NATIONAL RADIO NEWS

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Patenting an Invention

Alumni Association News

APR.-MAY 1939

VOL. 8 No. 8

JOT IT DOWN

Every man is ambitious. Every man wants to develop his mind. The great trouble with most of us is that we study hard but we do not do it systematically. We do not pause often enough or long enough in our reading to affix impressions upon our minds. We rely too much upon memory instead of stopping occasionally to make notes.

Robert Louis Stevenson carried two books with him always—one to read and the other to write in.

Keep a note-book. Jot down in it each idea, each thought you want to retain. The mere act of making a note tends to fix the thought permanently on our minds. Writing clarifies thinking and aids in concentrating on a subject.

Learning is essentially a process of transferring to the mind that which you read. But no mind can fully absorb everything in a text-book even when read several times in the ordinary manner. To read a text-book is one thing; to study a text-book is something entirely different. Each passage has one or more important facts; locate these, and jot them down in condensed form in your note-book. The act of condensing an idea into a few of your own words, then writing these words will invariably fix the idea in your own mind, there to stay for all time.

Memory is fickle—never rely entirely upon it for the preservation of important ideas. Try writing out things you want to remember; try this for a while, and see how much easier it becomes to master what you read.

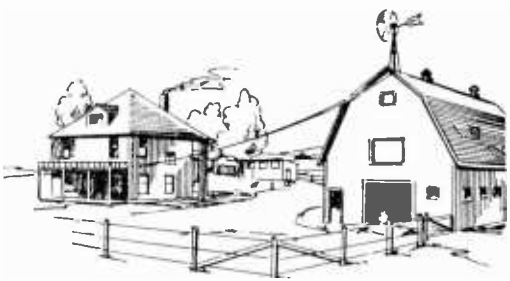
J. E. Smith, President.

Installing and Servicing 6-Volt Wind-Driven Battery Chargers

By L. J. MARKUS

Technical Editor

RADIO receivers which depend upon a 6-volt storage battery for all power requirements or at least for filament requirements are widely used in rural areas in this country. Wind-driven battery chargers for keeping the storage battery charged at all times are becoming increasingly more popular in these installations. The initial cost of a wind-driven charging system is ordinarily less than half the cost of an equivalent gas engine-driven charging generator, and there is practically no operating cost when the power is obtained from the wind.



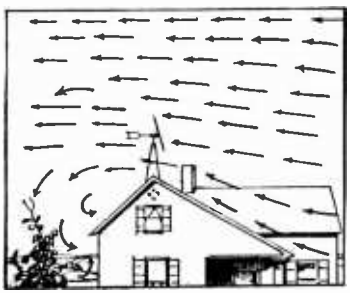
Six-volt wind-operated systems usually consist of a 2-blade wood propeller mounted directly on the shaft of a direct current generator, a vane or tail attached to the generator frame to keep the propeller facing into the wind when in use, a governor which prevents the propeller from reaching an excessive speed during high winds or storms, a tower which supports the generator high enough so the propeller will receive the full force of the wind, and a control panel which prevents the storage battery from discharging into the generator and at the same time indicates when the generator is charging.

The face of the propeller (the side which faces into the wind) is essentially flat and is inclined at an angle so that the propeller will revolve when the wind strikes it. The inclined face of the propeller is necessary only for starting purposes, however. When the propeller picks up speed, the air foil (the back side of the blade) is creating practically all of the power. The high speed and power which can be obtained from a properly designed propeller is due to the partial vacuum which is created on the curved back portion of the blades. This vacuum literally pulls the propeller around, acting in the same way as the vacuum formed on the curved upper surfaces of airplane wings. The propeller will ordinarily revolve at wind velocities of three to four miles per hour, but the generator will not begin charging the battery until a considerably higher velocity is reached.

Various types of governors are used to keep the speed of the propeller essentially constant once the maximum charging rate of the generator is reached. In one system the governor tilts the entire propeller and generator assembly upward at an angle which "spills" the excess wind off the blades, while in another system auxiliary governor flaps are used to spill the air away from the propeller and prevent excessive speed in high winds.

A wind-driven generator should always be provided with a manually-operated brake or with a mechanism for locking the propeller at right angles to the wind when not in use. The control wire for actuating the locking mechanism will run from the top of the tower to a convenient point on the ground.

A battery designed especially for radio use and rated at between 160 and 300 ampere hours will give far better performance than an ordinary automotive storage battery in any wind-driven installation. The size of the battery is particularly important when one or more lights are to be operated from it in addition to a radio set. In general, the battery employed should have sufficient reserve storage capacity to carry



Courtesy Wincharger Corp.

FIG. 1. A good wind charger installation on a home. The wind will act on the propeller with full force from all directions.

the normal load for a period of ten days, since there may be periods of calm or low wind which last this long in some localities.

In estimating drain, always figure on the basis of using not more than 75% of the rated capacity of the battery, for a battery should never be completely discharged. Estimate the normal drain on a battery in amperes, then estimate the number of hours during which the battery will carry this load during a ten-day period. Multiplying these two figures together will give you the total ampere-hour reserve capacity required in the battery. Multiply this computed value by 1.25 to get the required battery size. If this exceeds the capacity of a single battery, you can use two or possibly three 6-volt batteries connected together in parallel.

Choosing the Location. Since the wind is the only source of energy in a wind-driven battery-charging system, it is obvious that the generator must be mounted in a location where it will have the full sweep of the wind from all directions. Wind cannot be seen, for it is simply air in motion, seeking to equalize differences in atmospheric pressure at various points on the earth. For this reason your choice of a location must be based upon certain general rules derived from past experience with wind power plants.

Obstacles such as trees or buildings not only divert the wind and slow it down, but also cause eddies which may extend many feet in all directions around an obstacle. There are four fundamental rules which must be observed if maximum energy is to be obtained from the wind with any wind generator system:

1. The propeller should be at least 15 feet higher than any wind obstruction within 400 feet.

2. The propeller should be at least 800 feet away from groves of trees or other obstructions which are higher than the propeller.

3. The propeller should be at least 25 feet above the ground even in an open location, except possibly when the location is a high, windswept pasture hilltop.

4. The distance between the generator and the battery must not be more than 200 feet.

If a system is installed or inspected during winter, when trees are bare, remember that in the summer these trees will have full foliage and will form a wind-break. It is false economy to use too low a tower for the generator, for an additional 20 feet of height may double the generator output. "The higher the tower, the greater the power" is a slogan well worth remembering.

Excessive resistance in the two-wire line connecting a generator to a battery can cause line losses which prevent satisfactory operation of a 6-volt wind-driven charger. At distances greater

Courtesy Wincharger Corp.

FIG. 2. A typical farm home surrounded by trees. A low propeller location as at A is useless, for the main air stream passes above the propeller and produces a turbulence all around it. A 1¼" diameter pipe added to the short tower and supported by guy wires as at B gets the propeller into the main air stream, giving a 100% effective installation. A separate tower near the house, as at C, gives equally good results.

than 200 feet the size of wire required for delivery of full charging current to the battery becomes so large that its cost becomes prohibitive. When no suitable generator location is

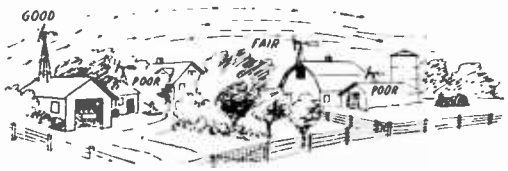
available within this distance of the battery, place the generator at the best possible location and use two batteries, one for the radio and the other for the generator. Thus one battery can be charged up while the other is operating the radio, and the batteries can be interchanged at regular intervals such as once a week. The extra battery cost will be offset by the saving in wire and the longer life of the batteries. If the generator is located near a barn, a light in the barn can be operated from the battery being charged.

Rooftops of homes are ideal locations for wind chargers, provided there are no high trees in the immediate vicinity. A good installation of this type is shown in Fig. *1*. Satisfactory results are obtained here with a fairly low and inexpensive tower. The length of the line to the battery is less than 50 feet, keeping line loss at a minimum and permitting the use of relatively low-cost No. 8 B & S gauge wire. When tall trees are near the house, an extension pipe can be added to the tower to get the propeller up into the main air stream, as indicated in Fig. *2*, or a separate tower designed especially for wind generator units can be employed.

Barns or other farm buildings not over 200 feet away from the radio battery are also satisfactory locations. The height of the tower used will depend upon the nearness to obstructions, as indicated in Fig. *3*.

Mounting the Tower. Practically all wind charger units come with a 10-foot high steel tower. When this is to be mounted on an ordinary gable roof covered with wood shingles or roofing paper, use the mounting scheme shown in Fig. *4A*. The bolts should go through good solid lumber, and both plate washers and lock washers should be used under the nuts at the lower ends. The tower should be perfectly vertical. Check this with a plumb line attached to the top of the tower; the plumb bob should touch the roof at a point equi-distant from all four tower legs. Rubber cushions made of old inner tubes or rubber heels can be placed under each tower foot to prevent transmission of propeller vibrations to the building. Apply roofing cement to the holes before inserting the bolts if there is a possibility of water leaking in.

When a tower is to be mounted on a slate roof where drilling of holes is impractical, make two



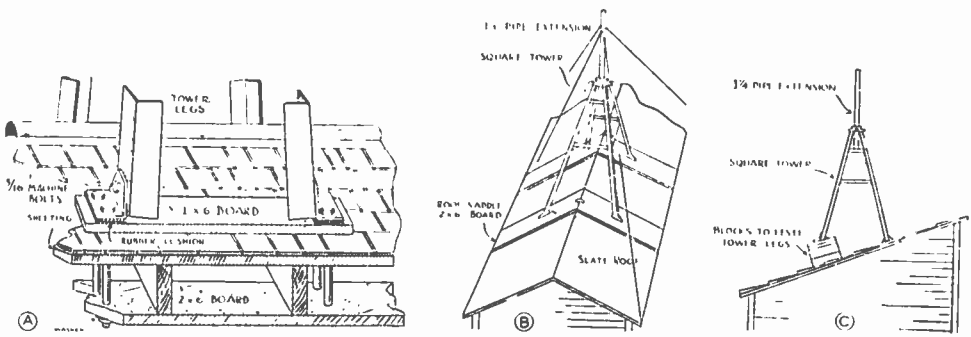
Courtesy Parris-Dunn Corp.

FIG. 3. Examples of poor, fair and good wind charger installations on outbuildings of a typical farm. Arrows indicate the path of the wind as it is deflected upward over the buildings and trees.

wood saddles like those shown in Fig. *4B*, using strap hinges or iron strips to hold the saddle boards together at the peak. Bolt the tower feet to these saddle boards after countersinking the holes so bolt heads will not rest on the fragile slate shingles, then anchor the guy wires to the edges of the roof. These guy wires will exert sufficient downward pressure to hold the tower securely in position.

Pieces of wood fastened together with long bolts can be used to block up two legs of the tower when mounting on a slanting or shed-type roof; this arrangement is shown in Fig. *4C*.

The effective height of the tower can be increased to 20 or 25 feet by removing the 1¼"-diameter, 12" long mounting pipe supplied with the unit, and replacing with a 10 or 15-foot long pipe of the same diameter. This extension pipe should



Courtesy Wincharger Corp.

FIG. 4. Methods of mounting a wind charger tower on an ordinary shingled gable roof, on a slate-shingled gable roof and on a slanting roof.

be supported by guy wires anchored to a point 3 feet below its top; a ¼"-diameter bolt through the pipe at this point will prevent the guy wires from slipping down the pipe.

Always ground the steel tower for protection against lightning. Use No. 4 copper wire, running it from a tower mounting bolt to a metal rod or pipe driven about ten feet into the ground.

Propeller Mounting. The method of mounting the generator and associated parts on the tower will vary with different makes of wind chargers.

FIG. 5. Check propeller tracking by measuring from each tip in turn to the tower, using a yardstick as shown here. The two distances must be equal, for otherwise the propeller would vibrate excessively.

Courtesy Parris-Dunn Corp.

Since detailed instructions for this part of the installation procedure are always supplied with a particular unit, we can pass on to the highly-important propeller adjustments. The propeller is generally attached to its hub with two bolts. Be sure that the flat surface of the propeller faces forward (faces the wind). Important: Always use a safety belt of some kind when working on a tower, as a precaution in case you should slip or lose your balance, and to eliminate the need for holding on with one hand while pulling up the generator.

The propeller must "track" properly if vibration is to be avoided. This means that both tips of the propeller must travel in the same path. To check tracking, measure the distance between one propeller tip and the tower, as indicated in Fig. 5, then turn the propeller half a revolution and make this same measurement for the other tip. If the two distances are not equal, loosen slightly the bolt on that half of the propeller which is closest to the tower, and tighten the other hub bolt. If this does not give sufficient correction, loosen both bolts and insert a broad tin shim across the entire width of the propeller on the side which is closest to the tower, then repeat the tightening process.

Vibration can also be caused by an out-of-balance propeller. Although each propeller is carefully balanced by the manufacturer, adverse atmospheric conditions can warp it or alter the balance enough to cause noticeable vibration. The balance can be checked by placing the exact center of the propeller on a knife edge or a three-cornered file; if it does not balance, get a small wood screw and move it outward on the light side until you locate the point at which it will restore balance. Insert the screw permanently at that point, being careful not to split the propeller. Several small brads may be used at the tip of the propeller in place of a wood screw, or a piece of thin metal of the proper weight can be attached to the flat face of the light-weight side near the hub.

Location of Control Panel and Battery. As a general rule, the 6-volt storage battery should be located as close as possible to the radio receiver, preferably in the same cabinet. If this is not possible or desirable, the battery may be placed in the basement directly below the receiver location, and connected to it with No. 6 or No. 4 B&S gauge wire (smaller wire would seriously affect operation of the radio set). The control panel can be mounted at a convenient location within a few feet of the battery or the receiver.

Wiring. Only heavy-duty weatherproof insulated copper wire should be used for the two-wire line which connects the generator to the battery. The correct sizes of wire to use for various distances between generator and battery are given in the following table:

Distance	Wire Size
Less than 50 ft.	No. 8 B&S Gauge
50 to 100 ft.	No. 6 B&S Gauge
100 to 200 ft.	No. 4 B&S Gauge

Standard porcelain strain insulators such as are used for regular outdoor power lines should be employed to support the wires at the generator location, at the house, and at intermediate points where the wire passes buildings, poles or trees. Ordinary porcelain nail knobs can be used to support the wires along the side of the house. The wires can be brought into the house through a basement window frame or a first floor window frame. Run the wires through two porcelain wall tubes which are slanted upward from the outside so rain cannot enter, just as when bringing an antenna transmission line into a building.

The basic circuit for a wind charger system is given in Fig. 6. The generator is designed especially for wind electric service, and employs an adjustable "third brush" like that used in automotive generators to maintain the output voltage essentially constant at varying speeds and to protect the generator windings from burning out at high speeds.

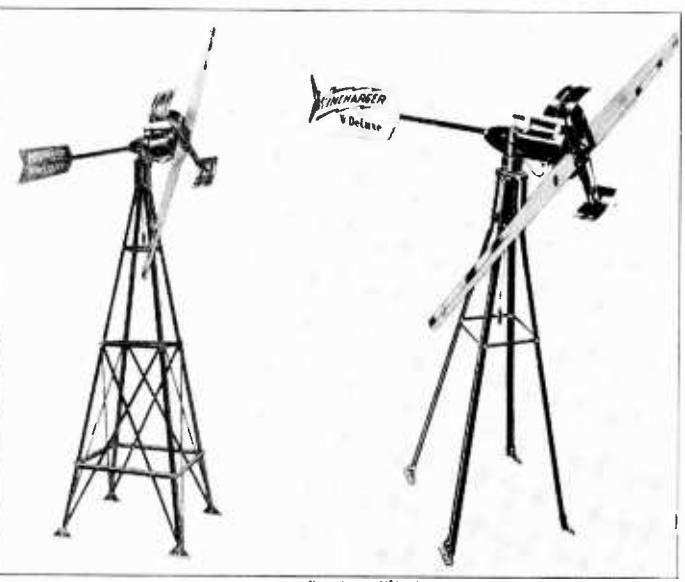
The large vane on a wind charger unit serves to rotate the entire assembly when the direction of the wind changes, in order to keep the pro-

peller facing into the wind at all times. A collector ring and brush arrangement directly beneath the generator provides electrical connections between the two line wires and the two generator terminals without interfering with this rotation of the generator assembly. When connecting a wire to a terminal in a wind charger system, first clean the insulation thoroughly from the end of the wire, then bend the bare wire into a loop which will fit over the terminal post. If working with No. 4 or thicker wire it may be more convenient to flatten the end of the wire by hammering, then drill in it a hole the size of the terminal post. Never attempt to bend this heavy copper wire around a terminal post, for this may result in bending of the post or damage to the insulation around the terminal.

The control panel ordinarily contains only two devices, an inexpensive ammeter which serves primarily to indicate *when* the battery is being charged, and a relay which prevents the battery from discharging into the generator during periods of low wind and calm when the generator voltage is less than the battery voltage. Observe that the relay coil is connected directly across the two line wires. During low winds the relay remains open and there is no closed circuit through the ammeter to the battery. With the average wind generator system, the generator will produce enough current to close this relay when the wind velocity is more than about 7 miles per hour, so that the propeller is rotating at approximately 350 revolutions per minute. When this speed is reached, the relay contacts

Courtesy Parris-Dunn Corp., Clarinda, Iowa.

Typical installation of Parris-Dunn Hy-Tower 6-volt charger on a shingled gable roof. This unit begins charging at a speed of approximately 350 r.p.m., corresponding to a wind velocity of about 7 miles per hour. Governor action tilts the entire generator upward when wind velocity becomes excessive, "spilling" the wind off the propeller blades and thereby keeping the generator speed essentially constant once maximum output current is reached. The installation and repair of wind generator units like this is a simple matter for any Radiotrician, as installation instructions are furnished with each unit. No special tools are needed.



Courtesy Wincharger Corp., Sioux City, Iowa.

Left: Heavy-duty 6-volt Wincharger with 10-foot self-supporting tower and 7½-foot diameter propeller. This direct-drive unit is rated to deliver a full 25 amperes in a wind velocity of 19 miles per hour or higher (this is claimed to be the highest top output of any 6-volt charger on the market). Charging begins at a speed of 250 r.p.m., corresponding to a 5½-mile breeze. Up to eighteen 25-watt lights can be installed along with the radio if good batteries are used with this heavy-duty unit.

Right: Model '39 6-volt Wincharger with 5-foot self-supporting tower. The 6-foot propeller is mounted directly on the propeller shaft. Charging begins in a 7½-mile breeze, as indicated on the graph in this article. The Wincharger units are equipped with double grease-sealed ball bearings, making it unnecessary to oil the generator bearings for the entire life of the generator. The turntable shaft should be greased if the charger fails to respond readily to changes in wind direction. A few drops of light oil should be placed on the pin joints of the governor flaps if the flaps do not respond readily to changes in wind velocity.

close, and the generator begins charging the battery. The approximate value of the charging current will be indicated by the ammeter on the control panel.

Two-volt radio storage batteries can be charged with a 6-volt wind generator system by employing a special control panel having a 2-volt relay and sometimes a current-limiting resistor.

Connections to the battery and to the radio set must of course be made with proper polarity. Two or more batteries may be charged at the same time if connected in parallel with the first battery, as indicated by the dotted lines in Fig. 6. Special care is required in making connections to the battery terminals, for low-resistance joints at this point will permit higher charging rates.

CAUTION: Never allow a wind generator unit to operate without a battery connected to its circuit unless you first short together the line wires either at the generator or at the control panel. If a shorting switch is installed at the control panel for this purpose, it will not be necessary to go outside and set the brake on the wind charger each time you want to disconnect the battery.

Checking Connections. After checking all connections in your system carefully, release the brake on the wind generator, then short-circuit the relay contacts on the control panel with a short length of copper wire. This serves to connect together the two positive terminals on the panel. The generator is now connected directly across the battery, and will act as a motor if you have wired up the system properly. The propeller will revolve, and the ammeter will show a discharge of somewhere between 4 and 8 amperes. A discharge of about 12 amperes might indicate that the brake was set; a higher discharge would mean a short somewhere in the system. This test must naturally be made at a time when there is not much wind, with a battery which is at least partially charged.

Servicing Hints. A wind generator cannot be expected to show the same high and constant charging rate on the ammeter as you are accustomed to see on the ammeter in an automobile. An automobile generator has the engine as a liberal source of energy, whereas the generator in a wind-charging system derives its entire energy from the wind. This energy is not constant because wind velocity is variable; when the speed of the propeller varies, the charging rate of the generator must also vary. If the wind velocity never dropped below 7 miles per hour, the ammeter would always show a charging rate of at least 1 ampere. Unfortunately, wind velocity may be considerably less than this for long periods of time. During these periods of low winds, the ammeter will indicate zero and the generator will not charge the battery, even though the propeller is revolving at what may seem to be a fair rate of speed.

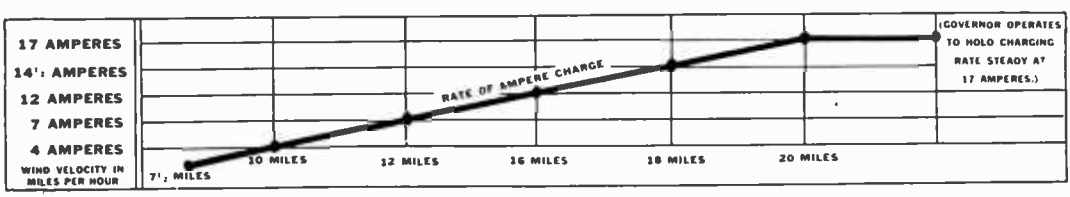
The alert Radiotrician who is located near a farm area can boost his income considerably by servicing wind generator systems. The complaints which you will encounter are relatively few, and the remedies for each are invariably quite simple.

Service procedures for some of the more common complaints will be given in this article; the servicing techniques for other defects will invariably be obvious to the man who understands the general operating principles of these systems.

Contrary to popular belief, the generator is the very last place to look for trouble in a commercial wind generator installation. Do not tamper with the generator until you have checked all other possible causes of the observed trouble.

Generator Will Not Keep Battery Charged. This is perhaps the most common complaint which you will encounter. It can be due to a number of different reasons. First of all, the propeller may not be in a location where it secures the full sweep of the wind.

Check carefully to make sure that the installation complies with the rules set forth in the beginning of this article. Remember also that during summer months there are often periods of calm lasting for several weeks, during which the wind will not reach the minimum charging speed of about 7 miles per hour. Simply explain this condition to your customer and suggest that he plan to have the battery charged at a battery service shop or use the radio less than usual during these periods of calm.



Charging rate in amperes at various wind velocities for model '39 6-volt Wincharger, made by the Wincharger Corporation, Sioux City, Iowa. Note that charging begins in this unit at a wind velocity of 7½ miles per hour.

To check for a defective relay, watch the ammeter as the wind increases to charging speed and the relay first closes. If the ammeter jumps to a reading of 1 to 2 amperes when the relay "cuts in," the relay is okay. If the generator has sufficient speed when the relay cuts in that the ammeter jumps immediately to 5 or more amperes, the relay is not functioning properly and should be replaced. A condition like this would raise the minimum wind velocity at which

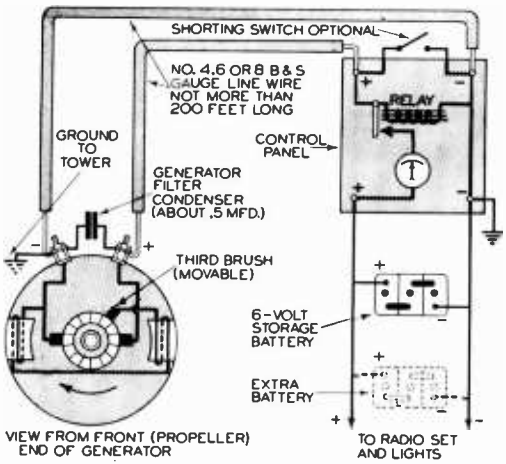


FIG. 6. Basic circuit diagram for a wind-driven battery-charging system.

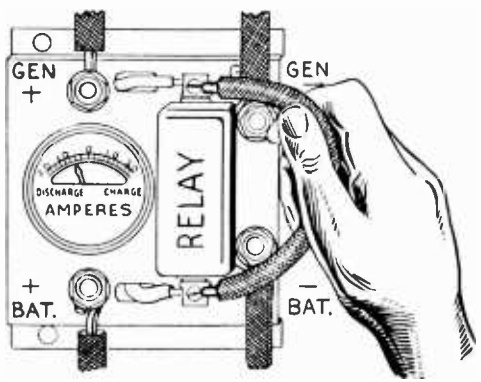
charging began and might result in a run-down battery.

If the relay vibrates when the charger is running, it may be possible that you have depolarized the generator by connecting the battery up backwards. To remedy this, simply short together the relay contacts for a few minutes, allowing the generator to operate as a motor. The relay contacts are ordinarily connected to large terminals at the top and bottom of the relay, making it easy to connect the contacts together with a short length of wire in the manner indicated in Fig. 7.

If you did not make the original installation, check the size and length of the line wires to be sure they meet the requirements as set forth in this article. Check all connections in the system carefully, for a single high-resistance connection may reduce the generator current to the point where it can no longer keep the battery charged. Be sure that all joints in the wires are soldered and carefully taped.

If there is any doubt as to whether the batteries will take and hold a charge, check their condition by a short circuit test and a hydrometer test, or have them checked by a competent battery man. Be sure that the original ampere-hour capacity of the battery is adequate for the service demanded of it. If more than one battery is being used, and a heavy drain is placed on the batteries, it is possible that more energy is being taken out of the batteries than can be provided by the wind generator system under the prevailing wind conditions. The solution in this case is obviously a change which will secure more power from the wind under prevailing wind conditions. Sometimes this can be accomplished by increasing the height of the propeller or by moving it to a more favorable location. In extreme cases it may be necessary to install a larger generator and larger propeller if the customer requires more power than can be provided by the existing unit.

Remember that each 15-watt bulb draws about 2½ amperes from the battery, which is the same as that drawn by the average 6-volt farm radio. A system designed primarily to provide power for a radio cannot be expected to operate a large number of lights in addition. If the customer desires to light his entire farm, recommend the installation of a conventional 32-volt storage battery with a wind generator system of corresponding voltage rating.



Courtesy Parris-Dunn Corp.

FIG. 7. Shorting the relay terminals in this manner shorts the contacts and makes the generator operate as a motor. This gives a check on the correctness of connections and also serves to polarize the generator correctly after an accidental reversal of battery connections.

The battery should be checked with a hydrometer about once a week. A battery should never be allowed to become completely discharged. Corrosion which normally forms on the

positive terminal of the battery can be partly eliminated by covering the battery post and clips with vaseline, after first cleaning off the corroded material by sprinkling ordinary baking soda over it, then pouring a small amount of water on the soda.

Fluctuating Charge. The charging rate as indicated by the ammeter will naturally rise and fall with the wind velocity. When the needle vibrates rapidly, however, the trouble will very likely be a dirty commutator on the generator. Wipe the commutator with a cloth soaked in gasoline, then hold a piece of No. 00 sandpaper against the commutator and turn the armature until the copper is clean and bright. Never use emery cloth or emery paper for this purpose.

A defective armature coil will also cause a fluctuating charging rate. A defective coil is most often due to operating the generator without a load connected to it; under this condition a high voltage builds up, causing breakdown between an armature coil and the generator frame. Replacement of the armature with a new unit obtained from the factory is the best procedure in this case, but it is a good idea to have the armature tested by a reliable generator service shop first to make sure that you have analyzed the trouble correctly.

Generator Causes Radio Interference. Both the relay and the generator in a wind charger system may at times cause radio interference. The relay noise will, of course, be heard only at such times as the relay opens or closes, and can be detected by listening to the radio and relay at the same time. A .5 mfd. paper condenser in series with a 10 to 20-ohm resistor across the relay contacts will invariably cure the trouble. If the relay contacts become pitted due to excessive arcing, it is best to replace the relay; a new unit can usually be obtained from the manufacturer for less than a dollar.

Generator noise is readily indentified since it increases and decreases in frequency as the propeller speed varies. It may be due to arcing at the generator brushes; this can invariably be cured by cleaning the commutator. Arcing may also be due to the third brush being set too far ahead (in the direction of rotation). The proper position for the third brush is specified in the instruction manual accompanying each system, and is ordinarily between 1 and 1½ commutator segments away from the nearest fixed brush. The generator will burn out if this movable brush is set closer than this to the fixed brush. Improperly seated brushes can also cause arcing; in this case place a strip of No. 00 sandpaper around the commutator with the cutting surface up, then rock the armature by hand while the brushes are resting on the sandpaper. This will make the brushes conform to the curved shape of the commutator. Radio interference can often be cleared up by improving the ground connection to the tower and to the instrument panel. Use No. 4 or larger copper wire connected to a rod or pipe driven at least 10 feet into the ground. Interference may also occur if the antenna wire of the radio is running parallel to the generator line wires; for minimum noise, the antenna should run at right angles to the line wires.

Excessive Vibration. This complaint is ordinarily made only when the wind generator tower is mounted on the roof of the house. Check the balance of the propeller first and make what corrections are necessary, then remount the propeller and check tracking. Inspect the rubber cushions under each tower leg, and replace them if the rubber has hardened or deteriorated.

The propeller should never be allowed to run during rain, snow, sleet, sand or dust storms, or when ice is forming on it. At a speed of 1000 r.p.m., the propeller tips are traveling at well over 200 miles per hour. Any solid objects which hit the propeller at this speed will quickly destroy it.

Short Circuits. Short circuits between the positive and negative wires in a wind charger system can occur at a number of different points. If the line wires are taped to the tower, examine the positive wire carefully to see if insulation is worn from it at any point. Check the radio condenser which is connected across the generator terminal, by operating the charger with this condenser disconnected. If no difference in the operation is noted, the condenser is undoubtedly okay and can be replaced. A short circuit may occur if the cover band of the generator touches either or both of the generator terminals, if the collector ring comes loose and touches a terminal, if wires are improperly attached to the terminals on the control panel, or if the positive wire at the radio set accidently becomes grounded. An open circuit will occur if the relay contacts become stuck in an open position, or if one of the collector ring brushes fails to make contact with the brass ring. Other opens and shorts in a system can be located by inspection or with an ohmmeter.

Radio Interference. A certain amount of interference noise will always be present when the radio is tuned to a short-wave band and the generator is operating. Setting the brake to prevent generator operation while listening to short-wave broadcasts is the simplest solution. With some systems, a short-wave switch can be provided at the control panel to prevent the generator from producing current; this method involves changing connections at the generator and running an extra wire from the generator to the control panel.

The Laboratory Page

By GEORGE J. ROHRICH, Engineer in Charge N. R. I. Laboratory

EXPERIMENT NO. 66

Object: To study the properties of transformers.

Apparatus Required: 0-5 milliammeter (Item No. 1); Headphone (Item 2); 0-50 voltmeter (Item 12); 10,000 ohm potentiometer (Item 13); two test prods (Item 8); 45-volt battery; audio transformer (Item 24).

Apparatus Assembly: Connect the parts as shown in Fig. 102. Notice that the *black test prod* will be used first by attaching it to terminal *B* for the first twenty-seven procedures, then changed to terminal *G* when directed later.

For the purpose of simple identification of all terminals in the circuits mark them as follows:

Let A be the point of the red test prod;
" B " " manufacturers mark on transformer;
" C " " minus terminal of Item 12;
" D " " plus terminal of Item 12;
" E " " plus terminal of 45 volt battery;
" F " " manufacturers mark on transformer;
" G " " manufacturers mark on transformer;
" H " " plus terminal of Item 1;
" I " " minus terminal of Item 1;
" J " " "point of black prod" when used at B;
" K " " "point of black prod" when used at G;
" P " " manufacturers mark on transformer;
" Q " " minus terminal of 45 volt battery.

Procedures and Observations: 1. Set the potentiometer dial to any value desired, then hold terminal *A* on terminal *B*. 2. Notice what happens to the needle of Item 1 when *B* is *first* contacted with *A*. You will note a momentary *upscale* deflection. 3. Note what happens to the needle of Item 1 when *A* is *steadily held* on *B*. There is no deflection this meter, in spite of the fact that Item 12 shows current is flowing in the primary. 4. Note what happens when *A* is *removed* from B. There is a momentary *downscale* deflection of the needle on Item 1. 5. Compare your observations in Procedures 2, 3 and 4 with the explanation in the "Theory of Action" in Experiment No. 7 in Outfit 1BA-1. You will find your observations agree with the explanations, showing that an induced voltage is produced only when the current in the primary winding is increasing or decreasing. There is no induced voltage when the current in the primary is steady, because then the magnetic field around this coil is maximum and constant.

6. Listen for clicks in the headphone while repeating Procedures 1, 2, 3 and 4. Notice that the use of the headphone lets you determine also when current does and does not flow from the transformer coil *F* and *G*, by producing clicks when changes of current occur in Procedures No. 2 and No. 4.

7. Repeat Procedure No. 3. Does Item No. 12 show that current is taken from the battery? Yes.

8. Hold *A* on *P* or *Q*. 9. In this procedure No. 8 is current taken from the battery? Yes, because Item 12 deflects steadily. 10. Is this current in Observation No. 9 greater than that registered in No. 3? Yes, because the resistance of the primary winding is not included.

11. Did the needle of Item No. 1 show a deflection when *A* was first contacted in Procedure 8? No. the needle does not deflect, leading us to conclude there is no induction and, therefore, no

(Page 12, please)

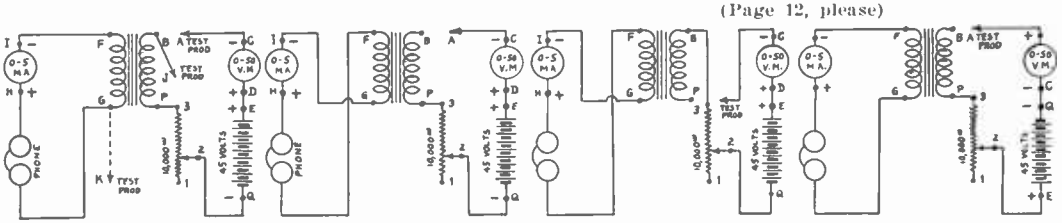


FIGURE 102 FIGURE 103 FIGURE 104 FIGURE 105

The Laboratory Page (Continued from page 11)

current in the primary in this procedure.

12. Could you hear a click in the phone in Procedure No. 8? For practical purposes the average person would say no click is heard, again showing there is no induction. However, some persons with extremely keen hearing can sometimes detect a very faint click, thus showing there are extremely small surges of electrons between *B* and *P*, this wiring acting as a capacity for storing or discharging the electrons during contact with *A*. Those persons who do make this observation can properly conclude that the phone is an extremely sensitive current indicator, many times more sensitive than any milliammeter.

13. Remove A from *P* or *Q*. Did the needle of Item 1 deflect now? No, again letting us conclude that for practical purposes there was no noticeable change of current in the primary.

14. Could you hear a click in Procedure 13? Conditions here are identical with Observation No. 12. For practical purposes no click is heard. However, some persons may say yes. This observation is called to your attention here to acquaint you with the fact that changes in current *outside of a transformer winding* sometimes may cause induction where ordinarily we do not expect it, becoming objectionable in some cases where the original spurious induction is amplified in succeeding stages, unless filtered out at the source with chokes and condensers.

15. Touch *A* to *F*, *G*, *H*, or *I*. 16. Does Item No. 12 show that current is taken from the battery? No, there is no current, therefore, no circuit exists.

17. Does a comparison of Procedure 16 with Procedure 2 convince you there are *two* electrical circuits, each independent from each other until *induction* sets in while currents are changing? Your observations will convince you these conditions exist.

18. Hold *J* on *F*, *G*, *H* or *I*. 19. During this time repeat each and every procedure from No. 1 to No. 17 inclusively. 20. During any of these observations in No. 19 were there any differences when including or omitting No. 18? You are certain to arrive at the proper conclusions that a *single* extra connection from one circuit into *any point* in another circuit has no effect in changing the actions. This observation is quite important because it permits us to join one circuit with another with convenient common connections like those made to a metal chassis, without interfering with the independent actions going on in independent circuits.

21. In Fig. 102 rotate the potentiometer dial to zero. Note that this includes the greatest amount of potentiometer resistance in the primary circuit, with a corresponding low reading of current registered on Item No. 12.

22. Attach A to B permanently. Now rotate the potentiometer dial from zero toward 100, steadily as well as unsteadily with periods of waiting, but always in the clockwise direction. Observe the deflections on the scales of Item 1 as well as Item 12. You will note that these clockwise rotations of the dial will cause *increases of current* in the primary. Whenever there are increases of current in the primary of Fig. 102 there will be upscale deflections on the scale of Item No. 1, indicating that the polarity of induction from increases of current is always in the same direction.

23. Rotate the potentiometer dial now in a counter-clockwise direction. Now note that whenever there are decreases of current in the primary, there will be downscale deflections on the scale of Item No. 1, indicating that the polarity of induction from decreases of current is in the same direction.

24. In Procedure 22 note there is never a down-scale deflection. Careful observation of Item 12 will reveal there is no down-scale reading at any time, therefore, no decreases of current in Procedure 22 at any time, thus completely convincing us now that the polarity of induction from increases of current is always in the same direction.

25. In Procedure No. 23 note there is never an upscale deflection. Therefore, we can be convinced that all decreases of current in the primary winding will produce the same polarity.

26. Comparison of Procedures No. 2 with No. 22 will show these are in agreement with each other.

27. Comparison of Procedures No. 4 with No. 23 will show these also agree with each other.

28. Remove the black test prod entirely from *B*.

29. Attach the black test prod to terminal *G* as shown by the dotted symbol in Fig. 102, now identifying it as "Terminal *K*."

30. Hold *K* on *A*, *B*, *C*, *D*, *E*, *Q*, or *P*. 31. While carrying out Procedure No. 30, again repeat Procedures No. 1 to No. 17 inclusive and also repeat Procedures No. 22 to 27 inclusive. 32. While doing Procedure No. 31 compare your results with Observation No. 20 and arrive at the same conclusion that any point in one circuit can be joined to any point in another without affecting the results.

33. While conducting Procedures 22 and 23 listen to the sounds produced in the headphone. You will note that there is an *absence* of *sharp clicks* like that obtained in Procedure No. 6. This shows us that *gradual* changes of current produce little or no sound. Those persons with keen hearing may detect a very faint hissing noise when the dial is rotated. This is due to comparatively sudden changes in current, resulting when the movable contact arm No. 2 on the potentiometer moves from one wire to the other along the resistance strip.

34. Connect the parts shown in Fig. 103.

35. Repeat each one of the procedures described for Fig. 102. Note that the observations are identical except that the deflections on Item 1 are in the reverse order. You have simply reversed the polarity of the meter and this lets you see that those deflections in a down-scale direction are of equal magnitude as those with an upscale deflection.

36. Similar experiments with Figs. 104 and 105 will show that reversing the current in the primary only reverses the polarities of induction.

RADIO-TRICIAN
REG. U. S. PAT. OFF.
Service Sheet
Compiled Solely for Students and Graduates
NATIONAL RADIO INSTITUTE, WASHINGTON, D.C.

RCA MODEL 94BT6

Precautionary Lead Dress

1. Leads on C16 and C20, and lead from R16 to terminal board, must be short. C22 and C4 are soldered direct (no leads).

2. Dress L10 away from chassis. Dress T1 secondary leads (brown and green) away from base and free of other leads (same applies to R17 and C27). Dress T1 secondary midtap (brown-black) free of other leads and close to chassis.

3. Maintain original ground points.

4. Antenna and ground leads 36 inches long, twisted, and arranged as shown in top view.

5. I.F. plate lead (blue) dressed close to and along edge of chassis.

Battery Charger Connections. The positive side of the 6-volt "A" circuit is connected to the receiver chassis, and the chassis is normally grounded. If the charger has a ground on the negative side, the ground should be removed, or changed to the positive side.

Do not change the length of leads from the receiver to the battery.

Alignment Procedure

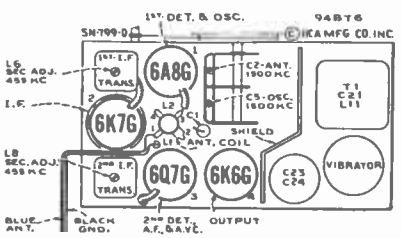
Cathode-ray Alignment is the preferable method. Connections for the oscillograph are shown in the chassis drawing.

Output Meter Alignment. If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-oscillator. For all alignment operations, connect the low side of the test-oscillator to the receiver chassis, and keep the output as low as possible to avoid a.v.c. action.

Presetting Dial. With gang condenser in full mesh, the pointer should be horizontal.

Resealing I.F. Adjustment Screws. After completion of alignment, seal the I.F. magnetite-core adjustment screws with a few drops of household cement.

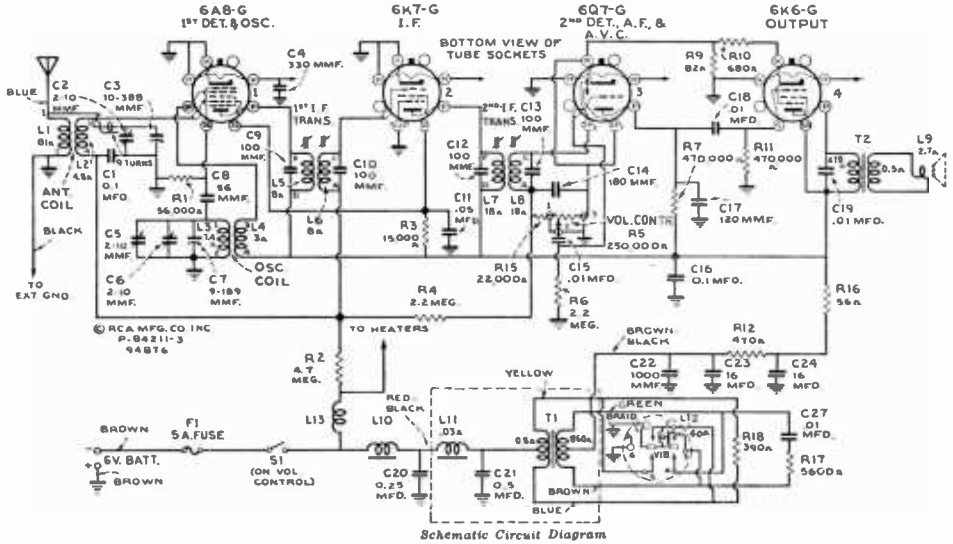


Radiotron and Trimmer Locations

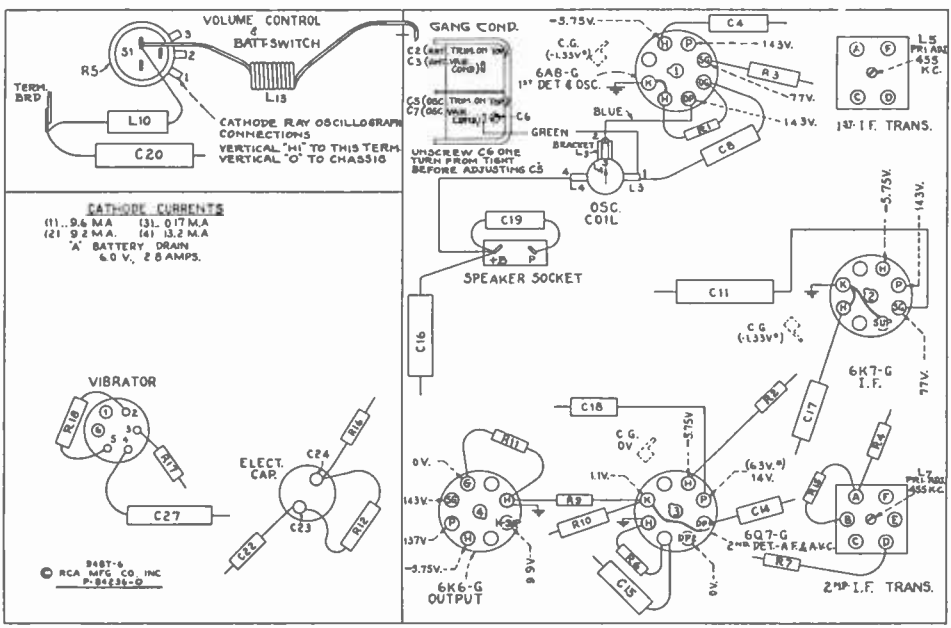
Alignment Table

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output
No. 1	6K7-G I.-F. grid cap, in series with .001 mfd.	455 kc.	Quiet point between 550-750 kc.	L7 and L8 (2nd I.-F. transformer)
No. 2	6A8-G 1st-det. grid cap, in series with .001 mfd.	455 kc.		L5 and L6 (first I.-F. transformer)
No. 3	Antenna lead, in series with 200 mmfd.	1,500 kc.	1,500 kc.	C5* (oscillator) C2 (antenna)

*Adjust C6 on gang condenser to one complete turn from tight, before adjusting C5.



Schematic Circuit Diagram

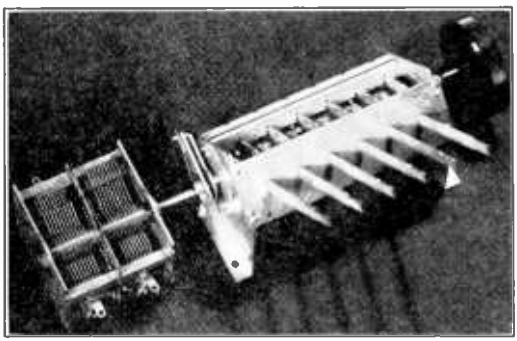


Bottom view—rear of chassis. Radiotron Socket Voltages, and Location of parts

*Note: Values with star (*) are operating voltages. Values not starred are actual measured voltages. Measurements made to chassis unless otherwise indicated. Measurements made with set tuned to quiet point, volume control at minimum.

How a Push-Button Tuner Works

The rack and gear type of direct push mechanical automatic tuning system is unique in that it gives a full 180 degrees of rotation, permitting a direct connection (without step-up gears) to the tuning condenser shaft. Preliminary adjustments are exactly the same as for any other mechanical tuning unit having a single locking screw in the center of the tuning knob. Although the operating principle of this unit is simple, and can be understood easily by examining the actual unit, the construction is such as to make it difficult to use photographs and diagrams alone in showing how the unit works.

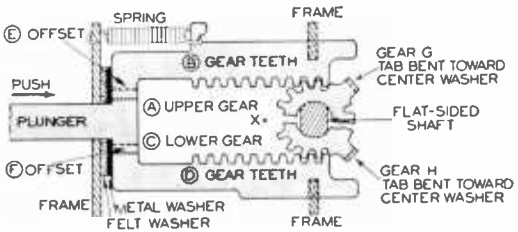


Courtesy Oak Mfg. Co.

Oak push-button tuner coupled directly to the shaft of a two-gang tuning condenser.

The following explanation should clarify any points which are not clear in the accompanying diagram of a single plunger on this tuner. This plunger is like a two-prong fork whose prongs are offset about ¼" by bends at *E* and *F*, with gear teeth on the inside of each prong (at *B* and *D*). The teeth at *B* mesh with the teeth of gear *G*; the teeth at *D* mesh with a similar gear *H*. Both of these gears have small tabs which are bent toward a center washer. Both gears turn freely independent of the shaft; between the gears is a metal center washer (not shown) with a straight projecting tab, held rigidly to the shaft by friction when the locking screw is tight.

Pushing in the button on the end of this plunger moves the plunger to the right, causing the gears to rotate in opposite directions. The gear tabs pass each other; one of them will engage with the straight tab on the central metal disc sooner or later, depending upon the setting of the gang tuning condenser, and will rotate this tab to point *X*; at this time both gear tabs will be pressing against the central tab from opposite sides, holding it rigidly at exactly the same position each time this particular button is pressed. The initial setting of this tab with relation to the gang tuning condenser shaft determines what station will be tuned in.



Simplified sketch of one plunger assembly in the Oak push-button tuner.

To set up a button for a station, the locking screw in the center of the manual tuning knob is loosened, the button is pressed all the way in, and the desired station is tuned in manually as accurately as possible. This process is repeated for each other button. The locking screw is then tightened, completing the adjustments.

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We Are Proud of You Too, Mr. Ebert

"Congratulations on your 25th Silver Anniversary. As a pioneer in a field which is in its own infancy, this is a proud distinction. To have survived in a field which is as important to the youth of the nation, as it is to the welfare of every inhabitant in every corner of the earth, the N. R. I. can truly celebrate. It is no easy matter to grow with a highly technical profession and remain a leader. As a graduate of the N. R. I., and as a Charter member of the Alumni Association, may I extend to you and all your staff my best wishes."

SYLVANUS J. EBERT, Technical Director WSUI, Iowa City, Iowa.

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Philco Star Album Now Ready

A new dealer promotion in the form of a Philco Radio Star Album has been announced by Philco Radio & Television Corporation.

This 16-page book, bound in an attractive two-color cover, pictures and identifies 144 radio celebrities, contains the latest log of long-wave stations and an up-to-date log of principal foreign short-wave stations. It also illustrates and describes Philco Mystery Control.

Patenting an Invention

By ROYAL R. ROMMEL

Editor's Note: Many of our students and graduates are of an inventive mind. Frequently, we receive letters asking for information as to the proper procedure to follow in applying for a patent on an invention. To give our readers authentic information on this subject, the following article was prepared for us by Mr. Royal R. Rommel, of the patent law firm of Lancaster, Allwine and Rommel, Suite 450, 815 Fifteenth Street, N. W., Washington, D. C. Members of this firm have been practicing before the Patent Office and Federal Courts in patent cases for many years.

Anyone interested in securing additional information on the subject of patents, or a copy of the bulletin, "General Information Concerning Patents," and the form "Evidence of Conception" which are mentioned in this article, may write direct to Mr. Rommel at the above address.

The average person, whether he follows a profession, is an artisan, unskilled worker, or business man, has but a vague idea of how to patent an invention, or the worth, value, and nature of a patent.

This article, while rather elementary, will give to the average individual an outline of the nature of a patent right, and how to secure it.

The Nature of a Patent

A patent in the United States is the grant to an inventor, for a period of seventeen years, of a monopoly to exclude all others from making, using and selling his invention. The main object in granting patents is to stimulate invention and the development and progress of the useful arts. To that end the law requires that the inventor fully describe and particularly point out the novelty in the invention so that the public, after expiration of the patent, will know how to make and use the invention.

Patentable Classes of Inventions Under The United States Laws

The laws of the United States designate the following six classes of Inventions and Discoveries as patentable. It is not necessary for an inventor to know or designate under which class his invention falls.

1. An Art:

The term *art* as applied to a patentable invention has the restricted meaning of: a *process*, or—a *method*. Process and Method inventions are of two species. First, those which are the most common, having to do with forces or elements producing *physical change*, such as chemicals, electricity, heat, light, pneumatics, hydraulics, metallurgy. An example of a chemical process is a method of making a new soap using a new combination of chemical ingredients. Second, those having to do with *mechanical* process steps, such as, for example, the process of making expanded sheet metal.

2. A Machine:

This class of patentable invention is most common. A machine is a device consisting of one or more elements which may be used to perform some useful work. The general idea of a machine is a device having a number of parts such, for example, as gas engines, carburetors, adjustable wrenches, knitting machines, soap making machinery, etc.

3. A Manufacture:

This class of invention (a manufacture) insofar as patent law is concerned means some *device* having *passive* properties. That is, something which serves the convenience or comfort of a user, such, for example, as garments, buildings, paper cups, etc.

4. A Composition of Matter:

A composition of matter is a combination of various ingredients, wherein, by reason of their association some new function is performed. The ingredients may be solid, comminuted, fluid or in gaseous form. Whether they be formed or compounded as a mixture or as a chemical union is not important. The commercial product known as "Plastic Wood" is an example of a patented composition, a new soap product, etc.

5. Plants:

The patent laws were amended in 1930 to permit anyone who has invented or discovered and asexually reproduced any distinct and new variety of plant, other than a tuber-propagated plant, to obtain a patent therefor.

The Statute does not give the inventor protection upon the *product* of the plant, that is, the fruit, nut, or flower.

Propagation is limited to asexual reproduction, such as by grafting, budding, cutting, layering, division, inarching, but not by seeds.

6. Designs:

An original and *ornamental* design is patentable. This class takes into consideration such products as have aesthetic appeal. For instance, a streamlined automobile; a new dress, a new shoe design, a new radio cabinet design, etc.

The Formal Parts of a Patent Application

A complete application for patent consists of the following:

1. A petition
2. A specification (description)
3. The claims
4. The inventor's oath
5. The drawings
6. The Government filing fee
7. Models (when required)

Because all patent law is purely statutory it is always advisable to employ a competent patent attorney to prepare the application.

Of the above parts of an application, the *claims* are the most important. The drawings, of course, show the invention, where the invention is capable of illustration, and the specification must be a full, clear, and concise description of the invention in exact terms and must refer to the parts illustrated in the drawings. Models are seldom required, except in extremely complicated cases, and with inventions claiming perpetual motion.

The patent statutes require that a formal and distinct claim or claims must be made by the inventor of that which he regards as his invention.

The phraseology of a patent claim is seldom understood by anyone not skilled in the technique and legal science of drafting and interpreting patent claims. In contemplation of law each claim in a patent, is in itself a separate patent. It is not unusual for a patent to be granted with ten or twenty claims in it, each one defining some different feature or combination of the invention.

Steps Preparatory to the Filing of the Application

A person who has an invention is mainly concerned with how he will initially proceed to disclose his invention. To anyone who has an invention and is really interested, the firm of which the author is a member will furnish information, including a free form called "Evidence of Conception," upon which an inventor can initially describe and sketch his invention. This form contains complete *instructions* how to proceed with sketching and describing the invention. It is more than an aid in disclosing the invention to his patent counsel, for it contains information which, if followed, will provide a proper exhibit, and proof of diligence of the inventor's conception of the invention, as of the date of execution of the form. This is important in event some rival inventor claims priority of the invention.

The necessity for condensing this article prohibits any typical illustration or description of an inventor's disclosure to his attorney, so that anyone interested is referred to the form "Evidence of Conception," and a supplemental bulletin "General Information Concerning Patents," which also contains information of interest to inventors.

Search of the Patent Office Records and Attorney's Report on Patentability

The inventor's attorney after having received the inventor's disclosure of his invention conducts a preliminary search and examination of the records in the United States Patent Office, *to discover to what extent other inventors have conceived of and patented or developed similar inventions.*

The usual charge for such an examination is $10.00, except in the case of very complicated inventions. In such cases the charge for a preliminary examination rarely exceeds $25.00. The prior patents or other data which the attorney finds as the result of the search are then analyzed, and a written report is prepared and sent to the inventor. Copies of any pertinent United States patents which are found as a result of the search are also sent with this report, without charge. In the report the inventor is advised whether or not, in the attorney's opinion, the invention is patentable over the inventions shown in the patents found as a result of the search. In the report the inventor is also advised of the detailed cost of preparing, filing and prosecuting an application for patent. If the search of the patent records shows that others may have preceded the inventor with similar inventions, all the expense incurred by the inventor is the cost of the preliminary search.

The complete application papers after they are prepared by the attorney are sent to the inventor

for signing and approval prior to filing in the Patent Office.

Patent Office Examination of the Application for Patent

Under the present American system of examining patent applications, technically and legally skilled officials of the United States Patent Office examine the application for novelty of invention. They consider all that other inventors have done in the field to which the particular invention of the application relates. This thorough examination has made our patent system so outstanding that it has been copied throughout leading foreign countries.

After the application has been prepared and executed by the inventor it is filed in the United States Patent Office, together with the Government filing fee, which at the present time amounts to $30.00. A filing receipt is issued by the Government identifying the application by its filing date giving it a serial or identification number, which is forwarded to the inventor.

The application is initially examined by an Assistant Examiner, who after formulating his views with respect to an action, discusses them with the Primary Examiner. Their decision is placed in writing and is forwarded to the attorney. This decision is known as an "Office Action" and in it the Examiner mentions any prior art patents or publications which disclose any similar inventions. In this Office action the Examiner states his reasons for rejecting each one of the claims of the application. Any claims found allowable are so stated in the Office action.

If the attorney after receiving the Examiner's Office action does not agree that the prior art patents or publications cited by the Examiner anticipate the claims against which such references are cited, the attorney makes a reply to the Examiner in the form of an argument analyzing the prior art patents or publications. In this argument the attorney points out to the Examiner the difference between applicant's invention, as claimed, and the prior patents or publications cited by the Examiner. This form of discussion continues back and forth between the attorney and the Primary Examiner until they have mutually decided upon the claims which are deemed to properly protect the invention. If they cannot mutually agree, an appeal can be carried to the Board of Appeals in the United States Patent Office. These arguments are very often supplemented by interviews with the Primary Examiner and his Assistants.

It is very difficult for an attorney, without viewing and analyzing the details of an invention, to give anything but a general idea as to the cost of preparing, filing and prosecuting an application for patent. That is true because the attorneys' work in preparing the specification, drawings and claims depend entirely upon the nature of the invention. Furthermore, the attorneys' charges for prosecuting an application, depend not only upon the nature of the invention, but upon the extent to which other inventors have patented inventions along similar lines; also, the attorney's work in drafting proper claims to adequately protect the inventor varies in the different divisions of the Patent Office.

For a simple invention such as an electrical plug connection or electrical fuse wherein invention is well defined, a competent patent attorney would necessarily make charges about as follows:

Search for Patent Records	$10.00
Attorneys' fee for Preparation of Drawings	10.00
Attorneys' fee for Preparation of Specification and claims	30.00
Government filing fee	30.00
Prosecution of application before the Primary Examiner	35.00
Total	$115.00

In addition to the above cost, after the application has been allowed by the United States Patent Office, a final Government fee in amount of $30.00 must be paid. This fee, however, may be paid anytime within six months after the notice of allowance of the application has been sent by the Patent Office to the inventor's attorneys.

One of Many Appreciated Letters

"I wish to congratulate you all on this the 25th Anniversary of the National Radio Institute. I received my copy of the Silver Anniversary Issue of National Radio News and have read it from cover to cover. This issue is certainly well done, so congratulations again!

"Mr. Birrel's story of the Institute has cleared up many things that I have wanted to know about the Institute and its personnel. I was surprised to learn what Mr. Smith and the rest of you have done, are doing, and will be doing, to help such fellows as myself prepare themselves to better go out and meet the world. I am very proud of being a student receiving training from such an institution.

"'The Romance of Radio,' by Mr. Markus, also hit the spot, and I am pleased to meet so many of the Staff 'in pictures.' I would like to meet the rest of you."

Paul B. Woodworth,
Elizabeth, Colo.

Built-in Shielded Loop Antennas

Each new radio receiver evolves logically from the preceding, and practical requirements of the listening public result in one improvement after another.

THE above statement by J. E. Smith in a foreword to an N. R. I. lesson receives dramatic verification in the trend this year toward receivers which require no external antenna or ground connections. The listening public has clamored long and loud for elimination of unsightly aerial and ground connecting wires to a Radio set. An inspection of a number of typical installations will reveal that a high percentage of housewives are actually operating ordinary radio sets without aerial or ground connections, on the theory that they would rather get along with somewhat noisy reception of a few local stations than have their room-decorating schemes ruined by a network of wires running up to each radio in the home.

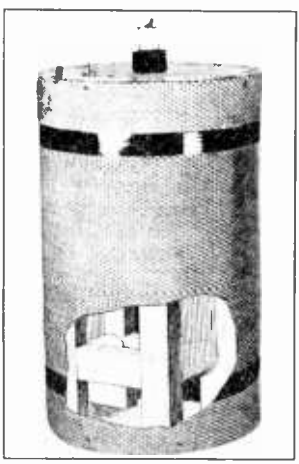
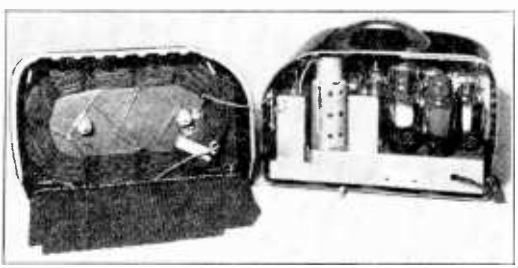


FIG. 1. This General Electric Beamascope antenna employs a large shielded loop, and is designed for mounting inside a console receiver. Part of the Faraday shield is cut away to show the loop winding and its wood frame inside.

Courtesy General Electric Co.

Radio manufacturers have long recognized this important practical requirement of the listening public, and after extensive researches have brought forth a practical and adequate solution to the problem in the form of a shielded loop antenna which can be built into both table and console model receivers. The shielded loop eliminates the need for an external aerial and ground without seriously reducing the efficiency of receiver operation.

How Shielded Loop Antennas Work. To understand how an ordinary loop antenna can pick up Radio signals satisfactorily when placed inside a grounded screen or cage known as a Faraday shield, and to understand how an arrangement such as this can "squelch" or reject noise signals at the same time that it picks up desired station signals, we must first consider the relative strengths of the electric and magnetic fields which are associated with radio waves. At all points which are more than a few hundred feet away from a transmitting antenna or source of noise interference, the electric and magnetic fields which make up the Radio wave are essentially equal in strength. Close to a source of Radio waves, however, the electric component E of a Radio wave is very much greater than the magnetic component H; in fact, E may be as much as 70 times stronger than H. Noise interference sources are generally so close to the receiver that the electric component E of the noise signal is much stronger than the magnetic component of noise, whereas the E and H components of a



Courtesy Zenith Radio Corp.

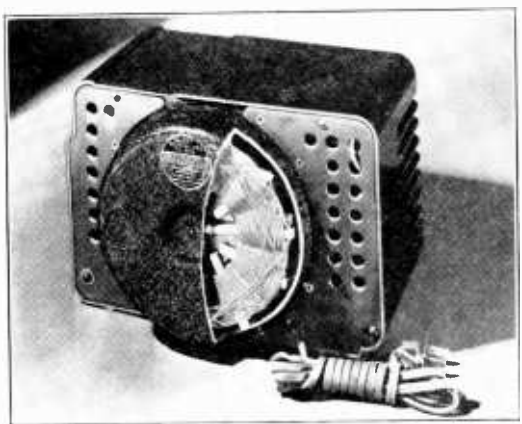
FIG. 2. This compact shielded loop antenna is known as the Zenith Wavemagnet. One side of the shield has been swung down to show the loop. The molded plastic housing for the Wavemagnet fits snugly against the back of the five-tube superheterodyne receiver shown at the right, eliminating the need for antenna and ground connections, and giving good reception even in locations having severe noise interference.

desired radio signal are practically always equal at a receiving antenna. If we can remove the electric component E of both the noise signals and the Radio signals, we can still depend upon the magnetic component of the Radio signal for program reception, and we will have left only the very weak magnetic component of the noise signal. A shielded loop eliminates man-made

noise interference almost completely without impairing reception of the desired Radio signal, for a grounded Faraday shield absorbs electric components and thereby prevents them from affecting the region inside the shield. This is simply a modern refinement of the principle first used by Michael Faraday, famous English physicist and chemist, in the year 1841.

At the time of writing this article, three manufacturers are using shielded loop antennas in their receivers. Let us analyze the construction of each.

General Electric Beamascope. The first shielded loop antenna to appear in a well-known Radio receiver was the General Electric Beamascope unit shown in Fig. *1*. The Faraday shield in this antenna is in the form of a closed cylinder with sheet metal discs covering the top and bottom faces, and with the sides covered with a coarse woven material in which the vertical threads are copper wire and the horizontal threads are non-conducting fiber. Every vertical wire makes contact with the top metal disc, but only one vertical wire makes electrical contact with the bottom disc. This construction eliminates closed circuits in the vicinity of the conventional loop antenna which is mounted inside this shield. (Conductive closed paths in the vicinity of a loop antenna would act as short-circuited turns, reducing the pick-up of magnetic components by the loop.) The shield is grounded, and consequently all signal and noise currents induced in the vertical wires of the Faraday shield by the electric components of signals are led off to ground without affecting the loop inside. The well-known directional characteristics of the loop are utilized to give additional noise rejection. The loop is rotated until its line of minimum pick-up is in the direction of the strongest noise source in the vicinity; this adjustment can be done simply by rotating the loop for minimum noise, without endeavoring to locate the exact position of the noise source. Provisions are made for connecting an outdoor aerial in case extreme distant reception is desired. This loop is intended for mounting in the cabinet of a console model receiver. The receiver itself is designed for maximum effectiveness with this unique antenna system; the first section of the main tuning condenser is connected across the loop, and serves to tune the loop to resonance at each station frequency. This results in greatly increased sensitivity.



Courtesy Continental Radio & Television Corp.

FIG. 3. Rear view of a 1939 Admiral table model receiver, with part of the housing cut away to show the Admiral Aeroscope. This particular unit does not have a shield, but the Aeroscope is also being made with a Faraday shield. The outer turns of the loop are wound in a different manner to provide for an external antenna connection.

Zenith Wave Magnet. The design of an effective shielded loop antenna small enough to fit into a table model receiver proved considerably more of a problem than was the case with console model receivers. The Zenith Radio Corporation was the first manufacturer to announce a built-in shielded loop in a midget or table model receiver. Their unit, shown in Fig. *2* and on the front cover of this issue, is known as the *wavemagnet*, and is contained in a gold-colored plastic box attached to the rear of the set. The Zenith wavemagnet consists of a flat, oval-shaped loop wound on a spider web-type fiber form, and mounted between two sheets of an ingeniously woven wire mesh material which serves as an electrostatic shield in blocking out noise, yet does not affect pick-up of desired station signals. The vertical wires of this woven material are all connected together at the bottom, with a lead going from this point to the receiver chassis in order to ground the shield.

Admiral Aeroscope. The shielded loop used by Continental Radio and Television Corporation in the Admiral line of table model receivers is essentially the same as the Zenith wavemagnet. It is mounted inside the receiver cabinet itself, instead of being in a box attached to the rear of the receiver. In some Admiral receivers the loop is used alone, without a shield; in locations where noise interference is negligible, these sets give equally as good results as those having shielded loops. An example of a set with a plain loop appears in Fig. *3*.

A Radio receiver equipped with a shielded loop antenna is ready to operate the instant it is plugged into a wall outlet. This means that a console model receiver can be moved to a new location in a room without a thought for aerial and ground connections, and table model sets can

(Page 24, please)

RADIO-TRICIAN
REG. U.S. PAT. OFF.
Service Sheet
Compiled Solely for Students and Graduates
NATIONAL RADIO INSTITUTE, WASHINGTON, D.C.

RCA MODEL 95X1

ALIGNMENT PROCEDURE

Remove Chassis from Cabinet

Reel up the antenna wire, and connect the high side of test-oscillator through an 80-mmfd. capacitor to the antenna terminal on the antenna transformer. Connect low side of oscillator to receiver chassis through an .01-mfd. capacitor. Turn gang condenser to minimum (full out), push in the manual-tuning (right-hand) button, tune oscillator to 1,560 kc., connect an output meter across the voice coil, and turn volume control to maximum.

Keep antenna roll and lead clear of chassis during all adjustments.

Adjust the two trimmers (C3 and C6) on side of gang condenser for maximum output, using lowest possible output from test-oscillator.

Turn pointer, so that it is horizontal and pointing to low-frequency end when the gang condenser is at maximum. Check pointer adjustment on a station.

Adjustment of Tuning Capacitors

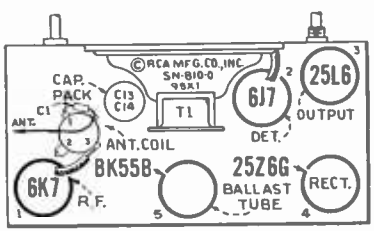
The preferable and quickest method of adjusting the tuning capacitors for five different stations is to employ a test-oscillator, as described below:

1. Make a list of the desired five stations, arranged in order from low to high frequencies.

2. Determine the correct settings of the test-oscillator for these five frequencies. This is accomplished as follows: Tune in each of the five stations on any standard receiver; zero-beat the test-oscillator against each station, and note the exact setting of the oscillator in each case.

3. Reel up the antenna wire. Connect the high side of test-oscillator through an 80-mmfd. fixed capacitor to the end of the antenna wire. Clip the low side of the oscillator through a 0.1-mfd. capacitor to one of the chassis-mounting screws on the bottom of the cabinet. Tune the oscillator to the previously-determined point for the lowest-frequency station, and adjust for a strong output.

4. Turn the volume control of the push-button receiver full clockwise, and push in the left-hand end button. Using an insulated screwdriver, peak capacitors C20 and C26, at the same time reducing the output of the oscillator in order to secure a sharp peak. (Clockwise adjustment of the capacitors tunes the circuits to lower frequencies, and counter-clockwise adjustment tunes the circuits to higher frequencies. The range of each trimmer is three full counter-clockwise turns from the tight position. Do not unscrew more than three turns.)



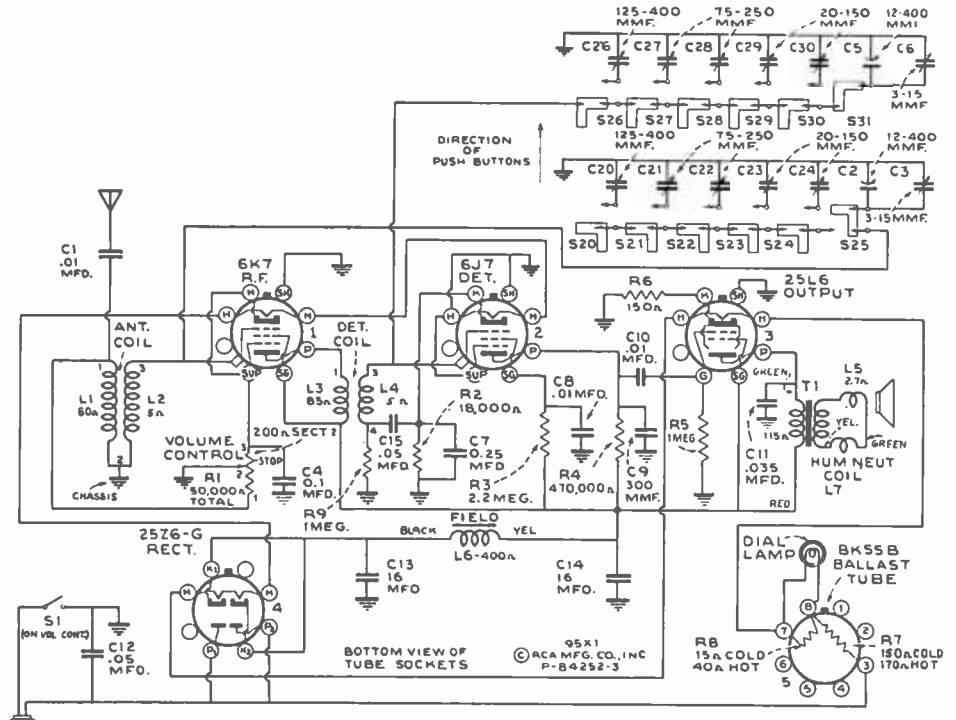
Radiotron Location

5. Push in the second button from left, and adjust C21 and C27 for peak output with the oscillator tuned to the frequency of the second station.

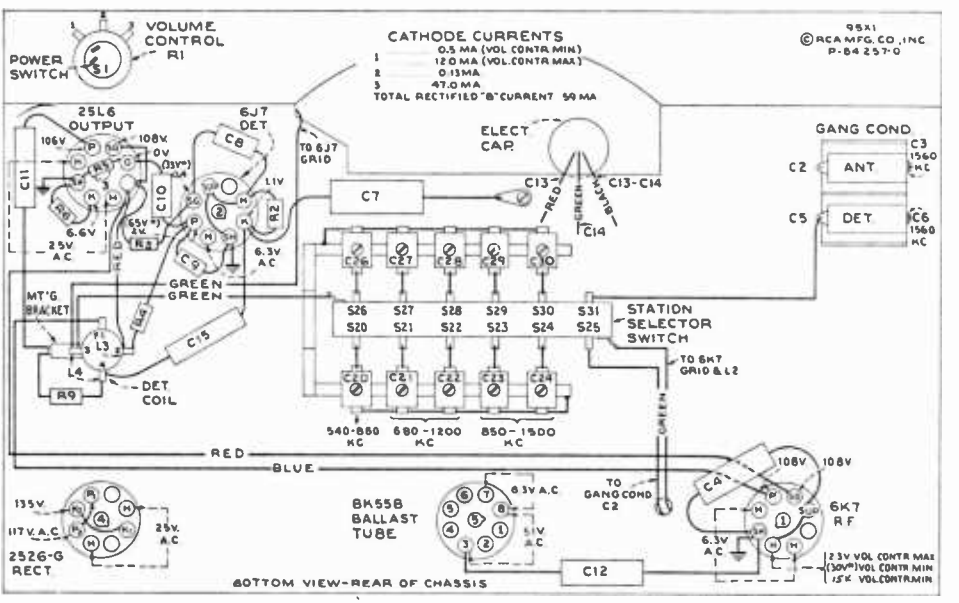
6. Proceed in this manner to adjust each pair of capacitors for the desired frequencies.

7. Final adjustment may be made in actual reception of the stations.

Readers who file Service Data in separate binders remove page carefully, trim on dotted line for same size as data published heretofore.



Schematic Circuit Diagram. The line by-pass, C12, is changed to .25 mfd. (Stock No. 12484) in some sets.



RADIOTRON SOCKET VOLTAGES, AND LOCATION OF PARTS

Measurements made to chassis unless otherwise indicated. Manual tuning button pushed in and set tuned to a quiet point, volume control at minimum.

Novel Radio Items

—BY L.J. MARKUS—

"Bobbies" Get Radiotelephones!

In the British towns of Brighton, Newcastle and Glasgow, the pockets of each constable contain the following items: A radio receiver no larger than a book; a telephone earpiece; a bell which is controlled by a small relay connected into the output circuit of the receiver; a number of midget dry batteries. When the 160-meter police radio transmitter goes on the air, the pocket bells all ring, the constables reach into their pockets for earpieces, and all listen in for orders or emergency calls.

———*n r i*———

WOR Tower Painters Defy 3,000 Volts!

The 385-foot towers of station WOR were recently painted without interrupting the 19½-hour daily schedule, after a daring workman found that he could work on the tower provided he climbed up before the station went on the air and stayed up until power was cut off. Explanation: The man is safe as long as no part of his body is grounded.

———*n r i*———

Tubes Use Almost-Invisible Wire!

The filament wire used in one of the new 1.4-volt dry-battery tubes is only about one-fourth as thick as a human hair. This fine wire, .0008-inch in diameter, can be seen by the human eye only under a powerful light.

Radio Locates Sardines!

A radio-equipped scout airplane flying far out over the Pacific Ocean will broadcast to the fishing fleet the location of each school of fish which is spotted, according to a recent report.

———*n r i*———

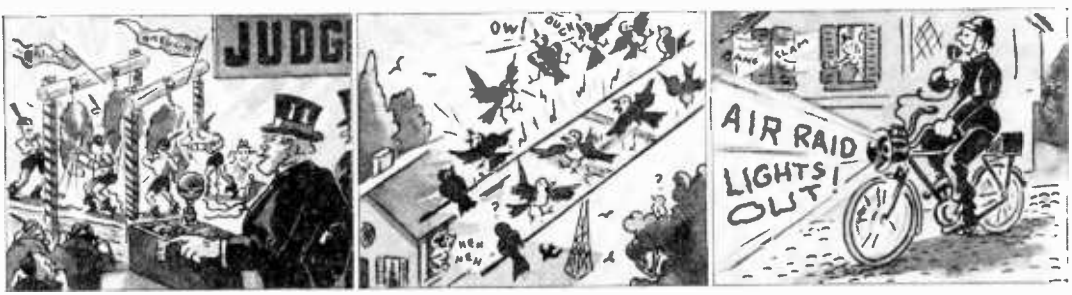
New Jobs For Operators!

Now that compact single-unit Radiotelephone systems for small ships are on the market, Radio operators can pick up quite a bit of extra money while waiting for their ships to leave port. The installation of this apparatus must be made by a licensed second-class operator, and all adjustments and repairs must also be made by a licensed man.

———*n r i*———

Radio Will Locate "Time Capsule!"

Five thousand years from now, some Radio engineer will set up electromagnetic prospecting equipment to locate an 800-pound metal "letter" known as the *time capsule*, which has been buried fifty feet below the Westinghouse exhibit building at the New York World's Fair. A specially prepared book which will be preserved in libraries throughout the world gives instructions whereby the Radio engineer of the future can locate this time capsule in the year 6938 A.D.



METER MEASURES FRATERNITY NOISE! At the annual Noise Parade during the homecoming celebration at Oregon State College, a General Radio sound-level meter was used to judge the noise produced by the various fraternity floats. Pneumatic hammers pounding on large circular saw blades brought first prize with an almost-painful sound level of 110 decibels. No one questioned the judging ability of the "electric ear."

BIRDS ACT AS VOLTMETERS! Birds perched on the rotatable ultra-high-frequency beam antenna of amateur station W8QY1 get a "hot foot" each time the transmitter goes on the air. The distance each bird jumps is an indication of the voltage between its feet. Theoretically, for a half-wave doublet antenna the birds should form a perfect half sine wave curve showing current distribution.

P. A. SYSTEM WORKS WITHOUT TUBES! A novel public address system capable of projecting speech nearly a quarter of a mile has been developed by the London firm of Tannoy for police use. A sensitive microphone is coupled to a weather-proof directional loudspeaker through a matching transformer and a 12-volt midget storage battery. The mike draws several amperes momentarily for loud commands.

Built-in Shielded Loop Antennas

(Concluded from page 20)

be carried to any room in the house and placed in operation immediately.

One Chicago hotel has a hundred Zenith wave-magnet receivers available for its guests, renting them at a small daily charge. The bellboy who delivers a set simply plugs it into a wall outlet, turns on the switch and proceeds to tune in a station. Noise-free reception with ordinary receivers would be almost impossible because of the strong man-made interference noise.

Radiotricians will find it profitable to leave a table model set having a shielded loop antenna while repairing the main receiver. The amazing performance of one of these sets will, in many cases, result in a sale, as practically all customers can use one or more extra radios in the kitchen, the study, or a bedroom.

———*n r i*———

How Diversity Reception Works

Fading is equally as serious a radio reception problem as noise interference. Automatic volume control counteracts fading to a certain extent, but when a signal fades down into the local noise level, the A.V.C. system brings up both the noise and signal levels.

Diversity reception is the weapon used to combat fading. It takes advantage of the fact that a signal practically never fades out at the same time in two different antennas. The antennas can be identical and spaced at least one wavelength apart (*space diversity reception*) or can be in different planes, such as one vertical and the other horizontal (*polarized diversity reception*). The simplest diversity receiving system would employ two antennas and a manually-operated single-pole, double-throw switch which connects one antenna at a time to the receiver. As the signal on one antenna fades out, the switch would be thrown to the other antenna, where the signal will invariably be fading up (increasing in strength). An ingenious circuit for accomplishing this switching action automatically is given in Fig. *1*. This circuit is essentially a magnetically-operated single-pole, double-throw switch which is actuated by the voltage across the A.V.C. load resistor in the receiver. The negative A.V.C. voltage is applied to the grid of the Thyratron tube in series with an adjustable negative bias provided by the "C" battery.

Now let us see how this diversity reception switch operates. Figure *1* shows switch blades *M* and *N* in the lower position, which connects the horizontal antenna to the receiver. Potentiometer *R* has previously been adjusted to a setting which provides a sufficiently high negative bias to prevent ignition (ionization) of the Thyratron tube as long as the signal stays above the noise level, and hence no current is flowing through the relay coil. When the signal fades below the noise level, the A.V.C. voltage in the receiver naturally goes down (becomes less negative); the Thyratron ignites, the relay operates, and switch blades *M* and *N* move upward. Blade *N* disconnects the horizontal antenna and immediately connects the vertical antenna in its place. Blade *M* interrupts the Thyratron plate current long enough to allow the strong vertical antenna signal to raise the A.V.C. voltage and prevent re-ignition of the Thyratron when *M* reaches its upper contact and closes the plate circuit again. The relay is so

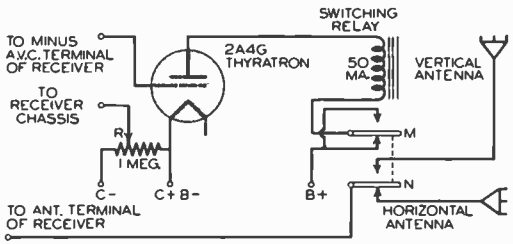


FIG. 1.

Simplified version of a diversity reception circuit developed by McMurdo Silver to counteract fading.

designed that blades *M* and *N* will remain in this upper position now until the vertical antenna signal fades out enough to cause ignition of the Thyratron again. This will restore blades *M* and *N* to the positions shown in Fig. *1*. The relay will operate in this same way each time fading occurs. A click will be heard each time a change of antennas is made.

More elaborate diversity reception systems are designed to have two or more antennas in use at all times, each feeding into a complete receiver channel up to the audio demodulator stage; the outputs of these receivers are then combined, so that all antennas contribute in varying amounts to the signal fed into the single audio amplifier. This costly duplication of R.F. and detector channels is necessary because carrier signals picked up by different antennas are out of phase with each other and cannot be combined until the carriers have been removed by the process of demodulation. These elaborate diversity systems, used chiefly for commercial point-to-point communication via short-wave radio, give no switching clicks during operation.

———*n r i*———

National Radio Institute, during 1939, is celebrating its 25th Anniversary—a quarter-century of progress—a record of achievement.

N.R.I. ALUMNI NEWS

Earl R. Bennett ..... President
Clarence Stokes, C. B. Morehead ..... Vice-Pres.
Allen McCluskey, E. E. Oliver ..... Vice-Pres.
Earl Merryman ..... Secretary
Louis L. Menne ..... Executive-Secretary

The New President of the N. R. I. Alumni Association Briefly Outlines His Objectives

TO FELLOW MEMBERS EVERYWHERE — GOOD WISHES

First of all let me express my deep appreciation of the honor that the members of the National Radio Institute Alumni Association have bestowed upon me, by selecting me as their President for the year 1939. In view of the fact that this year is the 25th birthday anniversary of the National Radio Institute, and the 10th birthday anniversary of the N. R. I. Alumni Association, it is a double honor. I sincerely hope that I can, in some small way, justify your choice by some act that will be of benefit to the organization and to all Radio servicemen.

During my three terms as Vice President of the N. R. I. A. A., and my four terms as Chairman of the Chicago Chapter of the N. R. I. A. A., it has been my policy to extend a helping hand, in any way I could, to the beginner in Radio. To accomplish this I have written many articles for the Chicago Chapter Chatter (a house organ published by and for the Chicago Chapter) and I have given quite a number of lectures on not only the proper methods of servicing but also on the proper approach to any problem, be it mechanical, electrical or customer.

It is my intention to continue this policy. I believe that one of the most important objects of the N. R. I. A. A. is to assist the beginner in Radio to make a success in his chosen field. He must know how to get new business—he must know how to hold old business, and he must know how to make a fair profit from his business. As a member of the N. R. I. A. A. it goes without saying that he already knows the technical side of Radio, but he must learn the practical side of it. We can help him, and in turn be helping ourselves by seeing to it that in getting off on the right foot in the business he leaves a good impression in the minds of his customers, which invariably reflects credit on the service industry as a whole.

To accomplish this is no small task, and requires the wholehearted cooperation of every member of the N. R. I. A. A. Good fellowship and friendliness to all other members is a necessity, as is the willingness to lend a helping hand to all new comers. And to receive the benefits from such a program, one most certainly must be a member of the N. R. I. A. A., whether he lives in city, town, or village.

Now, just a few words on a matter of policy. I strongly advocate an amendment to our By-Laws to restrict the term of office of the President of our Alumni to one year. Mr. Dunn, our President of last year set the right example when he decided not to run again in order to give someone else an opportunity to move up in office. I agree with that policy.

My sincere good wishes to every fellow member. Write to me, if you wish, in care of Headquarters, or at 1408 Brown Ave., Evanston, Illinois.

EARL R. BENNETT, President,
N. R. I. Alumni Association.

Here and There Among Alumni Members

J. B. Straughn, of Headquarters, returning from a meeting in Baltimore, stopped to adjust the wind-shield wiper on his car. A gust of wind blew his hat into a corn field. Hot in pursuit Straughn chased it until he lost it in the darkness. Anyway, that's his story, believe it or not.

———n r i———

Some of the boys in Chicago attended a party and dance given for the benefit of Erick Johnson, who has been seriously ill for some time. Erick was mighty pleased to know his many friends are pulling hard for him.

———n r i———

Two years ago T. L. Kidd borrowed $100.00 to start in business. Today he has the leading Public Address and Sound Laboratory in San Antonio, Texas. And exclusive of sound work, his Radio repair work runs well over $100.00 a week.

———n r i———

Ross Coleman is a member of the Radio Staff, R. M. S. "Aquitania" of the Cunard White Star Line, sailing from New York to London.

———n r i———

Henry W. Berger and Frank Mack of Long Island City, N. Y. are forming a partnership and will open a first class Radio shop.

———n r i———

Walter Young of Detroit is well again after a long illness. His twin sons, Harold and Howard, now seven years old, are his inspiration.

———n r i———

If Lucio E. Albano will get in touch with C. C. Hersey, 4 Irving Place, New York City, he may recover a key case which was found by Hersey.

———n r i———

A year or so ago when Joseph Kaufman, Director of Education, N. R. I., made a talk to the members of New York Chapter, a big cat in the room heckled him. Recently when Kaufman again talked to the New York boys the same cat was there to annoy him.

———n r i———

H. W. Malstrom, graduate of 1926, bobs up in Bremerton, Washington, where he is teaching Radio in the Bremerton High School.

———n r i———

Since June, 1937, our member Jim Seeley has been in the Will Rogers Memorial Hospital at Saranac, N. Y. Jim will be glad to hear from any members who may care to take time to write to him.

———n r i———

Ken Hughes of Calgary, Alberta, Canada, has been operator at CFAC. Recently they found out he has a good voice, so now he takes a turn at announcing too.

———n r i———

Mrs. Spangler, who has been of great assistance to our fellow member, Howard Spangler, in the building of one of the outstanding Radio service shops in Knoxville, Tenn., has recovered from a serious operation. Bet Howard missed her while she was in the hospital.

———n r i———

Mr. E. E. Starr, Lodi, Calif., celebrated his seventy-eighth birthday on January 29, 1939. Congratulations and continued good health.

———n r i———

From Mrs. S. Boutilier, Houlton, Maine, comes word that graduate Maurice Boutilier slipped out of this world. He had long been a sufferer of asthma, but the end came very suddenly in his sleep. Only twenty-two years old—that's sad news.

———n r i———

Robert E. Ayres of Baltimore, Md., is back in Radio after a year's lay-up, owing to an automobile accident. Wow! Glad you are back in the game, Bob.

———n r i———

Help! Help! How about some news? Send it in for these columns, please.

———n r i———

Now G. S. McLean is showing a great interest in a Local Chapter at Winnipeg.

———n r i———

L. J. Kunert, Secretary of New York Chapter, always a booster, writes that when the New York World's Fair is over the 1216½ acres will be transformed into a public park of the city.

———n r i———

W. G. Van Every of Denver is getting a big kick out of the new Dodge Sedan he bought with Radio earnings.

———n r i———

Speaking of autos, Executive Secretary Menne dashed into a no parking zone near the Institute one morning "just for a few minutes." When he went back at 4:30 P. M. the cops had towed the car to the station. Zowie! Five bucks.

———n r i———

Robert Beaule of Lewiston, Maine, not only is a very successful Radio man, but he also is a close student of music. He knows all about Beethoven, Mendelsohn, Schubert and other outstanding composers.

———n r i———

Transradio press operator—there's an interesting job. That's the title held by Vincent Dolva at Station KGCU, Mandan, N. D., a graduate of 1937.

———n r i———

Kenneth C. Robieson is Chief Radio Operator, Fort Snelling, Minn. Likes his job—which makes life sweet.

The Service Forum

Conducted by

J. B. Straughn, N. R. I. Service Consultant

Send in your service notes. We will re-word them for publication. To qualify your note for the NEWS *you must have observed the same trouble on two or more identical receivers.*

PHILCO MODEL 38-35 — **HUM ELIMINATION**

Beginning with run 3 receivers the red wire which connects the filament of the 6Q7G tube to the on-off switch was lengthened. The wire should follow the rear, side and front panels of the chassis close to the base instead of being connected directly from the switch to the socket contact.

———*n r i*———

PHILCO MODEL 38-38 — **INCREASED BATTERY LIFE**

By replacing resistor No. 38 (900 ohms) with a 2,000 ohm unit, the current drain on the "BC" battery will be reduced.

———*n r i*———

PHILCO MODEL 38-39 — **OVERLOADING AND DISTORTION**

In order to reduce maximum volume buzz the following parts may be changed: Resistor 22 (11.7 ohms) should be changed to a 12.3 ohm resistor. Philco replacement part No. 33-1273, resistor No. 30 (2 megohms) should be replaced by a 4 megohm resistor, resistor No. 27 (160,000 ohms) should be increased to 240,000 ohms.

———*n r i*———

PHILCO MODEL 38-690 — **HUM ELIMINATION**

To prevent hum, condenser No. 123 must be placed as far as possible away from the A.C. switch of the audio bass control No. 122.

J. R. JACKSON, Service Manager, Philco.

———*n r i*———

GRUNOW MODEL 10G — **INTERMITTENT**

Disconnect and solder together leads from phono jack. If this clears up the trouble the switch is defective and the hot A.F. portions are intermittently shorting to the chassis. If phonograph is not used, leave out of circuit.

———*n r i*———

SPARTON MODELS 600, 610, 620, 737, 930 AND 931 — **DEAD**

I have found that the trouble can usually be traced to the breaking down of one of the small by-pass condensers connected either to the plates of the tubes or the cathode thereof. There are four of these units setting upright in the can containing the tubes. They are mounted to the chassis with a screw which serves as one connection and a lug projecting from the side is the other contact. The first call I had I replaced with an exact replacement. This also broke down in short order. I concluded that the peak voltage they are able to withstand is rather low. I now replace with a tubular 600 volt condenser with pigtail leads. There is room below the sub-panel for these units. One is a .25 mfd. unit connected to the plates. The other three are 1 mfd. units on the cathodes.

HILBERT E. GLADE, Wisconsin.

———*n r i*———

PHILCO FORD 1936 MODEL — **DISTORTION**

Distortion accompanied by a decrease in volume when the volume control is turned on full may be traced to an open in the secondary of the second I.F. transformer. A new transformer should be installed.

———*n r i*———

SPARTON MODEL 931 — **INTERMITTENT AND HUM**

This trouble may usually be traced to a defective .6 ohm hum balancing resistor connected between the filaments of the 182 power tubes. The resistor may increase to as much as 6 or 7 ohms thus seriously reducing filament current to these tubes and causing low volume as well as the other listed troubles.

J. D. OLWAGE, Africa.

———*n r i*———

RCA MODEL 8M1 — **VIBRATOR HASH**

Install a 500 ohm flexible wire wound resistor in series with the black lead going to the local-distance switch on the control head assembly.

———*n r i*———

RCA MODEL 280 — **DISTORTION**

Distortion on resonance is often due to an open in the .003 mfd. A.V.C. coupling condenser located inside the first I.F. transformer. Lack of A.V.C. voltage due to this open condenser is the cause of the distortion and replacement with another condenser of approximately the same capacity will eliminate the trouble.

(Page 29, please)

Chicago Chapter

Executive Secretary Menne attended our last meeting which was held at our regular meeting place, Eckert Park, Chicago Ave. and Noble St. In spite of very severe weather a good crowd came out and we had a bang-up meeting.

Our Chairman, Ed Sorg, was in good form and he kept things humming until 11:00 P.M., when we adjourned the business session for a bit of good fellowship.

The business meeting was opened by Sorg with some late information on Radios and equipment. Sorg keeps us posted on anything new in the Radio line which is of interest to servicemen in the Chicago area.

Then J. Cordero demonstrated a simple piece of equipment which he built. Next we took up a defective receiver which was brought to the meeting by one of our members. We put the tester on it and after a careful point to point test we located the trouble. The trouble located we proceeded to get out soldering iron and tools and soon we had the set in tip-top shape. This brief account gives an idea of the kind of meetings we hold. We get right down to practical work. We waste little time on speeches and formality. No one need feel backward about attending these meetings. The boys welcome new members. What speaking is necessary our Chairman does. Ed Sorg knows what it takes to make meetings interesting and he arranges each meeting in advance.

These meetings are held on the first and third Thursday of each month at 8:30 P.M. in Eckert Park Field House, Chicago Avenue (1400 West). Come out and brush up on your shop technique.

RICHARD CORDERO, Secretary.

———*n r i*———

Philadelphia-Camden Chapter

Things have been going along nicely with us. We have a new meeting place at 1619 Girard Ave., and we now are organizing a membership campaign to increase our already good attendance.

There are lots of fellows in the Philadelphia-Camden sector who are missing a good thing by neglecting to come down and join us. When members such as M. Blackwood find it worthwhile to travel fifty miles to be with us regularly it must be because the fellows get some real money-making ideas and information.

Charley Fehn, our Chairman, is working like a beaver lining up new speakers for us.

We meet on the first and third Thursday of each month.

ALLEN SCHIAVONI, Secretary.

Detroit Chapter

John Stanish, our Chairman, is determined to make 1939 a very progressive year in the history of our Local Chapter. He is giving us excellent programs and promises no let-up at all. Stanish is that sort of fellow. He is a human dynamo and things simply hum under his direction.

At our last meeting Mr. Henry W. Rissi, President of the Radio Supply and Engineering Co., addressed us. After a brief, but interesting, talk Mr. Rissi introduced Mr. R. H. Hendricks of his organization. Mr. Hendricks gave us a complete and practical demonstration of the Rider Chanalyst. After a very informative talk the fellows gathered around the instrument, while Mr. Hendricks patiently answered all questions.

Mr. L. L. Menne of Headquarters, was a visitor at this meeting. He beamed broadly at a very enthusiastic reception and addressed the Chapter briefly with some appropriate remarks.

Unfortunately, our Secretary and Vice President of the National organization, Mr. F. E. Oliver, was quite ill with influenza and unable to attend this meeting. The fellows expressed the hope that Oliver would be well enough to attend our next meeting.

Chairman Stanish gave a brief pep talk after which we adjourned to take part in a special party which was arranged for Menne. There was plenty to eat and drink and most of the fellows stayed until long after midnight. This gathering was held in our regular meeting place, the modern, air-conditioned shop of our member Robertson at 10 Lawrence Avenue, at Woodward Avenue. Come out any second or fourth Friday of the month. Our attendance is gradually increasing under the inspiring leadership of Chairman Stanish who always starts meetings promptly at 8:30 and arranges for plenty of action to make every meeting a worthwhile one for all who attend.

C. H. MILLS, Acting Secretary.

———*n r i*———

Vice President Morehead in Peoria, Illinois

C. B. Morehead, who has been one of the real regulars in Chicago Chapter will be missed for sometime. Morehead was transferred to Peoria, Illinois, for an indefinite time, but we hope he will be back in Chicago in about six months. His assignment in Peoria is temporary.

The boys in Chicago will miss him, but Morehead has promised to continue as Editor of the Chicago Chapter Chatter, working with Bennett, who is Technical Editor.

The Service Forum (Continued from page 27)

PHILCO MODELS 38-22 AND 38-23 — **PILOT LIGHT BURNS OUT**

This trouble, caused by high line voltage, may be eliminated by shunting the 75 ohm resistor (Philco part No. 33-3027) across the pilot lamp.

—n r i—

PILOT MODEL 93 — **VERY LOW VOLUME**

Open circuited speaker field winding; replace the speaker.

—n r i—

PILOT MODEL X63B — **DEAD**

Shorted R. F. plate by-pass condenser, use a 600 volt, 25 mfd. replacement.

—n r i—

PILOT MODEL X65B — **LOUD HUM**

A loud hum as the set is turned on is due to a defective 75 tube (second-detector and first audio). Replace the tube.

—n r i—

FAIRBANKS MORSE MODEL 72 — **LOW VOLUME**

Defective volume control (decreased in resistance). Replace with a new one which should be a 500,000 ohm unit with a tap at 50,000 ohms for bass compensation.

—n r i—

ZENITH CHASSIS No. 5801 — **CRACKLING AND LOW VOLUME**

Open circuited first I. F. coil primary winding. Replace the I. F. transformer.

—n r i—

ZENITH CHASSIS 5801 — **REGENERATION**

Open circuited second detector diode load by-pass condenser, capacity 50 mmfd. mica.

—n r i—

PHILCO MODEL 16 — **LOUD HUM**

Leaky power supply filter condenser. Capacity 8 mfd.

—n r i—

PHILCO MODEL 38-2670 — **CRACKLING AS THE VOLUME IS TURNED FULL**

Defective speaker, center the cone, test the output transformer.

—n r i—

ERLA MODEL 82A175E — **DEAD**

Shorted .05 audio coupling condenser.

—n r i—

EMERSON CHASSIS U6C — **LOW VOLUME**

Open 2,500 ohm speaker field winding, replace the speaker.

—n r i—

EMERSON CHASSIS U6C — **MODULATION HUM**

Defective 6H6 second detector tube, replace the tube with a new one.

M. Ghiyasuddin, India.

—n r i—

AIRLINE MODELS 62-305, 62-385, 62-414 AND 62-495 — **SQUEAL AT HIGH VOLUME**

Check the 10 mfd. 25 volt electrolytic condenser. I have found this condenser open in several sets. Replace with at least 50 volt condenser of same capacity. Another thing is the output transformer of this model. I have found two of these radios with the output transformer open.

James Ratiburn, Missouri.

—n r i—

GENERAL ELECTRIC MODELS E-91 AND E-95 — **WEAK RECEPTION AND LOW B VOLTAGE**

When a new type 5Z4 rectifier tube restores operation, check the two wet electrolytic condensers as these sometimes have a leakage current as high as 50 mills each, therefore destroying the tube after several hours service.

Millard A. Mitchell, Tenn.

—n r i—

DELCO MODELS 641 AND 643 — **HASH**

Remove set from container and expose the power pack, where will be found a twin .5 mfd. condenser No. 7231150. This is an A filter. Breaking wax off grounding end of condenser will reveal a loose or bad connection. If original replacement is not obtainable, substitute two .5 mfd. condensers. Don't forget to run new wire from A choke coil to vibrator socket.

—n r i—

DELCO MODELS 641 AND 643 — **VIOLENT SCREECHING SIMILAR TO OSCILLATION**

This condition is not a case of open condensers or bad grounds, but a faulty 6X5G tube. Check tube very carefully for leakage between one cathode and plate.

A. E. Barwood, South Africa.

—n r i—

AUTO RADIO — **SERVICE HINT**

If the installation of a suppressor at the distributor does not clear up interference, try the suppressor at the coil end of the center distributor lead.

Albert Balzum, Minn.

—n r i—

PHILCO MODEL 38-8 CODE 121 — **INCREASE HIGH FREQUENCY AUDIO RESPONSE**

To increase the response of the audio system at the higher frequencies, reduce the capacity of condenser No. 40 (.008 mfd.) to .004 mfd.

—n r i—

PHILCO MODELS 38-22 AND 38-23 — **HUM**

To prevent hum when the volume control is on full, the red and brown leads from the second I.F. transformer (18) must be placed as far as possible away from the cable and pilot lamp leads at the rear of the chassis.

New York Chapter

At one of our recent meetings we had an attendance of 135. This was a fine tribute to Mr. J. Kaufman, Director of Education, N. R. I., who gave us an interesting talk on "Television—1939 Version." After the meeting many of the fellows remained to ask Mr. Kaufman questions. Mr. Kaufman very patiently stayed until long after midnight to cover all of the points which were brought up by fellows eager for information. It was a grand meeting. L. L. Menne was also present and entertained the boys briefly, while Mr. Kaufman was warming up to his task.

Chairman Stock wishes to thank the members for their attendance which has been an inspiration to all of our officers. Our officers are glad to give the newer members the benefit of their experience. We always have a good practical talk arranged for each meeting.

We anticipate many students and graduates of N. R. I. will visit the World's Fair in New York. To those who may be in our city on the first or third Thursday of any month we extend a cordial invitation to join us in our meeting at Damanzeks Manor, 12 St. Mark's Place, New York City.

We are looking forward to a meeting at which Earl Bennett, the new President of the National organization will be present. Mr. Bennett has promised to visit New York sometime during the summer.

LOUIS J. KUNERT, Secretary.

———*n r i*———

Additions to N. R. I. Ham List

We shall be glad to list your call letters if you are an amateur operator. Give us your call letters the next time you write. The following have been reported recently.

ZS6GB—W. Gorman—Brakpan, South Africa.
W9NXV—L. D. Lewis—So. Hutchinson, Kans.
W3IHVV—John Di Leo—Lancaster, Pa.
W3BLN—W. Norman Dalling—Pottstown, Pa.
W9ZKI—Eldon Schultz—Great Bend, Kans.
W5IHLK—C. A. Perkins—Del Rio, Texas.
W9YBK—M. S. Sarchett—Sigourney, Iowa.
W8QPF—Charles E. Stuhl—Cleveland, Ohio.
VE1BP—C. F. Fuller—Hortonville, N. S., Can.
W8RUN—Edw. Waibel—Millvale, Pa.
W9TRX—E. H. Koch—Centralia, Ill.
W1LCL—Paul P. Glazier—Greenfield, Mass.
VE4APQ—H. E. Vernon—Winnipeg, Man., Can.
W2LKA—R. Ferris—Peekskill, N. Y.
W2GQ—Wm. McClenahan—Brooklyn, N. Y.
VE3AWB—H. S. Korbie—Kirkland Lake, Ont., Can.
W9CCJ—Melvin Osborne—Indianapolis, Ind.
W7GVG—David O. Reichlein—The Dalles, Oreg.
W8SJY—Geo. Heintz—Flint, Mich.
VE4AFZ—D. T. Black, Watrous, Sask., Can.

Baltimore Chapter

Pete Dunn, who served our Chapter as Chairman for three terms and who also served the National organization for several years as President, is again back in the chair at our Chapter. Pete is one of those fellows who likes lots of action and promises plenty of good things for our members.

Wiegand W. Jensen, who has been Chairman for the past two years is not shirking responsibility by any means for he has accepted the office of Vice-Chairman. In this capacity he will be able to give his time and cooperation to the Chapter, as he has always done in the past. Dunn and Wiegand make a good team.

The complete slate of new officers is as follows:
Chairman—P. J. Dunn
Vice-Chairman—W. W. Jensen
Sec.-Treas.—I. A. Willett
Asst. Sec.-Treas.—W. B. Giese
Librarian—E. W. Gosnell
Sgt.-at-Arms—G. D. Parlett

Our meeting of March 21 was a humdinger. We had our usual session after which we served refreshments aplenty. It was just a sample of other big things we have in store for our members.

Straughn and Menne of Headquarters, were present. We also had a good representation of guests and it is hoped that all students and graduates in the Baltimore area will come out to meet with us. The better attendance we have the better programs can be arranged.

We meet on the first and third Tuesday of each month at Fishpaw's Hall, Baltimore and Gilmor Streets, at 8:30 P.M.

I. A. WILLETT, Secretary.

Technical Editor Bennett on left, Mrs. Alice Bennett, Mrs. Letha Morehead and Editor C. B. Morehead get out an edition of the Chicago Chapter Chatter.

Appreciates Consultation Service

I sure do enjoy reading such articles as the Service Forum, the Laboratory Page and the Service Sheets. I certainly appreciate the mighty fine consultation service offered to a student. I had been trying for a long time to get a certain circuit diagram for an All-Wave Fifteen tube Hi-Fidelity Superheterodyne receiver, but when I asked Mr. Dowie, Chief Instructor, I received a copy of the diagram by return mail. That's real service.

T. C. COUGHLIN,
Brooklyn, N. Y.

———n r i———

Want More of This, Fellows?

I congratulate you on the wonderful make up of the Silver Anniversary edition of the NATIONAL RADIO NEWS. "Modern Servicing Technique" by Joseph Kaufman was tops. Have already read this article three or four times.

WILLIAM LOFSTROM,
Valdosta, Ga.

———n r i———

More Power to Jay and Ozzie

The NEWS has meant more to me than just service news. It has been healing to a troubled mind. I have been sick for a long time. However, I am beginning to feel myself again, so I am catching up on reading the RADIO NEWS. I have just finished reading an article by Mr. Markus, entitled "Electronics, Inc. Stage a Halloween Party." I couldn't have enjoyed myself more at a movie.

WALTER YOUNG,
Detroit, Mich.

———n r i———

National Radio News is Interesting

I think the RADIO NEWS is one of the most interesting magazines ever published.

ARNOLD BREKSTAD,
Mound, Minn.

Another Suggestion

In reading NATIONAL RADIO NEWS I took an interest in what was publised as short cuts in Radio work. All those tricks can be learned by experience. I have a suggestion which I believe may be old to some, but new to others. The idea I have, which I have discovered myself through an accident is magnetized tools by placing a screw-driver in any speaker field of a fairly large output. In a short time you are able to pick up small screws and hold them indefinitely. I am sure some of the boys would like to make use of the idea.

JOSEPH CELENTANO,
North Bay, Ont., Canada.

———n r i———

Swell Mag, Eh, Pal

Your magazine, the RADIO NEWS is a swell mag, let me tell you. I look forward to the Laboratory Page and the Service Forum. The Radiotrician Service Sheet is swell also.

FRANCIS C. MORAVEK,
Bridgeport, Conn.

———n r i———

Wants Articles on Servicing

I think the NEWS is tops. Mr. Rohrich's Laboratory Page is my favorite page. The Service Forum is also helpful and the "Kinks and Short Cuts in Radio Servicing" was very useful and of course saves me a lot of time. Please give us plenty of articles on servicing.

LUCIEN GUITARD,
Sturgeon Falls, Ont., Canada.

———n r i———

Wouldn't Want to Miss The News

NATIONAL RADIO NEWS heads my reading list. I would not want to miss "Servicing Universal A.C.-D.C. Receivers," "Installing Push-Button Tuners" and "Kinks and Short Cuts in Radio Servicing."

J. H. CROWLEY, JR.,
Memphis, Tenn.

Visitors at N. R. I. Are Welcome

Many of our students and graduates will visit the World's Fair in New York. Those who pass through Washington are cordially invited to drop in at N. R. I. to meet some of the officials and staff members of the Institute. We are proud of our building, our equipment and our carefully trained organization.

If you pass this way be sure to call on us. You will get a much bigger and better impression of N. R. I. after you see our facilities for servicing our students and graduates—and how we do it.

The following letter from a student is typical of others we receive.

"Just arrived from your beautiful city of Washington, D. C., and I must say I certainly did enjoy every minute that I was in Washington, and the surrounding neighborhoods.

"I was very much impressed by the beautiful and immaculately clean school that you maintain as the headquarters for N. R. I. Such a modern school and competent staff certainly gave me renewed courage to study more and work harder to strive to be a more efficient Radio serviceman.

"Now that I'm back in the old harness again, I go at my work with a little more vim and vigor, after that vacation and visit to your school during which I saw your staff of instructors.

"Many thanks to you and all of your staff for your kind consideration and especially to you, Mr. Smith, to the Editor L. L. Menne and Technical Editor L. J. Markus, who showed me the different departments and also the laboratory equipment and its operation.

"I am grateful to you all for the splendid hospitality shown me during my stay in your city."

Toivo J. Heino,
Keewatin, Minnesota.

Thanks For 25th Anniversary Letters

Mr. Smith, Mr. Haas, Mr. Dowie and all members of our Staff give thanks for the great many letters of congratulation we have received in connection with the celebration of our 25th Anniversary.

Space limitations permit us to publish only a very few of these letters in National Radio News so we express our appreciation in this more general, but nevertheless deeply sincere way. Thank you all for your good wishes.

NATIONAL RADIO NEWS

FROM N.R.I. TRAINING HEADQUARTERS

Vol. 8 No. 8

April-May, 1939

Published every other month in the interest of the students and Alumni Association of the

NATIONAL RADIO INSTITUTE
Washington, D. C.

The Official Organ of the N. R. I. Alumni Association

Editorial and Business Office, 16th & You Sts., N. W., Washington, D. C.

L. L. MENNE, EDITOR
L. J. MARKUS, TECHNICAL EDITOR

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