station, suspect leakage in condenser C_2. Leakage in the condenser will permit the negative voltage of the AVC circuit to be applied through C_2 to the grid of the triode section of the 6SQ7 and distortion may result.

The a.v.c. voltage may be checked across C_1 by means of V_3, but will read inaccurately (lower than actual value) unless a high resistance d.c. meter is used.

The B supply voltage can be checked at V_5. Measurement V_4 is used to indicate the voltage across C_5. If you find that you get no plate voltage indication at V_2 and the voltage across C_5 (V_4) is much lower than normal in value, it's likely that C_5 is leaky. You can check the circuit by disconnecting C_5 temporarily. If the voltage rises sharply to an approximately normal value, you have evidence that the condenser is defective and you must install a replacement.

In checking the circuit, if no voltage is obtained across C_5, measured at V_4, but a voltage is obtained across C_6, shown by V_5, R_6 very likely is open. Check it with an ohmmeter or by replacing it. Some voltage will usually be obtained

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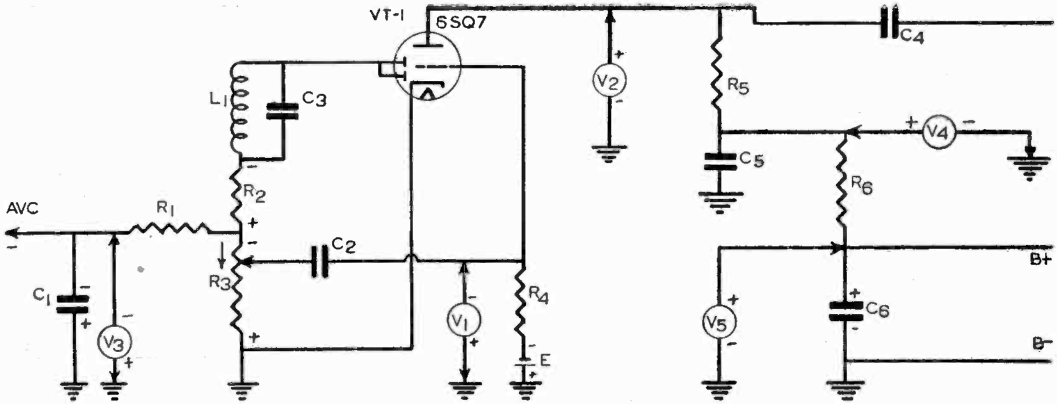

Fig. 9

across C_5 if this condenser is leaky. To check, C_5 can be disconnected. If V_4 gives no reading, even on a low range, R_6 is open. (Assuming there is normal voltage across C_6.)

Many students think that there is something wrong when they find that they cannot measure a negative d.c. voltage between the diode plates of VT_1 and ground with an ordinary voltmeter. Because of the high impedance of the tuned circuit and the fact that it operates at an r.f. level, shunting a d.c. voltmeter of comparatively low value of resistance across this circuit will upset the circuit, making this voltage test meaningless. An ohmmeter should be used to check the continuity of this circuit.

An I.F. Stage

The signal supplied to the diode second detector is furnished by the i.f. amplifier stage. A typical i.f. amplifier stage, using a 6SK7 tube, is shown in Fig. *10*.

The a.v.c. voltage on the tube can be checked by means of voltmeter V_1, connected across C_1. The junction point of C_1 and R_1 in the a.v.c. circuit should be negative with respect to ground when a station is tuned in and a.v.c. bias is developed. A voltage of from 1 or 2 volts, to as high as 15 or 20 volts is normal when a high resistance meter is used. The stronger the station being tuned in, the greater the measured d.c. voltage.

If the voltage across C_1 is lower than normal in value, C_1 may be leaky. The condenser can be checked by replacing it and repeating the voltage test.

The a.v.c. bias voltage across C_1 varies according to the signal strength of the station, as you tune

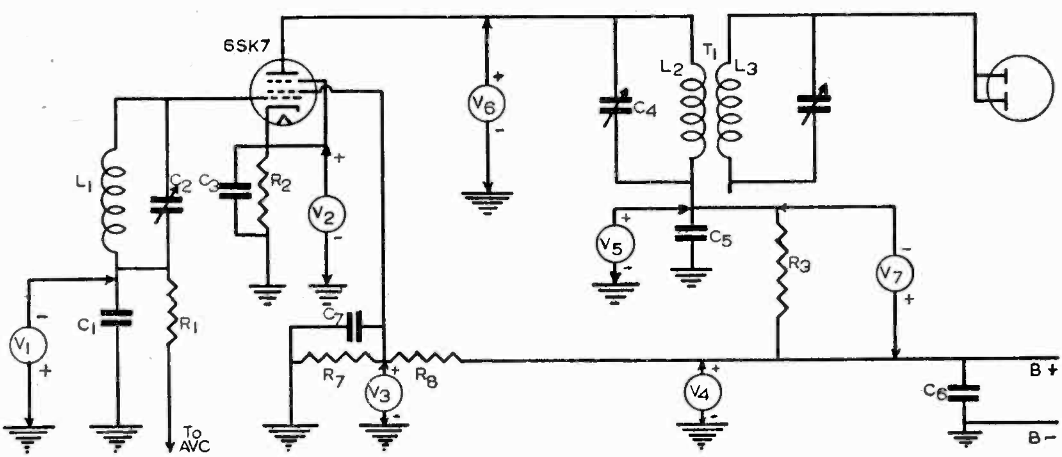

Fig. 10

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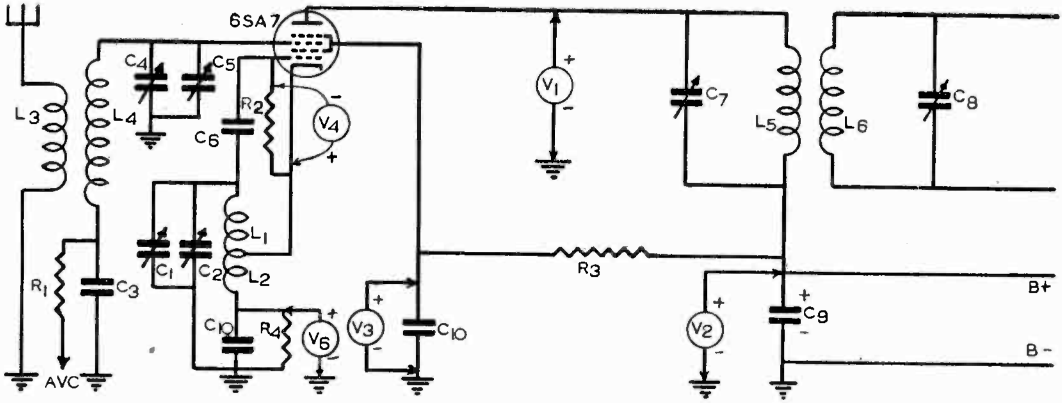

Fig. 11

on and off resonance. The cathode bias in the circuit is established by means of the voltage drop across R_2. The electron flow in the circuit is from the chassis up through R_2 to the cathode of the tube. Therefore, the cathode is positive with reference to ground. When measuring the value of cathode resistor bias on this tube, the positive prod of voltmeter V_2 is connected to the 6SK7 cathode pin and the negative prod to ground or the chassis. The normal bias in a circuit of this kind will be –3 to –10 volts, depending on the design of the circuit.

The plate voltage, measured at V_6, will be about 250 volts in a straight a.c. set, and approximately 100 volts d.c. in an a.c.-d.c. set. Lack of plate voltage on this tube might indicate an open in L_3 or R_3. If we get an approximately normal d.c. voltage across C_5, indicated by V_5, but no d.c. voltage on the plate pin shown by a lack of normal reading on V_6, suspect an open in L_2, the primary of the i.f. transformer.

If the B supply voltage across C_6 (output filter condenser) shown by V_4, is normal but we find that no voltage is indicated at V_5, R_3 probably is "open." When replacing R_3, if it is badly charred, check C_5. It may be shorted or leaky. If there is a decrease in the B supply output voltage and R_3 is overheated, while V_5 is much lower than normal in value, it is likely C_5 is defective and has low leakage resistance. If this occurs, the full B supply voltage is applied directly through the low leakage resistance of C_5 across R_8, causing an increase in the current flowing through R_3. This will be indicated by a larger than normal reading for V_7 in Fig. *10*.

The screen voltage of the tube may be checked by means of V_3. The most convenient point for this test will be from the screen grid pin No. 6 of this tube to chassis. If the screen potential is much lower than normal in value but R_8 is not overheated and the B supply voltage is apparently normal, the value of R_8 may have increased to a very much higher than normal value.

If, however, we find evidence of overheating of R_8, by visual inspection, and the potential across R_7 is much lower than normal in value, it is quite likely C_7 is leaky. To check, disconnect C_7. If the voltage across R_7, which is measured by V_3, is now normal, replace C_7.

If we find a higher than normal value of voltage across R_7, shown by V_8, the trouble might be a lack of emission in the tube, an open in R_2 or more likely an "open" or increase in resistance of R_7.

Making Voltage Measurements in a Typical Mixer Stage

The signal supplied to the 6SK7 i.f. amplifier stage, in Fig. 10, in a typical set, will be furnished by a mixer stage, using a 6SA7 tube, for example. A stage of this kind is shown in Fig. *11*.

The plate voltage in this stage may be checked by V_1. The positive prod is connected to the 6SA7 plate pin No. 3, and the negative prod to the chassis. A normal reading for a.c. sets is about 250 volts. For a.c.-d.c. sets, approximately 100 volts is normal on the 6SA7 plate. If no reading is obtained but the output voltage of the B supply measured across C_9 shown by V_2, is all right, it's likely that L_5 in series with the 6SA7 plate is "open."

If little or no voltage is obtained across screen by-pass C_{10}, and R_3 is overheated, it's quite likely that C_{10} is shorted or leaky and should be replaced.

If the voltage across C_{10} is higher than normal in value, R_3 may have decreased in resistance value or the tube may have lower than normal emission. The amount of cathode bias developed

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across cathode resistor, R_4, can be checked at V_6. Lower than normal bias might be due to a defect in C_{10}, or in R_4. Each can be checked with an ohmmeter or by replacement.

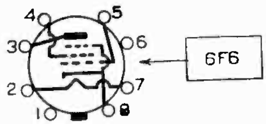

Fig. 12

The Oscillator Section

An appreciable negative voltage (from −5 or −10 volts to as high as −20 volts), across R_2, should be measured with a high resistance voltmeter, with the polarity indicated for V_4 in Fig. *11*, when the oscillator is oscillating. If you fail to measure this voltage, look for an open in the oscillator coil, L_1-L_2. The L_2 section frequently is found "open" in servicing and may be checked for continuity with an ohmmeter. An open in L_2 will result in zero voltage across R_4.

A short circuit in oscillator tuning condenser C_1, or trimmer C_2, would also cause oscillator failure. Then, the first grid of the 6SA7 will not be negative with respect to the cathode, a condition indicated by voltmeter V_4.

Everything that there is to know about practical voltage tests in radio servicing has not been given in this article. It would be impossible to do that—you learn gradually and build up your background of technical knowledge over a period of time. However, the pointers given should help you in getting started and understanding basic measurements.

Practice making voltage tests on your own initiative. Compare your measurements with the figures given in manufacturer's voltage charts and the values given in tube manuals and tube charts.

While the values given in a tube chart or a tube manual may serve for approximate purposes, very often they are quite different than the actual values under working conditions in typical receivers. Use the tube chart and tube manual voltage values only as an approximate guide. If you do not have a tube manual you may obtain one by getting in touch with a radio distributor or supply house. Or, if you wish, write directly to RCA Manufacturing Company, Camden, New Jersey; Sylvania Electric Products Company, Emporium, Pennsylvania; or Tube Division, General Electric Company, Schenectady, New York.

Tube Charts

To use a tube chart, first look the tube number up in the chart. Some reference to a given type of socket will be given, for example, 7S, for the 6F6. Refer to the undersocket view given in the tube chart. This may appear as shown in Fig. 12. This view is a view of the socket as it would appear with the radio chassis turned upside down. The pin terminals are numbered 1 to 8 in a clockwise direction and the guide pin is used as a reference.

The use of a tube chart will be largely self-evident to a serviceman. Compare the sockets of sets you work on with socket layouts given in socket layout charts and in tube manuals.

Practice using your tube chart. It will become as handy and useful to you as your test equipment and in time, with experience, you will remember the pin terminal connections of the tubes most commonly encountered in your radio servicing. However, the chart will always be necessary to check your memory and to identify pin terminals of tubes unfamiliar to you.

—n r i—

Attention Veterans Taking Courses Under The GI Bill

We have a number of men who lost their training benefits with us merely because they moved or changed address without notifying their Regional Offices of the change. You should be very careful to keep the Veterans Administration informed of your whereabouts at all times.

One man's training was interrupted in August, 1946 for failure to leave a forwarding address. He has still not been reinstated, in spite of all we can do to straighten the matter out. We're trying, though!

Several otherwise excellent students failed to return reports of lessons completed to their Regional Offices—when requested to do so. One man refused to make these reports from June until October 1946, at which time his Regional Office interrupted his training. BE SURE this doesn't happen to you! Send reports to your Regional Office IF requested to by them. It is in your own best interest. Not all Regional Offices require these reports, so you need not be concerned unless you are notified to make a report.

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Broadcast Station Operators Wanted

Radio Station KBOW located in Butte, Montana, is to go on the air soon. They are in need of several men with first class radiotelephone licenses. This sounds like a nice opportunity for the right men. If interested, your application should be directed to Mr. Leon Lloyd, Manager, Radio Station KBOW, Box 1932, Butte, Montana. Be sure to state your qualifications fully in letter of application.

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Successful as Chief Engineer Radio Station KGCU

Raymond V. Barnett operating his "ham" radio station.

Dear Mr. Smith:

"Back in the fall of 1938, I finished the NRI Course and received my Diploma. I had opened my own shop in my home town in the fall of '37—averaged about 35 dollars a month that winter. Went back to the farm during the summer of '38. Back to radio shop in town again that winter. Worked for Maytag Electric Store in Crosby, N. Dak., during summer of '39. Opened my own shop at Beulah, N. Dak., in the fall of 1939 and began making a decent existence. Got my first ham ticket back in '38 and by January of 1942 I had built several ham transmitters besides my own, and had earned an ARRL code proficiency cerificate at 25 words per minute. In January 1942, with the government crying to high heaven for radio operators, and me with a family too big to let me in the army, and wanting to do whatever I could to further the war effort, I locked up the shop and went to work for Uncle Sam as radio operator and later as Junior Monitoring Officer with the Radio Intelligence Division of FCC. Was stationed at Fort Meade, S. Dak., until that station was abandoned. Had obtained both First Telephone and Second Telegraph licenses while with FCC so in May 1944 I came up to Bismarck and went to work for KFYR as transmitter operator. Started at $35 per week and was drawing $49 per week when I left them to take over my present position as Chief Engineer at KGCU at Mandan, just across the river from Bismarck, at a substantial increase in salary. I own my own home in Bismarck and do not owe a penny on it. My taxes are paid. I have five children and my bills are paid the first of each month. I have money in the bank. I'm not rich except in the fact that my slate is clean. I love Radio, whether you want to call it work or play. For me it is both and it has furnished me with a decent living for the past eight years which is more than I can say for all the other jobs I have worked at. I have worked for everything I have, but in my case my work, though a headache at times, has for the most part been enjoyable. As to the part the National Radio Institute has played in my life—it got me started and gave me the ground work and fundamental training a man must have in order to make a success. When I started that course, my family and I were existing on a cash grant from the county, because the WPA had discontinued its work program. There were no jobs for anybody unless they were fully trained and experienced in a specialized field. Five dollars out of that grant went to NRI every month. More than one day went by when we got up hungry and went to bed hungry at night. It was tough, sure, but we have never regretted the sacrifice we made. I wanted to learn in order to better my living conditions. I studied until I was blue in the face and dizzy. I had never finished high school, and at times I would fold up a text and go outside and walk a mile or two thru the fields with impedance, phasing, power factor and db's dogging my every step. Somebody once said 'a person is never comfortable while learning.' Truer words were never spoken. I still have trouble trying to define a db but nobody has ever asked me to except you and anyway I still think it would be more fun to do than to handle a pick and shovel all day. I am doing work I like and getting paid for it. If I could do it after I was 35 and married and jobless, it should be a lot easier for a young fellow."

Sincerely yours,
Raymond V. Barnett
Bismarck, North Dakota

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N.R.I. ALUMNI NEWS

Frank Zimmer .... President
Ernest W. Gosnell .... Vice-Pres.
Harry R. Stephens .... Vice-Pres.
Chas. J. Fehn .... Vice-Pres.
Harry Andresen .... Vice-Pres.
Earl Merryman .... Secretary
Louis L. Menne .... Executive Secretary

Frank Zimmer of New York Is Elected Alumni President

MR. Frank Zimmer has been elected President of the National Radio Institute Alumni Association for the year 1947. Always a vital figure in the affairs of the Alumni Association Frank Zimmer now has been honored by being elevated to the highest office within the gift of our members.

Zimmer will be a good President. He is a good Radio man, a good business man, an accomplished speaker and an energetic worker. For thirteen years he has been a member of New York Chapter. As an officer of that local, particularly as a member of the Executive Committee, Zimmer has been a most tireless worker for the benefit of our Alumni members.

Mr. F. Earl Oliver of Detroit, who opposed Mr. Zimmer in this friendly contest was the first to send congratulations to our new President. Earl Oliver served our Alumni Association as President during 1943. He did not again seek the office but the primary sometimes shows strange results. Always very popular with our members, Mr. Oliver polled so many votes in the primary he was nominated to run for President against Mr. Zimmer. Because a candidate cannot run for more than one office, Mr. Oliver thus missed his chance to be re-elected as a Vice-President for 1947. He therefore steps out of the picture of National Officers for this year but he will bounce back in a year or two. Mr. Oliver is Chairman of Detroit Chapter this year, an office he has held in previous years and he will be very much in the limelight you may be sure.

In the field of Vice-Presidents the election results show Harry R. Stephens of Detroit, Charles J. Fehn of Philadelphia, Ernest W. Gosnell of Batimore and Harry Andresen of Chicago elected. Actually Dr. George B. Thompson of Los Angeles was among the four receiving the highest total of votes for Vice-Presidents. Since Dr. Thompson was nominated we have received a letter from Mrs. Thompson informing us that Dr. Thompson is gravely ill. Mrs. Thompson informs us that the doctor's condition is so serious she is unable even to read our letters to him. Under these unfortunate circumstances Dr. Thompson would be unable to accept the oath of office and we are carrying out the wish of Mrs. Thompson which is that the good doctor be relieved of all responsibility until he recovers.

As was expected both Earl Merryman as Secretary and L. L. Menne as Executive Secretary were re-elected. Mr. Merryman was elected Secretary at the time our Alumni was organized in 1929 and has held the office ever since. Mr. Menne directs the affairs of the Alumni Association at Headquarters and is also Editor of NATIONAL RADIO NEWS.

It is, of course, unfortunate that all candidates cannot be elected. In an organization such as ours these offices are purely honorary. Sometimes the vote is so close the result is not decided until the last day permitted for balloting. The fact that some candidates are better known because of Chapter connections or for other reasons is certainly no reflection on those over whom they were elected. Often candidates who miss being elected in one year come back stronger than ever in following years. They are all grand fellows who have no personal ambitions but merely a desire to serve their fellow members in any capacity for which they may be called. They are strictly organization workers.

Now for a busy year! Because of many new developments the great field of Radio promises brighter opportunities than ever before.

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New York Chapter

Since our last report we held our annual social party. It was a tremendous success. The enclosed pictures (see pages 28 and 29) give you an idea of the fun.

We had ninety-four present at this party including J. A. Dowie, L. L. Menne and H. L. Emerson from headquarters in Washington. We have had as good or even better attendance at previous parties but this one took the prize for real entertainment. Everyone present had a glorious time.

It would take pages to cover the entire proceedings. The following touches the highlights. The meeting was opened by Chairman Wappler with the National Anthem. Then our Washington guests were introduced. We were all very happy to have Chief Instructor Dowie with us. Mr. J. E. Smith, who was also scheduled to be present, at the last moment found it impossible to make the trip because of pressing matters in Washington.

Everyone was invited to partake of food of which there was much in quality and quantity. This was a buffet supper where all could select what they preferred and take as much as they pleased.

James J. Newbeck was then presented by the Chairman to act as Master of Ceremonies. It should be said that Jimmie did a grand job. He looked and acted like a professional.

Talent was presented in the following order to give just a sketchy report. The three Tunesters, led by William Fox, in songs which included one of their own, "My Rodeo Queen." Next, Crez Gomez on the Saxophone, then a talk by Lou Menne followed by interesting comments by Zimmer, Newbeck and Peterson, three of our candidates for national offices, (Lou Kunert, your humble correspondent was the fourth), then A. J. Schlette with a Celesta Recital, now a talk by J. A. Dowie, then more entertainment by Andrew Murphy on the Hawaiian Guitar, followed by a side-splitting comedy skit in which the actors were Messrs. Remer, Fox, Steinhurst and Gomez. The latter two played the part of ambitious but untrained young men who open a radio shop. Remer is their first customer. What they do to his radio in about five minutes just isn't in the book. They used crow-bars, hatchets, hammers and cleavers. It was a scream (see pictures). The bill for the job was $12.50 including seventy-five cents each for lunch with a liberal charge for time, most of which was consumed by the two partners arguing about what to try next and who was the boss. Remer grabbed his radio set, paid his bill with plenty of mumbling, then went across the street to Mr. William Fox, an NRI Radiotrician where, of course, he got a businesslike reception and first class service. It was a great skit superbly acted. It was extremely funny and tapered off into real seriousness. Comedy with a moral is a good way to put it.

Joel Robinson then rendered a few selections on the Mandolin. This was followed by a talk by H. L. Emerson. Then Teddy Durante, with his Harmonica, also Fred Jensen, Banjo expert. George Hirsch led the Chapter in group singing which went on and on and became louder and louder until long after the time good radio men should be in bed. It was a great affair, thanks to all who gave so much time to make it a success. Thanks also to Mr. Dowie, Mr. Menne and Mr. Emerson for coming from Washington to be with us and for their inspiring remarks.

Our following meeting was something of a letdown with only fifty-four attending (*only* fifty-four, he says; Editor) but this was expected because of the holidays when many of our members are unusually busy. We were indeed privileged to hear Mr. Byrnes of Radio Maintenance Magazine, who made an interesting talk. Then James J. Newbeck, our own Jimmy, gave his final talk in a series on the Oscillator. This was followed by the ever popular questions and answers session conducted by Pete Peterson.

At our meeting of December 19, we re-elected our entire slate of officers. This is the fourth consecutive term for all present officers—a real tribute to them. We all promise to work hard during 1947 but next year the present officers want to step out to make way for new blood.

New York Chapter meets on the first and third Thursdays of each month at St. Mark's Community Center, 12 St. Mark's Place—between Second and Third Avenues, New York City. Meetings start at 8:15 PM.

Louis J. Kunert, Secretary
145-20 Ferndale Avenue
Jamaica 4, New York

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Baltimore Chapter

Officers for the current year are as follows:

Chairman	H. J. Rathbun
Vice-Chairman	L. Arthur
Secretary-Treasurer	F. J. Butler
Recording Secretary	P. E. Marsh
Librarian	E. Shue
Master-at-Arms	George C. Phillips
Financial Committee	T. H. Clark and C. M. Whitt

We showed the films of the Westinghouse Elec-

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tric Company titled "Radio and Electronics."

We have had some very interesting Radio talks by members and outside speakers. Beginning with Chairman Rathbun our Chapter is able to present some very capable speakers on the subject of Radio and its many branches. These men speak the Radio man's language. They are practical Radio men who have everything in common and for this reason our discussions are always very beneficial.

We meet on the second and fourth Tuesday of each month at Redmen's Hall, 745 W. Batimore Street, in Baltimore.

P. E. Marsh, Recording Secretary
Box 2556, Arlington Sta.
Baltimore 15, Md.

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Detroit Chapter

We are forging ahead and have outgrown our quarters. Our meetings are now held at 21 Henry Street, Corner Woodward Avenue, Second Floor. These are ideal quarters for us.

Our own Floyd Buehler, Instructor at Electronics Institute, Inc., showed four reels of movies which included "Principles of Electricity" (GE Film) "Making a Record at Victor, Camden, New Jersey," "Motors and Generators" and "Exploring the X-Rays."

We also held a special meeting for the purpose of visiting Radio Station WWJ. This was a very interesting and educational affair. We are grateful to the Staff of WWJ for their courtesies to us.

Officers elected for the year of 1947 are as follows:

Chairman .... F. Earl Oliver
Vice-Chairman .... Charles H. Mills
Secretary-Treasurer .... Harry R. Stephens
Assistant Secretary-Treasurer .... Larry Upham
Finance Committee .. Leonard Winkelmann and Clarence McMaster
Librarian .... Floyd Buehler

With the new set of officers, all of whom are thoroughly experienced in their respective offices and very proficient in Radio—the Detroit Chapter is headed for another prosperous year. Jim Quinn, retiring chairman, will be right there to help us, too.

Detroit Chapter meets on the first and third Fridays of each month. Remember our new meeting place is at 21 Henry Street, Corner of Woodward Avenue. You are cordially invited to meet with us. Students of NRI are welcome as visitors.

Harry R. Stephens, Secretary
5910 Grayton Road
Detroit 24, Michigan

Phila-Camden Chapter

The following officers will serve during 1947.

Chairman .... Harvey Morris
Vice-Chairman .... John McCaffrey
Recording Secretary .... Clifford N. Hill
Financial Secretary .... Julius Schubert
Treasurer .... Charles J. Fehn
Librarian .... Milton Tice
Sgt.-at-Arms .... Frank Armstrong

We were glad to have a visit from L. L. Menne and H. L. Emerson of Washington. This was a lively meeting at which time we disposed of two important functions—the election of officers and a decision upon a new meeting place.

Please take notice that we have changed our place of meeting. In order to get accommodations at our new meeting place it was also necessary to change the night for holding our meetings. We now meet at 4510 Frankford Avenue, in Philadelphia on the second and fourth Monday of each month. Please make a note of this new address and also the change in meeting nights.

You will like our new meeting hall. If you have not attended a meeting during the past several weeks we urge you to join us in the very near future to get acquainted with our new surroundings. Phila-Camden Chapter, under strong leadership, is really going places in 1947.

Clifford N. Hill, Recording Secretary
1317 N. Alden Street
Philadelphia 31, Penna.

n r i

Chicago Chapter

Our election of officers will be held in January which is just too late to be reported in this issue of the NR News.

We have had some very interesting talks by our members and visitors. Two talks which should receive special mention were given by Steve Bognar on "Television Antennas" and Harry Andresen on "A.M. and F.M." Our members are very enthusiastic regarding a new service which we have for those who attend our meetings. This is in the form of mimeographed sheets which contain service notes. For example there is one on Excessive Hum and what to look for to overcome it. This is cited merely as an example of how completely these service notes are prepared. On this subject of Excessive Hum there are two solid pages of suggestions. Any Radio man can find these service notes very helpful.

We have been meeting at 2759 S. Pulaski Rd. If you live in the Chicago area and are interested in attending our meetings, send your name and address to the undersigned.

Harry Andresen, Vice-Pres.
3317 N. Albany Ave.
Chicago 18, Ill.

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(Left) Master of Ceremonies, Jimmy Newbeck, affectionately presents member George L. Woodward with a pound of his favorite smoking tobacco. Mr. and Mrs. Woodward recently celebrated their 50th wedding anniversary. (Center) Steinhurst and Gomez are "testing" a tube with a match while Remer awaits results with not too much confidence. Part of the comedy skit which had everyone laughing. (Right) The effervescent Chairman of New York Chapter, Bert Wappler, who deserves special mention here for his fine leadership.

The pictures below and on the right hand page are candid shots taken at the party and give "proof positive" that there was plenty of talent, food, drink and merriment. A great party.

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Servicing Hints for Your Note Book

Atwater Kent 37 to 60. When dial belts are not obtainable use heavy dial cable. Anchor to pulley pins, spot with drop of solder. Move condenser to take up slack.

—— *n r i* ——

Atwater Kent 38 and 42. Low volume due to lower than normal plate voltage on 27 detector. Replace resistor in the plate circuit, located in the power pack under the contact board.

—— *n r i* ——

Atwater Kent 40. Dead set caused by open in 2000 ohm bias resistor of 71A.

—— *n r i* ——

Atwater Kent 40. Noise, due to dirty contact on volume control. Remove volume control. Use fine sandpaper to clean contact surfaces and bend rotor arm carefully to get better contact.

—— *n r i* ——

Atwater Kent 55. When pulleys are completely disconnected from shaft and condensers aligned, replacement of pulleys generally throws the job out again. To overcome this, loosen one screw completely and then loosen the other very slightly, just enough to allow the condenser shaft to turn when the pulley is held in place.

—— *n r i* ——

General Electric H-31. Intermittent and Fading. If this difficulty is attended by shifting of the station dial settings, the low frequency padding condenser will usually be found broken at the spring tab. Replace, to clear the trouble, with a 745 mfd. (maximum) unit.

—— *n r i* ——

General Electric M-40. Irregular and muffled reception. See if particles worn from vibrator points have fused into bakelite insulating strip against which the points rest and, if so, clean strip thoroughly with file.

—— *n r i* ——

General Electric 51. Intermittent Hum. Replace .05 mfd. condenser coupling 6B7 grid to volume control.

—— *n r i* ——

General Electric A-63, A-65. Inoperative when played with tone control in the bass position. If shorted, the .03 mfd., 400 volt tone control condenser will prevent operation when the control is turned to the bass position. Distortion will also be noted with the control in the treble position. If the receiver is played continuously with the control in the latter position, the 8000 ohm 1 watt resistor in series with the condenser will be damaged. In this event, replace both. A 600 to 1000 volt condenser rated at .03 mfd. should be used as a replacement condenser.

—— *n r i* ——

General Electric A-63. If set is noisy, check for leakage between field coil and pole piece or loudspeaker frame. To do this, disconnect field leads from circuit. Then touch one ohmmeter test prod to one field coil terminal, and one to pole piece on frame. Leakage should be very high, above 20 megohms, if loudspeaker is in good condition.

—— *n r i* ——

General Electric G-65. Oscillation and Distortion. The .012 mfd. condenser, connected to plate of 6K6G, too close to yellow automatic tuning lead, causing feedback to control grid of 6A8G.

—— *n r i* ——

Grunow 5B. Loud a.c. Hum. Due to pilot light being shorted out on variable condenser gang. Remedy by twisting insulating washer around until pilot light does not touch condenser frame and apply some form of cement to top of insulating washer to hold it in place.

—— *n r i* ——

Grunow 7A, 700, 701. Fading or Intermittent Reception. When you have a bad case of fading or intermittent reception in this model, look for an open or intermittent open 0.1 mfd. by-pass condenser in the r.f. and 1st detector stage. This condenser is a dual unit in a small can mounted on the back of the antenna coil shield. If one is not familiar with this model, he might not observe the way this condenser is connected. The wires come from the bottom of the condenser and run through the coil. The top of the condenser has the points for the tone control condenser.

—— *n r i* ——

Majestic 20. Do not attempt to remove the bottom plate of this receiver until the sides have been removed and the necessary wires disconnected. Otherwise, damage to wiring may result.

—— *n r i* ——

Philco 610. Distortion. Often due to leaky .015 mfd. coupling condenser between 75 plate and 42 grid. A .01 mfd. 600 volt condenser is a satisfactory replacement.

—— *n r i* ——

Philco 635. When replacing tubes after checking, be sure the grid lead of the 75 tube is inside the tube shield. Otherwise, squealing and oscillation may result.

—— *n r i* ——

Philco 650. Oscillator won't start when set is first turned on. Try replacement of condenser in screen circuit of 6A7, particularly if screen voltage seems lower than normal.

—— *n r i* ——

RCA 811K. Noisy Automatic Tuning or Motor Stalling. Check the small gear at the top of the gear assembly—the one on which is mounted a small arm that engages a pin on the extended motor shaft when the motor is turned on. This gear may be worn, or, in some cases, pressing down too tightly on the next gear in the assembly. At any point in the gear assembly where there is friction, use oil rather than grease. Many greases tend to dry out and harden from the heat developed by the tubes in the chassis. Light machine oil is best for the purpose.

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Here And There Among Alumni Members

It's a baby girl in the home of Mr. & Mrs. Frank H. Catlin, Sr., of Lincoln, Nebraska. Peggy Jo, the new arrival, weighed in at six pounds. Good luck Peggy, and congratulations to your Pa and Ma.

n r i

Alumnus Stephens M. Robers, Vineyard Haven, Mass., has joined the ranks of NRI radio amateurs. He now has a Class A Station, call W1OQT.

n r i

Our best wishes go to Mrs. Ethel M. Quinn, who is ill. Ethel is the wife of James A. Quinn, the 1946 Chairman of the Detroit Chapter. The doctor has ordered Mrs. Quinn to stay in bed and take it easy. What's wrong with that, Ethel?

n r i

Congratulations to Mr. U. M. Westbrook on his new position as an engineer at Radio Station WPAX, Thomasville, Georgia.

n r i

Ernest V. Bettencourt of South Dartmouth, Mass., is interested in contacting fellow Alumni members in his vicinity with a view of starting a local chapter. His address is 75 Rockland St., Telephone Number 2-0158 New Bedford.

n r i

Stanley C. Leek, Jr., 460 Chestnut St., West Reading, Penna., now has his first-class 'phone ticket, and is looking for a position in Aircraft Radio. He served in the Navy as an A.E.T.M., and has a fine background for his future work.

n r i

The new call letters WØRUG were recently issued to NRI Radio Amateur E. E. Baldwin, Box 398, Harvard, Nebraska. Let us hear from more of you "hams."

n r i

It is nice to hear from Joseph R. Jordan, Pine Bluff, Arkansas. He is building a new Radio shop and says that business is great. One of his success secrets is calling back at the customer's home to make sure that the repaired set is giving satisfactory service.

n r i

Word has just come to us from Mrs. Thompson that Dr. George B. Thompson, of Los Angeles, California, is very ill—too ill even to have letters read to him. Dr. Thompson has been sick for some time and for the last nine months has been bedridden. Our best wishes are with our former alumni President (1941) in this crisis.

n r i

Elroy Schizkoske, Pembrooke, Ontario, Canada, has accepted a position as an engineer at Radio Station CHOV in Pembroke.

n r i

We received a newspaper clipping from New York Chapter regarding the fiftieth wedding anniversary of George L. Woodward. Congratulations Mr. and Mrs. Woodward on your Golden Wedding Anniversary. Mr. Woodward, an NRI Graduate in 1941, has been an alumni member since that time and is very active in New York Chapter.

n r i

It's another little girl at the home of Norman P. Fornoff, Pekin, Illinois. The Fornoffs have another daughter, now three years old. Mr. Fornoff formerly managed the Radio Department of a Sears store in Moline, Ill., and now has his own radio business in Pekin.

n r i

George W. Andree, of Washington, D. C., visited NRI recently and purchased one of our new roll chart attachments for use with his Model 66 NRI professional tube tester. Andree services radios and motion picture equipment in his spare time.

n r i

Another NRI alumnus has a new job as a broadcast engineer. Ira J. Walters, Owen Sound, Ontario, Canada, is now with broadcasting station CFOS. Owen Sound is located on the northern shores of famous Georgian Bay, noted for lovely scenery and good fishing.

n r i

The mails brought a swell letter from J. B. Peters, of Fleming, Kentucky. He is planning a new business to include Radio service, and Radio, Record, and Appliance sales. Best of luck to you, Peters.

n r i

Harvey Girard, another Canadian Alumnus from Ottawa, Ont., Canada, deserves special mention. He has been a member of the NRI Alumni Association for the past sixteen years. This is, of course, not a record, but can you top it?

n r i

It was a pleasure to receive a letter from James A. McDonald, of Dorchester, Mass. He has a fine spare-time business in his home, and a large stock of radio parts; just recently became a member of the Radio Technician's Guild.

n r i

It's been quite a long time since we last heard from Elmer Hughes, now of Sackville, N. B., Canada. He is with the Canadian Broadcasting Corporation at the International Short Wave Station located in Sackville, N. B. He is at present working in the Senior Group doing maintenance work on two 50 KW short wave transmitters (6 to 21 mc.) and a marine transmitter on 1070 kc. Sounds like Hughes is getting up in the communication world.

n r i

H. C. Wenzel, another successful NRI graduate and alumnus operates WENZEL'S RADIO SERVICE in Windsor Locks, Conn. He has expanded his store. Young Robert, his son, only 12 years old, is now helping by testing tubes and removing chassis, etc.

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Thomas A Smith

Dear Mr. Dowie:

I am a graduate of the U. S. Army Air Technical Service Command Instrument School. (As a civilian in 1940) I worked for them at various installations, including Middletown, Pennsylvania, Baltimore, Maryland and New Castle Army Air Base, Wilmington, Delaware. At the last place I was Civilian Training Administrator for mechanics of all trades and crew members of the aircraft other than pilots.

I joined the U. S. Navy as an enlisted man in March, 1943 and was assigned as an Instrument Overhaul and Theory Instructor at their Chicago Naval Air Technical Training Center for a year and a half. Then was transferred to Ward Island, Corpus Christi, to help maintain the Radar Training Aircraft or Flying Classrooms. It was here that I realized that to stay in the instrument business I would have to know much more about electronics and Radio. It was one of your NRI students there who told me about your school and the advice of one of the Training Officers that caused me to contact you as soon as it was possible to do so after discharge from the Navy in December, 1945. The NRI Course has helped me tremendously ever since then in my daily work, as I'm an Instrument and Radio Installation man at the Atlantic Aviation Service Inc. at DuPont Airport, Wilmington, Delaware, distributors for all Bendix Radio equipment.

I plan to operate an Instrument Service of my own as soon as parts and new models are available in sufficient quantity and I can purchase the few necessary equipments I still require. I have worked on all types of aircraft since 1930, the year I graduated from High School. I am a government licensed pilot and hold instructor ratings on Parachutes, Instruments, and Civil Air Regulations, am a charter member of the Amateur Microscopists of America Society and a member of the Delaware Vocational Teachers Association. Was a member of the Delaware Wing of the Civil Air Patrol in the early days of the war.

Sincerely,
Thomas A. Smith

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