

NATIONAL RADIO NEWS



IN THIS ISSUE

Servicing Universal A.C.-D.C. Receivers
Electronics, Inc. Battles Crime with Radio
Alumni Association News

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RADIO MARCHES ON!

When dark clouds hover over the business horizon, and pessimists talk about a business recession—*Charlie McCarthy sets a new record for listener popularity and RADIO MARCHES ON!*

When people begin to watch their dollars more closely, staying at home evenings in order to conserve finances, the theaters and night clubs suffer. When the stay-at-homers become aware of the shortcomings of their old Radio sets, and decide to have them serviced so they will do for another year—*Radio servicemen find themselves head over heels in work, and RADIO MARCHES ON!*

When the old Radio set sounds pretty bad and cannot be economically repaired, stay-at-home families begin to rebel at forced economy programs; in self-defense against demands for more costly entertainment, fathers go out to buy new Radio sets—*the receiver manufacturing and merchandising branches of the Radio industry prosper, and RADIO MARCHES ON!*

When people are forced to turn to Radio for entertainment, they take notice of the great improvements which have been made in Radio program quality within the past few years; they join the ranks of enthusiastic and regular Radio listeners—*the sponsors of Radio programs find Radio advertising so profitable that they buy more of it, and RADIO MARCHES ON!*

When overtime work ceases and working days are shortened, people have more time to take notice of the tremendous strides made by the Radio industry in improving tone quality, simplifying tuning and modernizing the cabinets of Radio receivers; they get one big yearning for a new Radio receiver—*an aggressive Radio set dealer converts that yearning into proud realization, and RADIO MARCHES ON!*

When jobs vanish and salaries drop in many other industries, things keep right on humming in the factories, in the sales rooms and in the service shops of the comparatively new Radio industry—*Radio men see clear business skies and bright futures, for RADIO MARCHES ON!*

J. E. SMITH, President

Servicing Universal A.C. - D.C. Receivers

By J. B. STRAUGHN

N. R. I. Service Consultant

ONE of the most common types of receivers brought in for servicing is the "cigar box" type universal A.C.-D.C. receiver using a T.R.F. circuit with four or five tubes. Sets like this have been widely distributed over the entire country and have been sold at extremely low prices. Since manufacturing costs must obviously be kept down when a receiver complete with tubes is to sell for less than \$10, low-grade parts are often employed. Breakdowns are frequent, and servicemen are expected to make prompt repairs.

Unfortunately for the customer, it costs very nearly as much to repair one of these small receivers as a larger set. When a customer hears the estimate of service costs, he generally exclaims: "Why, I can buy a new radio for less than that!"

This is true, sad to say, but the business-like serviceman will point out that the parts in the new receiver will be no better than those in the old one, and the same trouble will undoubtedly develop in a short time. On the other hand, if the old receiver is repaired, using first-class parts which the manufacturer could not afford to employ, excellent results may be expected. The cost

The signal circuits of a midget T.R.F. radio are extremely simple. Generally there is one stage of radio frequency amplification using a 6.3 volt super-control pentode tube such as the 78, 6D6 or 6K7. The former two types have the same base and are interchangeable, while the latter uses an octal base.

The R.F. amplifier feeds into the detector, which uses a pentode tube having a sharp plate current cut-off characteristic. Interchangeable type 6C6 or 77 tubes, or the octal-base 6J7 tube will generally be found in the detector stage.

The audio output of the detector is fed by means of resistance-capacitance coupling into the power output tube, which is generally a type 43 pentode. This tube in turn feeds the loudspeaker; although a dynamic loudspeaker is more often used, you will occasionally encounter a magnetic speaker.

In some sets one or more dummy tubes will be found, with only the filaments connected into the circuit. As long as the filament circuit is not open, the condition of a dummy tube is immaterial; in fact, defective tubes are often used origi-

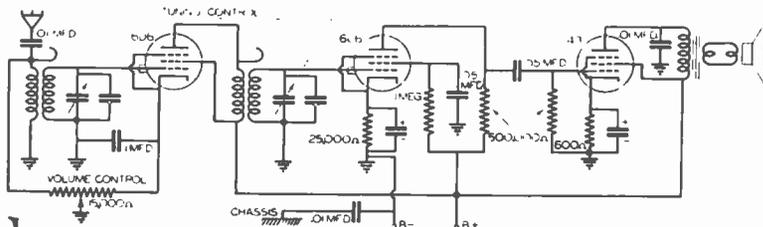


Figure 1

of service work on one of these sets should really be considered a part of the purchase price, for the value of the receiver will be increased in exact proportion to the value of the new high-grade parts. Such a line of reasoning seldom fails to bring in the job at a high enough price to give the serviceman a fair profit.

Although this article deals primarily with the servicing of universal T.R.F. receivers for which circuit diagrams are not obtainable anywhere, the procedures described apply equally well to these T.R.F. receivers when circuit diagrams are at hand, and will also prove of value in servicing universal A.C.-D.C. superheterodyne receivers.

inally by the manufacturer to keep costs down while making the customer think he is getting a larger receiver.

In Fig. 1 is shown the typical signal circuit arrangement of an A.C.-D.C. T.R.F. receiver. There are several peculiarities which should be noted; these are: 1, the chassis may not be an electrical part of the circuit, in which case the ground symbols simply indicate that the parts so marked are connected together; 2, the screen grid of the R.F. tube gets the same potential as the plate; 3, an external ground connection is not used because one side of the power line (which connects to the receiver circuits) is grounded; 4, the small coils

connected to the primary R.F. coil windings provide capacitive coupling in addition to the usual inductive coupling between primary and secondary windings.

The aerial for a midget set is usually of flexible wire, permanently attached to the set and connected to the receiver input circuit through a small tubular or mica condenser. This aerial wire may be grounded to a water pipe or other external ground, in which case the R.F. signals picked up by the ungrounded side of the power line will flow through the primary of the first R.F. transformer, then through the antenna condenser and the aerial wire to ground. The R.F. signals pass-

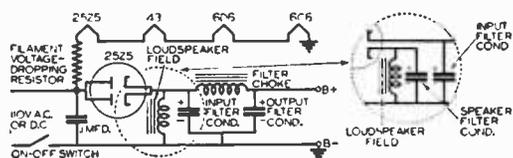


Figure 2

ing through the primary induce a signal voltage in the secondary in the usual way.

If the chassis is an electrical part of the circuit and the line cord plug is inserted in such a way that the chassis connects to the hot (ungrounded) side of the power line, you may get a shock when you touch the chassis if some part of your body is grounded. If you get a shock, reverse the line plug if the source is A.C.; this will connect the chassis to the grounded side of the power line. In the case of D.C. power you cannot reverse the plug, for that would make polarity incorrect; you will simply have to avoid standing on a concrete floor (a good ground), and avoid touching any grounded object while working on the set with power on. With either A.C. or D.C. power, never make a direct connection from the chassis to an external ground, for this may short-circuit the power line and blow the line fuse.

Figure 2 shows a typical power supply circuit used for both T.R.F. and superheterodyne universal A.C.-D.C. sets. A 25Z5 tube is connected as a single half-wave rectifier, but where the loudspeaker field coil is energized independently of the receiver circuit, there will be a separate connection to each cathode and an extra filter condenser connected directly across the loudspeaker field, as indicated in the dotted circle at the right in Fig. 2.

The tube filaments in a universal receiver are wired in series, with each filament requiring .3 ampere. The filaments of the type 25Z5 and 43 tubes require 25 volts each, while the 6D6 and 6C6 tubes each require 6.3 volts. This makes a total of approximately 63 volts, and means that

the filament voltage-dropping resistor must drop 115-63, or approximately 52 volts. Since 3 amperes flows through this resistor, it will have an ohmic value of $52 \div .3$, or approximately 175 ω .

If pilot lamps are used, they are usually placed in series with the voltage-limiting resistor. Each lamp is operated at about 4.25 volts, and hence the required voltage drop across the limiting resistor is reduced by this amount. Two pilot lamps connected as in Fig. 3A reduce this required voltage drop by 8.5 volts. (Although the lamps are rated at 6.3 volts, they are operated at 4.25 volts so they will not burn out because of the sudden surge in current when the set is first turned on.)

Pilot lamps are always shunted by resistors, for these lamps do not draw as much current as the tube filaments. The shunt resistance will be equal to the shunt current (the difference between the 3 ampere filament current and the pilot lamp current) divided into the voltage across the lamp or lamps.

Pilot Lamp Color Code. On A.C.-D.C. sets, only two types of pilot lamps are ordinarily used; these can be identified by the color of the glass bead through which the filament-supporting wires pass. A Mazda No. 40 lamp with a miniature screw base draws .15 ampere and has a brown-colored bead. A Mazda No. 46 lamp with a miniature screw base draws .25 ampere and has a blue bead, while a Mazda No. 44 lamp with a bayonet base also draws .25 ampere and has a blue bead. A third type of lamp, having a white bead and drawing .20 ampere, is infrequently encountered. Replace burned-out lamps with new

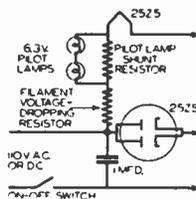


Figure 3A

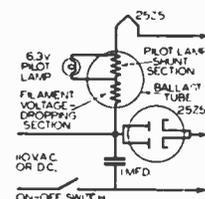


Figure 3B

lamps having the same bead color and voltage rating (6.3 volts).

You will occasionally find two pilot lamps connected in series directly across the 110-volt line, with no shunt resistor across them. These will be 110-volt Japanese lamps similar to those used on Christmas trees. They are connected in series to operate at half-voltage, thereby having longer life while still giving sufficient light to illuminate the tuning dial.

Types of Filament Resistors. Various types of filament voltage-dropping resistors are used in

universal A.C.-D.C. sets. Many of the earlier models use ordinary wire-wound resistors mounted under the receiver chassis. The chief disadvantage of these is that the heat which they radiate causes deterioration of nearby receiver components, chiefly the electrolytic condensers.

Line cord resistors, having the resistance wire embedded in asbestos and placed in the line cord along with the usual two copper wires, are now widely used because they keep the dissipated heat entirely out of the chassis. Line cords are easily identified by the fact that they have three leads instead of two; the resistance wire is connected to one of the line wires, the connection being made directly to one of the prongs on the line cord plug. The line wire which connects to this same prong may be identified with an ohmmeter, and always goes to the rectifier plates. The other line wire will go to the ON-OFF switch which is mounted on the volume control of the receiver.

When a receiver which uses a line cord resistor is in operation, the line cord becomes quite hot, but this is natural and is no cause for worry. Never attempt to shorten the line cord when it has a built-in resistance, for this would reduce the resistance value and affect the operation of the receiver.

Ballast tubes are even more satisfactory than line cord resistors for filament voltage-dropping purposes. These tubes can now be secured with either glass or metal envelopes, the metal envelope being the more popular. The resistance element is mounted inside the envelope and connected to prongs on the tube base. Oftentimes

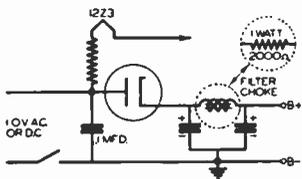


Figure 4

taps are provided, with connections to tube prongs, to eliminate need for separate pilot lamp shunt resistors; an example of a ballast tube having one tap for this purpose is shown in Fig. 3B.

When a ballast tube burns out, always replace it with another having exactly the same number. This is necessary because the tubes are made with many different ohmic values and with many different arrangements of prong connections. Ballast tubes become very hot while in use, but as the heat is above the chassis, critical parts in the receiver are not damaged.

Servicemen are sometimes asked to replace line

cord resistors with ballast tubes; space limitations make it unadvisable to attempt this, for midget receivers are quite compactly constructed. Incidentally, an ohmmeter provides the quickest way of identifying the various prongs on a ballast tube.

Rectifier Circuit Variations. A single 12Z3 rectifier tube or even a type 37 triode with grid and plate connected together may be found in a circuit arrangement like that in Fig. 4. Since supplying field excitation to a dynamic speaker would place too heavy a drain on the rectifier, you may expect to find a magnetic loudspeaker in a receiver having this power pack circuit. The

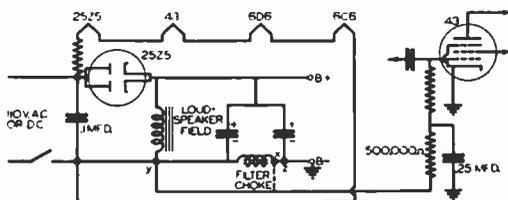


Figure 5

.1 mfd. condenser connected across the power line tends to prevent interference from entering the receiver by way of the power line. Oftentimes a 2,000 ohm, 1 watt resistor is used in place of the more efficient but bulkier and more costly filter choke, as indicated inside the dotted circle in Fig. 4.

Sometimes you will find a circuit which uses two 12Z3 tubes connected in place of a single 25Z5; the circuit will be the same as that in Fig. 2 except that the two diode sections of the rectifier tube will be in separate envelopes. The filaments of the two 12Z3 tubes will be in series and will together be electrically equivalent to the filament of a single 25Z5 tube. This gives the set an extra tube and is therefore an advantage from a sales standpoint. The two tubes supply sufficient power for loudspeaker field coil excitation, and hence a dynamic loudspeaker will usually be found. A single 12Z3 tube cannot, however, supply enough current for both the loudspeaker field coil and the receiver circuits and last a normal length of time.

Another power pack circuit using a 25Z5 rectifier tube is shown in Fig. 5. Here the filter choke is placed in the negative plate supply lead, and the voltage drop across the choke is used as C bias for the control grid of the power tube. When the voltage drop across this choke is not correct for biasing purposes, a resistor is inserted between points *x* and *z* in Fig. 5, and the control grid return lead of the power tube is run to point *x*, as indicated by the dotted line, instead of point *y*. The ohmic value of the inserted resistor is so

chosen that the voltage drop across the resistor equals the correct bias voltage for the tube. Notice that the cathode of the power tube is grounded, eliminating the need for a cathode bypass condenser and resistor. A decoupling resistor and condenser are required in the control grid circuit of this tube, however.

A rather unique method sometimes used to secure a positive screen grid voltage for the detector tube is shown in Fig. 6. Observe that here the detector screen grid is connected directly to the cathode of the power tube, which is sufficiently positive with respect to the detector tube cathode for this purpose.

Filter Condenser Connections. When the filter choke is in the positive side of the power pack circuit, all electrolytic condensers will have a common negative lead. When the filter choke is in the negative side of the circuit, however, the negative side of the input filter condenser does

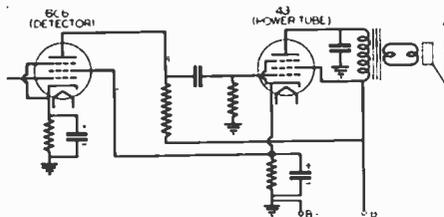


Figure 6

not connect to ground (chassis) and consequently requires a separate lead. In this case the two filter condensers may have a common positive lead, as is the case in Fig. 5.

Failure of filter condensers is quite a common occurrence in universal A.C.-D.C. receivers. Oftentimes there will be no markings whatsoever on the old condenser block to serve as a guide in ordering a new unit; in a case like this, the following method of reasoning will allow you to order a satisfactory replacement.

Make a sketch of the old condenser block, showing all leads which come out from it. Now trace each condenser lead and determine where it goes in the circuit. By this time you will be able to recognize the type of power pack circuit used. Label each lead on your sketch according to the point to which it connects, and indicate its polarity. Once you recognize the type of circuit used, you will have no difficulty in determining the polarity of any point with respect to the B—lead and in drawing the internal connections for the condenser sections. Condenser block sketches for the power pack circuits given previously in this article are shown in Fig. 7.

Here are a few tips towards identifying the various leads. If the filter choke is in the positive side of the power pack circuit, as evidenced by a direct connection from one of the choke terminals to the cathode or cathodes of the rectifier tube, then all of the filter condensers in the block will have a common negative lead. You can identify this common lead by the fact that it connects to the receiver side of the ON-OFF power switch either through the chassis or through a common lead. Once this is done, you can draw in the internal connections of the condenser block just as has been done in Fig. 7.

If the choke is in the negative side of the power pack circuit, as evidenced by the rectifier tube cathode tracing directly to the screen grid of the power tube without encountering any current-limiting or choking devices, you can locate the negative lead for the input filter condenser by the fact that it will be the only filter condenser lead connected to the switch side of the filter choke. Where the loudspeaker field coil gets its current from a separate section of the 25Z5 rectifier tube, there will be a condenser across the loudspeaker field coil with its negative lead also connected to the switch. In most cases a single common negative lead is used for both condensers. The positive leads for these condensers are easily identified; the positive lead of the loudspeaker filter condenser will go to that 25Z5 cathode to which the speaker field is also connected, while the positive lead of the input filter condenser will go to the other cathode of the rectifier tube.

Having located the leads and determined the functions of the various sections of the electrolytic filter condenser block, you are ready to place on your sketch the approximate capacity values for each section. Use the following general rules as your guide: *Input Filter Condenser* — any value between 10 mfd. and 20 mfd., rated at 200 volts D.C. working voltage; *Output Filter Condenser*—any value between 8 mfd. and 16 mfd., rated at 200 volts D.C. working voltage; *Loudspeaker Field Coil Filter Condenser* — between 4 mfd. and 8 mfd., rated at 200 volts D.C. working voltage; *Cathode By-Pass Condensers* — 5 mfd., rated at 25 or 35 volts D.C. working voltage.

While condensers smaller than the minimum values given should not be used, the maximum values may be exceeded without impairing the operating qualities of the receiver. The voltage ratings can likewise be higher than the minimum values given.

Your electrolytic condenser block sketch now gives you the necessary data for ordering a replacement unit. If a unit having the desired internal connections and desired capacities is not available, the next best thing is to order a condenser block having the desired capacities and separate leads for each section. If even this is

not available, make up your condenser block from two or more separate electrolytic condenser units having the desired capacity and voltage ratings. When ordering separate units in this way, be sure to check the available space and choose units which are small enough to fit this space.

Is the Customer's Complaint Justified? The operating characteristics of a universal A.C.-D.C. "cigar box" receiver of the T.R.F. variety must be carefully considered before attempting service work, in order to make sure that the customer's complaint is justified. These little receivers are designed primarily for reception of powerful local stations which are spaced well apart in the broadcast band. The receivers have little selectivity, so that local stations which are separated by less than 100 kc. may be expected to interfere with each other. The receivers likewise have poor sensitivity, and the reception of distant or even semi-distant stations will therefore be unreliable. Where the complaint of the customer simply involves one of these factors, no service problem exists. Likewise, good fidelity and freedom from blasting at full volume should not be expected from these receivers, particularly if they employ a magnetictype loud-speaker. The customer making complaints which involve these factors is asking too much of his receiver and requires a better receiver to meet his needs.

Common Troubles. The simplicity of the circuits used in universal T.R.F. receivers greatly limits the variety of troubles which may develop. The complaints which will most often be encountered are: *Set is dead; local signals are weak; hum is excessive; set distorts; oscillation (squealing) exists; set operates intermittently.*

Servicing Dead Receivers. When the receiver is dead, determine first of all if the tubes light or warm up. An open circuit somewhere in the series filament circuit is indicated if they do not. Take out each tube in turn and check its filament prongs with an ohmmeter for continuity or test the tube in a conventional tube tester. If tubes are okay, check the filament voltage-dropping resistor with an ohmmeter. If a ballast tube is used for this purpose, inspect its socket connections in order to determine between which prongs there should be continuity. If a line cord resistor is used, check with an ohmmeter between the line cord resistor lead and each prong on the wall socket plug in turn (the plug being removed from its outlet); with the power switch open, or one tube removed, there should be continuity between one of the prongs on the wall plug and the

receiver end of the line cord resistor if this resistor is okay. If there is a shunt resistor across the pilot lamp or lamps, check this with the ohmmeter for continuity. Check pilot lamps also for continuity.

If the set is dead but all tubes light up and test okay, use the D.C. voltmeter section of your multimeter to measure the voltage between the common rectifier tube cathode connection and the timing condenser frame (this always being at B— potential and convenient to reach with a test probe). With the set plugged into an A.C. outlet, you should measure between 90 and 120 volts, while with the set plugged into a D.C. outlet, this voltage may be as low as 85 volts. If no voltage is measured here on D.C., try reversing the position of the line plug; proper polarity must always be observed on D.C.

A low rectifier tube output voltage on A.C. operation is an indication of defective filter condensers. Check each condenser or condenser section in turn, by disconnecting one of its leads and then checking the condenser for leakage with an ohmmeter. If leakage resistance is lower than the

normal value for a condenser of similar size, the condenser is defective and requires replacement. Even if leakage resistance is normal (check the leakage resistance of a new condenser of about the

same size for comparison if you are uncertain), the condenser may still have deteriorated through drying out of the electrolyte, with a resultant lowering of its capacity. Try a new filter condenser at each position in turn, while the old unit is disconnected. Separate 8 mfd., 475 volt test condensers should be kept on hand for tests like this on any receiver. If the rectifier tube output voltage comes up to normal when a new condenser is inserted, this is a sign that the old condenser was defective.

Even when only one section of the old electrolytic filter condenser is bad, a new block should be installed, for there is a good possibility that the other sections of the block will soon fail in a similar manner if left in the receiver. When using a test electrolytic condenser in this manner, you must, of course, observe polarity very carefully, for connecting an electrolytic condenser to a voltage source with improper polarity will in most cases ruin it.

If the rectifier tube output voltage of the dead receiver is normal, check the D.C. voltages between the B— point in the circuit and each plate

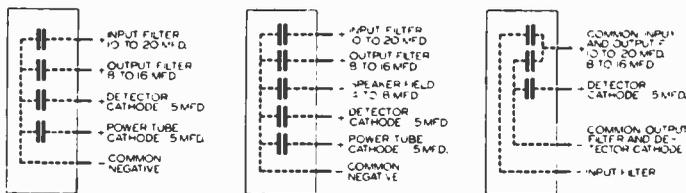


Figure 7

and screen grid *prong* of each tube. Repeat this test for the corresponding tube socket lug; failure of the two readings for any one tube electrode to correspond indicates a break between the lug and the tube socket prong connection, making the installation of a new socket necessary.

Improper voltages on any tube electrode will point to the source of trouble, just as in the case of an ordinary A.C. receiver. The circuit diagrams in this article will give you an idea as to what voltages to expect; obviously the detector tube plate voltage and the control grid voltage on the power tube will be quite low due to the high values of resistance in these circuits.

Simple continuity checks of various receiver circuits often prove the speediest way of locating trouble in a dead receiver. There should be continuity between the rectifier tube cathode and the plates, as well as screen grids, of all other tubes in the receiver, with the exact ohmmeter reading depending upon the sizes of the resistors in the various circuits. There should be continuity from the receiver side of the ON-OFF power switch to the control grids, as well as the cathodes, of all tubes in signal circuits.

Rotor and stator plates of tuning condensers are sometimes shorted together; inspection will often reveal such a short, but if doubt exists, disconnect the coil lead from the stator of each section and check each section individually with an ohmmeter. There should be no continuity between rotor and stator plates of a section.

To check the bias resistors in the cathode leads of the detector tube and the power tube, first disconnect the electrolytic cathode by-pass condensers and then check the resistor with an ohmmeter. These condensers often have sufficient leakage to mask the effect of an open resistor. While making this test, check the leakage resistance of the by-pass condenser with the ohmmeter.

Circuit disturbance tests on these receivers are limited to touching the control grip caps with the finger or removing the caps, for pulling out a tube opens all filament circuits and masks the effect of the test. The above tests should result in location of the trouble in any dead universal receiver which uses a conventional T.R.F. circuit.

Servicing Weak Receivers. Essentially the same tests are made on a weak receiver as on a dead receiver. In addition, the dynamic loudspeaker field coil and its supply should be checked by applying a screw-driver to a pole piece; absence of pull indicates a defective field coil or no supply voltage to it. The continuity of the aerial should be checked with an ohmmeter, and the trimmer condensers should be readjusted for maximum output. Weak reception can often be cured by moving the control grid leads around enough to secure a small amount of regeneration.

It is a good idea to check the line voltage in the customer's home when weak reception is the complaint; if this voltage is below normal, report the matter to the local power company. Ordinarily there is nothing you can do to a receiver of this type to offset low line voltage. Excessively high line voltage is not serious in these small receivers, for the tube filaments and the pilot lamps are designed to stand up under all normal fluctuations in line voltage. With D.C. power lines particularly, the line voltage on peak loads may drop to a point where no reception is obtained, and again the trouble is not the fault of the receiver.

Servicing Receivers for Hum. A certain amount of hum is to be expected in any receiver operating from an A.C. line. Many servicemen forget this fundamental fact and spend hours trying to eliminate perfectly normal hum which they observe after correcting the original defect in the receiver. Hum should never be so loud, however, that it becomes annoying when listening to the program from a local station. Excessive hum is often caused by a reduction in capacity of filter condensers, by a heater-to-cathode short in some tube, by an improper connection of a filter condenser, or by an open control grid return.

Curing Distortion. Improper centering of the loudspeaker voice coil is a common cause of distortion; the usual corrective methods apply here just as in larger receivers. Always try a new output tube when distortion is the complaint, for the great amount of heat dissipated by the heater in this tube often affects other electrodes in the tube.

A leaky coupling condenser between the detector and the grid of the output tube is another likely cause of distortion. If you can measure a D.C. voltage across the grid resistor of the output tube when the positive voltmeter probe is connected to the grid end of this resistor, a leaky coupling condenser is indicated; replace with a .05 mfd., 600 volt cartridge condenser if you cannot determine the value of the original part. Check the ohmic values of the cathode bias resistors, and check cathode by-pass condensers for leakage in the manner already described, for these are also possible causes of distortion.

Distortion often occurs when the volume control is turned up too high when tuned to a strong local station; this is a normal condition due to overloading of the receiver stages or of the loudspeaker, and the remedy obviously is for the customer to keep the volume level below the point at which distortion begins.

Curing Oscillation. A certain amount of oscillation is to be expected in these midget receivers when the volume control is advanced to its maximum setting, for the designers of these sets de-

(Page 11, please)

The Laboratory Page

By GEORGE J. ROHRICH



George J. Rohrich, Engineer
in Charge N. R. I. Laboratory

The purpose of this department is to furnish supplemental experiments to students who have completed their Home Laboratory Course, but who wish additional laboratory experience. You are not required to perform these experiments, but you will gain increased knowledge by doing so.

Most of the material required will be that received as part of the Laboratory Course. Any other material necessary can be purchased very reasonably and will constitute an investment rather than an expense, as it will serve as replacements in service work or be useful in your shop later.

EXPERIMENT NO. 63

Object: To study the action of alternating voltages on a meter which is designed primarily for use with direct current.

Apparatus Required: Power supplied to outlet which is known to be A.C. with voltage between 100 and 120 volts; power limiting panel described for Fig. 83 in a preceding laboratory page; a 10-watt lamp; test wires attached to plug and potentiometer (items Nos. 55, 56 and 13); 0-50 voltmeter (item No. 12); test prods (item No. 8).

Apparatus Assembly: Connect the parts as shown previously for Fig. 83. Plug No. 1 may be inserted and used in socket No. 1 for A.C. in any convenient manner, but it is advisable to insert it in the special way explained for Fig. 81 so the lamp (or lamps) will be in the ungrounded side of the A.C. power line. Place one 10-watt lamp in one lamp socket in this power limiting panel.

Assemble the potentiometer to the plug as shown in Fig. 97 and insert this Plug No. 2 in Socket No. 2 of Fig. 83.

Assemble the test prods to the voltmeter as shown in Fig. 98.

Experimental Procedures: 1. Insert the Plug No. 1 in the Socket No. 1 for D.C.

2. Hold the test prods of Fig. 98 on terminals 1 and 2 of the potentiometer. Rotate the potentiometer dial from 0 toward 100 but restrict this rotation preferably between 0 and 40 in order to prevent overloading the meter. Note the deflection on the meter, whether up-scale or down-scale. Reverse the test prods on terminals 1 and 2 and again note the deflection on the meter.

3. Reverse the Plug No. 2 in Socket No. 2.

4. Repeat Procedure No. 2.

5. Insert the Plug No. 1 in the Socket No. 1 for A.C.

6. Repeat Procedure No. 2 and *carefully* compare with results obtained previously with D.C. applied.

7. Repeat Procedure No. 3.

8. Repeat Procedure No. 2 and *carefully* compare results with those obtained in Procedure No. 4.

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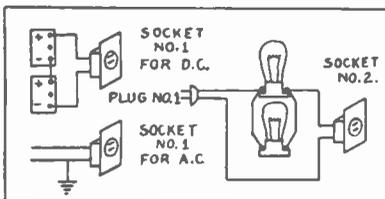


FIG. 83

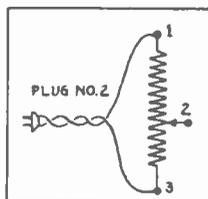


FIG. 97

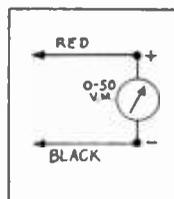


FIG. 98

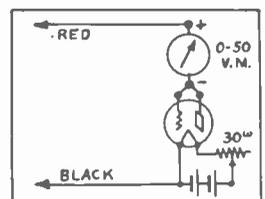


FIG. 99

The Laboratory Page (Continued from page 9)

Observations: 1. Procedures No. 1 and No. 3 allow you to apply D.C. to the potentiometer terminals. The applied polarity in the one case is the reverse of the other.

2. Proof that the polarities are opposite is obtained by the fact that an upscale deflection is obtained in the one case while a downscale deflection is obtained when the test prods are reversed. In order to identify the applied polarity, without tracing out the circuit of twisted wiring to the marked terminals on the batteries, we can trace the shorter path to the marked terminals on the meter. To do this, first hold the test prods on terminals 1 and 2 so an *upscale* deflection is obtained. Then you know from previous experiments that the marked *positive* terminal on the meter connects to that terminal on the potentiometer which is positive. The other terminal, to which the remaining test prod is attached is the negative terminal.

An overload of D.C. on the Readrite type D.C. meters will cause a *downscale* deflection, regardless of the manner in which the polarities are applied. This observation is not made ordinarily until the normal full scale current is exceeded by at least two times. Therefore, in order to guard against an overload, the potentiometer dial rotation is restricted in its movement. The reason the pointer deflects in this manner during an overload with this particular type meter is due to the current in the meter coil temporarily remagnetizing the small permanent magnet attached to the pointer with a magnetic polarity that is opposite to the original during the time proper electrical polarity is applied. The effect is then the same as reversing the electrical polarity. This temporary remagnetizing process only neutralizes the original magnetism while current is flowing. The original permanent magnetism is retained at all times

and functions in the regular manner when the overload is removed.

3. and 4. When Plug No. 2 is reversed, the polarities are opposite. In other words, if terminal No. 1 is *positive* in Procedure No. 2, then terminal No. 1 is *negative* in Procedure No. 3. Of course, it is possible that terminal No. 1 may be *negative* in Procedure No. 2, which means that it will be *positive* in Procedure No. 3.

5, 6, 7 and 8. Upon inserting the plug in the A.C. socket and carrying out the previous procedures, you will find that the pointer on the meter will read *downscale*, regardless of the manner in which you hold the test prods on terminals 1 and 2, or the manner in which Plug No. 2 is inserted in its socket.

This last set of observations clearly shows that the D.C. type meter is not satisfactory for use alone when measuring A.C. voltages because there is no way for obtaining upscale deflections.

The pointer on the meter will begin to vibrate when the voltage exceeds a few volts, further indicating that this Readrite type D.C. meter needs a rectifier in order to make it useful for measurements with A.C.

Explanation: Meters are constructed in various ways for the purpose of obtaining upscale deflections when used with D.C. In general, these meters are not satisfactory when A.C. is applied directly to the meters. Each type of D.C. meter reacts in its own peculiar manner when used with A.C. This experiment shows the peculiar manner in which the Readrite type meter reacts. If you would use another type meter, such as a D'Arsonval type meter, you will get no deflection at all.

EXPERIMENT NO. 64

Objects: 1. To show how a rectifier can be added to a D.C. meter. 2. To study the halfwave type rectifier.

Apparatus Required: Same as used in Experiment No. 63 with the addition of the following: one 4-prong socket; one type 30 or type 31 vacuum tube; one 30-ohm variable resistor; two dry cells.

Apparatus Assembly: Change the connections used in Fig. 98 so you have the meter connected to the vacuum tube as shown in Fig. 99.

Experimental Procedures: Use the identical procedures given in the eight steps for Experiment No. 63.

Observations: 1 and 2. When D.C. is applied to the test prods in Fig. 99, by holding them on terminals 1 and 2, then you will get *no deflection* if the *red* test prod is connected to the *negative* terminal of the potentiometer. This action is caused by the fact that the vacuum tube has the peculiarity of letting a current flow only when the *red* test prod is connected to the *positive* terminal of a voltage source. Therefore, a deflection is obtained only when the proper polarity is applied by reversing the test prods.

3 and 4. The observations are similar to those obtained in the first two procedures, with the exception that the polarities on the potentiometer are applied in the reverse manner.

5 and 6. These observations show that an *upscale* deflection is obtained at all times when using A.C., regardless of the manner in which the test prods are applied to terminals 1 and 2.

7 and 8. These observations are identical with those obtained in Procedures 5 and 6. This shows that polarity does not have to be observed when a D.C. meter is properly connected to a rectifier, during the time that A.C. voltages are used.

Explanation: An alternating voltage is one which reverses its polarity many times per second. The effect of A.C. is the same as *rapidly* repeating Procedures Nos. 1 and 3 over and over again. As this rectifier acts only from half of the total number of reversals of voltage, this is called a half-wave rectifier.

In following experiments we will calibrate this meter for use as an A.C. voltmeter and also study full-wave rectifiers.

Universal Receivers

(Continued from page 8)

pend to a certain extent upon regeneration for high gain. Oscillation at low volume control settings can be due to open by-pass or filter condensers, as well as to failure to use tube shields if they were originally provided. Shielding of the control grid leads of the R.F. and detector tubes, if these leads are over-exposed, or changing the positions of these leads are likely cures. Connecting the aerial to an external ground is sometimes effective in eliminating oscillations. Cramping the aerial into a small space will often cause oscillations; keep this wire stretched out to its extreme length. As a last resort, when oscillation cannot be cured in any other way, detune the trimmer condensers until it ceases.

Intermittent Reception. Any of the usual causes of intermittent reception in radio receivers are to be expected in these midgets, but my experience has shown that in most cases either a defective type 43 output tube or a defective coupling condenser between this tube and the detector stage will cause intermittent trouble. Try a new output tube first of all, then try a new coupling condenser. If the trouble persists, wiggle each of the tubular condensers in the receiver in turn with your hand in an attempt to make the trouble appear. If this is not successful, resolder all connections in the receiver. If the volume control is noisy in its action, install a new control. Check the aerial with an ohmmeter while bending it slowly back and forth through its entire length, for this will sometimes reveal a break.

General Suggestions. Unless you are thoroughly familiar with the socket connections of the tubes used in these midget receivers, always have tube base layouts at hand for ready reference. These layouts are particularly helpful when making point-to-point voltage or resistance tests and when locating various parts in the receiver.

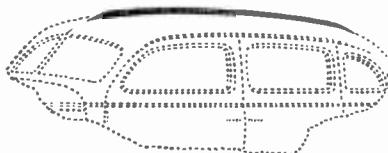
Auto Radio Service Hint

This hint applies only to sets using a tube as a rectifier, not the synchronous vibrator types. Where the plug-in type vibrator is suspected and a trial replacement is not available, A.C. may be used to test the B supply. Connect set in usual manner to a storage battery to supply filaments and speaker field. Connect a 100 watt lamp in series with a test prod to one side of 110 volt line. Connect other test prod to other side of line.

Remove vibrator and touch test prods to outside terminals on primary of vibrator transformer with the receiver turned on. If the set operates, vibrator is probably only trouble. The lamp resistance limits the current for this test.

Unique Molded Auto Radio Aerial Looks Like Part of Car

The Airmaster, a new streamlined auto radio aerial which is encased in a 1½" high molded rubber housing, meets all requirements of perfect auto radio reception without destroying the contour of the car. Running longitudinally along the entire length of the top and tapering gracefully down over the curved end surfaces, it adds a pleasing streamline effect.



The rubber molding and the resulting solid, one-piece construction provides complete protection for the antenna wire in all weather conditions, leaving no chance for rust or corrosion. Installation is simple, as no vacuum cups, insulators or other parts are required for mounting. A tube of special rubber cement supplied with each aerial permits quick, easy cementing of the rubber molding to the roof of any car.

Two standard sizes are made in a standard black finish for use on coupes and sedans. Each antenna is individually boxed with complete, easy instructions for attaching. Literature on Airmaster Aerials can be secured on request by writing to the Renson Products Co., Conshohocken, Pa.

Philco Parts Sales Show Big Gain

Philco's Radio parts division showed, for 1937, more than a 25% increase in sales over the previous year.



From a small room to an up-to-date store on one of the busiest corners in Newark, N. J., within a period of only two years, is the success story of Graduate Edward M. Schminks.

Page Eleven

Sprague Plug-in Type Noise Filter Announced

Sprague Products Company, North Adams, Mass., has introduced a new plug-in type Radio noise filter, having a number of important features. Tests have proved it to be unusually effective in reducing Radio interference caused by electric razors, heating pads, hair dryers, and practically all fractional horsepower electrical motor or vibration devices commonly used in homes or business houses.

Made in convenient round size, 2" long by 1 $\frac{1}{16}$ " diameter, the new Sprague filter can be plugged into any socket conveniently—even in double wall receptacles where the larger size of old style square or oblong filters sometimes interfered with use of the second socket.



The Sprague unit has male prongs of a new and longer type, assuring excellent contact at all times. The female socket at the opposite end is also devised for sturdy contact that will not wear loose.

The filter is designed either for installation directly at the power line outlet of the Radio receiver so that no interference will enter the line cord and be radiated to the set or antenna system; or at the power outlet to which the noise-making electrical appliance is to be attached.

Sprague Filters are attractively packaged in individual boxes with ten boxes packed in a carton especially designed for counter use.

With the tremendous popularity of certain home appliances such as electric razors, dealers and servicemen who feature this new item should have no difficulty in interesting customers who frequently find it decidedly unpleasant to play their radios when these appliances are in use.

Page Twelve

Cover Photo: One-Person Loudspeaker

Outstanding among recent Radio developments is the midget crystal-type "Hushatone" loudspeaker announced by the Brush Development Company of Cleveland, Ohio, for use under a pillow or cushion on a bed, couch or chair, where it can be heard only by the person resting on that pillow. This Brush "Hushatone" unit, small enough to fit in the palm of your hand, enables patients in hospitals and sanatoriums to listen to their favorite Radio programs without disturbing any one else in the room and without having to use awkward and oftentimes heavy earphones. It may be attached to almost any type of Radio receiver by making simple connections to the primary winding of the output transformer and introducing a switch which allows change-over from the "silent" loudspeaker to the regular Radio set loudspeaker. Volume is controlled either by varying the position of the head upon the pillow or by varying the regular volume control on the Radio set.

The illustration on the front cover of this issue shows a Brush "Hushatone" unit attached to a modern personal-type table model receiver being used in a hospital room. Even the smallest type of A.C.-D.C. receiver provides more than ample gain for operation of this sensitive crystal speaker, which is said to have better tone quality than ordinary midget loudspeakers.

— n r i —

Powerful New Canadian Station

One of the world's most modern Radio stations has been erected at Hornby, Ont., Canada, by the Canadian Broadcasting Corporation. The new 50,000-watt transmitter was built at a cost of \$250,000. The giant output tubes especially designed for the C. B. O. cost about \$1,000 each.

So hot do these tubes get that they must be water-cooled. This water is also used to heat the building.

The call letters of this powerful station are CBI. The station is now on the air.

— n r i —

Additions to N. R. I. Ham List

Jerry C. Miller—W9QON—Chicago, Ill.
Earl Martin—W1JFH—Lynn, Mass.
Ben Lane—W4ETY—Dothan, Ala.
David Melvin—W4FBD—Aberdeen, N. C.
Art Leitner—W9QLG—Cannelton, Ind.
Joe L. Stewart—W4EXV—Brunswick, Ga.
Thomas B. Hedges—W8BKE—Cambridge, Ohio.
C. C. Sabor—W9VIZ—Leavenworth, Kans.
Charles Strayer—W3HBC—York, Penna.
Joseph Jernick—W2KLC—Southold, N. Y.
Frank Tucker—VE1KD—Grand Manan, N. B.,
Can.

New Radio Gadgets

Electrolytic condensers mounted on standard 4-prong tube bases so they can be plugged into 4-prong sockets in radio sets and easily replaced when necessary are announced by Tobe Deutschmann Corp., Canton, Mass.

Midget photo-tubes, no taller than match packets, are announced by RCA. Instead of standard tube bases, each tube has a metallic contact button at each end of its glass envelope. Special clip-type mounting sockets are used. There are two models, the RCA-921 gas photo-tube and the RCA-922 vacuum photo-tube.

Carefully selected cactus thorns are being sold by mail order Radio supply houses for use as needles in the pick-up units of electric phonographs.

An entirely new feature in microphone design is the "directivity control" switch found in the new "Tri-Polar" crystal microphone recently announced by Shure Brothers, Chicago, Ill. The switch knob has been designed to appear as an integral part of the microphone case and permits instant selection of uni-directional, bi-directional or non-directional characteristics.

With automatic tuning capturing the imagination of the radio-buying public, the Howard Radio Co., Chicago, Ill., has announced a converter unit which can be attached to any radio receiver, providing automatic push-button tuning for any eight stations. The unit has its own power supply and will operate at any reasonable distance from the receiver.

New cathode ray tubes designed particularly for television reception and known as the RCA-1800 and RCA-1801 kinescope tubes have been made available for experimenters. Both tubes are of the electromagnetic deflection type, the first having a 9-inch screen and the second a 5-inch screen.

An automobile aerial of the fish-pole type, whose height is completely controllable from the driver's seat even while the car is in motion, is the newest thing in the auto radio field. When the aerial is retracted, there is nothing to interfere with the smart lines of the car. The manufacturer is Hugh H. Eby, Inc., Philadelphia, Pa.

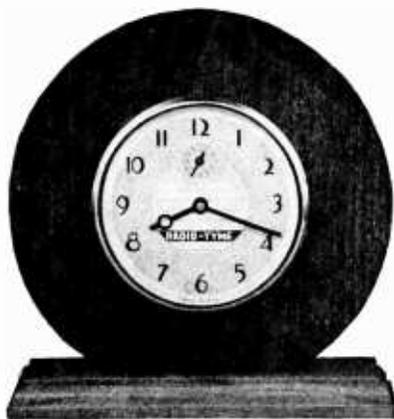
Allied Radio Issues Interesting Catalog

Allied Radio Corporation, 533 W. Jackson Blvd., Chicago, Ill., announces the release of its new 164-page spring and summer 1938 Catalog featuring important new developments in every field of Radio. The Allied book devotes separate sections to Radio receiving sets, service equipment and replacement parts, public address, and Amateur gear. Sent free upon request.

Clock Turns on Radio Set

A new clock developed especially for Radio use has its alarm gong mechanism replaced by a mercury switch which closes at the time indicated by the alarm-set dial. At the back of the clock is an ordinary A.C. outlet, into which a Radio set or any other electrical appliance may be plugged.

The clock is set in the same manner as an ordinary alarm clock; it can be used to turn on the



Radio at the arising hour in the morning, or at any other time of day when a desired broadcast is to begin.

If the Radio set is tuned to the desired station at the time the clock is set, no further adjustment will be necessary when the set is turned on by the clock. This Radio-Tyme clock is made by the Gibb Manufacturing Corp., 216 N. Clinton St., Chicago, Ill.

— n r i —

Thirteen Radiomerriments!

- Amp**—A little devil.
- Cycle**—Motorized horse used by speed cops.
- Magnet**—A tiny worm.
- Ohm**—Where factory men go at five o'clock.
- Sensitivity**—Willingness to fight when insulted.
- Soft Copper**—A good-natured policeman.
- Succup Circuit**—Path traced by a vacuum cleaner.
- Terminal Lug**—A bum in a railway station.
- Toggle**—What the Romans wore.
- Toggle Switch**—Persuader for small children.
- Transformers**—Cosmetics, hair dyes, wigs, razors, etc.
- Variable**—Any woman.
- Zero**—A fiddler who wore a toggle.



L. J. Markus

By L. J. MARKUS

N. R. I. Technical Editor

Micro-wave transmitters, direction finders, program scramblers and a host of other radio gadgets play important parts in this science fiction story of a fiendishly clever criminal who used radio to make himself crime-king of Washington.

STATION WLX was on the air, its carrier waves spreading through the ether as they sought the favor of the vast unseen audience in the nation's capital. The many thousands who scorned this small Washington station were to miss the most sensational mystery ever staged for radio. Real tragedy, not the mock variety, was to ride the air waves tonight.

Speeding toward Washington on the Lee highway was a long, orange-red truck bearing the cryptic insignia "Electronics, Inc." To most people this was simply a delivery truck for a small but prosperous radio service shop bearing the same name, but actually it was a complete traveling electronic laboratory designed by Jay Green, the lean, blonde-haired young engineer whose hobby was the design of new radio and electronic gadgets. At the wheel was Ozzie, the chubby, fun-loving co-partner who converted these designs into neatly-wired actualities. Though equally youthful, he possessed an uncanny ability to handle radio tools.

Jay reached over and tuned their auto radio to WLX, for detective story-loving Ozzie was anxious to hear the debut of a scheduled new mystery drama.

The last strains of a musical program faded away—the announcer made the usual station announcement, then his voice rose to a dramatic pitch for the punch line: "WLX presents—the Murder-Master!"

There was a blare of music from a tinny orchestra; it blended into a queer howl, then faded out altogether. The program seemed to have been cut off, but shortly it came back again. There was new music now, haunting and creepy, fol-

lowed by a sudden clash of cymbals. Then a voice was heard—shrill and cackly, incoherent like the babble of a maniac, yet powerful and insidious.

"Greetings, radio audience! I am the Murder-Master, wholesale dealer in death. In my fifteen minutes on the air tonight I shall entertain you with three murders. At five-minute intervals, men of whom you have all heard—men in Washington who stand in the way of my plans, shall die. I will tell you when they die and where they die; the morning papers will tell you how they died. Congressman Melville Easton, the first on my list, has exactly two minutes to live."

Ozzie tensely gripped the steering wheel as he maneuvered across Key Bridge in the heavy theater hour traffic, enjoying every minute of this drama which was being so realistically reproduced by their specially-built high-fidelity receiver. Jay, however, had a worried expression; his keen ears had detected a queer noise in the background all through the speech—a hiss which he recognized as that of an electrical transcription. Something was wrong, for the newspapers had announced that the play would be enacted in the WLX studio.

Suddenly Jay came to a decision. Reaching under the dash for a hand set, he flipped a switch which placed the truck's powerful short-wave transmitter on the air, then turned on the short-wave receiver also located in the rear of the truck. In fifteen seconds a lamp flashed, indicating the system was warmed up and ready for use.

Now Jay whistled peculiarly into the microphone—five equally spaced tweets. He knew that this

c. Battles Crime with Radio

would connect directly to a telephone line a similar two-way transmitter and receiver in the laboratory of Electronics, Inc., allowing him to make a phone call while the car was in motion. Jay had looked up Congressman Easton's telephone number in the directory always carried in the car; he gave this number to the operator who answered. The call went through, and Jay's grim face relaxed as the butler answered. Impressed by Jay's seriousness, the butler promised to call Easton to the phone immediately.

The Murder-Master seemed to divine Jay's thoughts. *"Efforts to save Easton will fail!"* gloated his eerie voice from out of the loud-speaker. *"I have marked him for death—I, the Murder-Master—and NOW, at this very instant, he is dying!"*

A splitting crackle almost knocked the hand set out of Jay's grasp. He shouted into the mouth-piece again and again, and at last received a terrified answer.

On the car radio, the Murder-Master had again resumed his crazed mumbblings, but now the babble was toned with satisfaction. The two men in the truck scarcely heard the broadcast, as Jay talked again with the butler and Ozzie sought vainly to get the drift of the conversation. Then Jay's features froze, as stolidly he replaced the hand set under the dash and turned to his anxious partner at the wheel.

"The butler didn't reach Easton in time. That sound was made by an explosion which wrecked an entire wing of the house. All that he saw in Easton's study were chunks of furniture flying everywhere."

"And Melville Easton?" asked Ozzie.

"The butler says there was only one place where Easton could have been at that time of the evening. That was in the study!"

Among all the listeners then tuned to station WLX, Jay and Ozzie were the first to know how accurate had been the Murder-Master's prediction—to realize that two more actual murders would take place within the next ten minutes. Here was another case for Electronics, Inc., one which promised to tax their ingenuity, courage and resources to the utmost.

"Head for the WLX transmitter, Ozzie. There's a bare chance we can pick up the trail of this fiend and possibly even catch some of his men

as they leave the station," commanded Jay in crisp tones. Jay reasoned that the transcription was being broadcast directly from the transmitter, for only one operator was on duty there at the time and could easily be overcome. With proper handling of the transmitter controls, the transcription could be put on the air without the knowledge of the large staff at the broadcasting studio, where the original radio drama was undoubtedly being enacted at this time according to schedule.

While Ozzie guided the car across town through heavy traffic, Jay busied himself in the rear of the truck with preparations for the expected encounter with the Murder-Master's henchmen at the transmitter.

Twice more they heard the announcement of a new victim, and each time Jay frantically but unsuccessfully tried to phone a warning. The final triumphant announcement of accomplished crime broke into a screechy jubilation, blended into a sudden crackle of static, then all was quiet for a moment. The silence was broken by a calm, clearly understandable voice saying, "You have just listened to the radio mystery drama entitled 'The Murder-Master.' If you like this new WLX feature, tune in at the same time next week for another surprise."

"That's Dave Higgins, the regular WLX announcer!" exclaimed Ozzie. "Then this was a radio drama after all, and no one was murdered! Those three men must have promised to verify the play as a publicity stunt for this first broadcast." Ozzie looked anxiously at Jay for verification of these words, but Jay soberly shook his head.

"Those crooks simply switched back from the transmitter phonograph pick-up to the studio program line, Ozzie," stated Jay. "Those dramatists at the studio don't know yet that they weren't on the air."

The truck slid to a stop beside the street entrance to the second-floor transmitting rooms of WLX. Across the sidewalk and up the stairs dashed Jay, with Ozzie close behind.

Lights were out in the second-floor hallway, a sure sign that something was wrong. Furthermore, the transmitter room door was locked. At a gesture from Jay, two hundred pounds of Ozzie crashed against the door. It yielded in a shower of splinters, and Ozzie skidded on his nose far into the room.

The scene inside was fraught with danger. Lashed to the chair and securely gagged was the transmitter operator, while at the far end of the room were two masked men, cramming apparatus into satchels. The unexpected arrival of Jay and Ozzie startled the men into grabbing their still-open satchels and diving for the fire escape. Just as the last man vanished through the window, Jay heaved a small black object like a baseball. It landed in a satchel, unnoticed as the man clattered down the fire escape and vanished in the darkness.

Recognizing the futility of giving chase in the darkness, Jay returned to the control desk where Ozzie was holding a greatly swollen nose with one hand and endeavoring to release the station operator with the other. Jay quickly cut the ropes, but the operator could give no information other than to verify what Jay had already surmised. Police arrived, quizzed the three men over and over again, and examined every corner of the transmitter room without securing a single usable clue.

The next day marked steady investigations by the law. They were seeking the Murder-Master through his own crimes, but each retraced trail went astray. In the case of Melville Easton, tiny wheels, pieces of wire and fragments of metal in the ruins of the study showed that some one had planted a bomb in the room and wired it to a time clock. This scheme was almost certain of success, for it was well known that Easton retired to his study at eight each evening to read the newspapers. The other two murders likewise revealed an intimate knowledge of the habits of the victims. There were no clues, no discernible motives for the triple crimes.

While police labored in vain and all Washington buzzed with excitement, the streamlined orange-red Electronics, Inc. truck could be seen speeding back and forth across town from Georgetown to Anacostia, working gradually upward from the Potomac River in five-block steps. As usual, Ozzie was at the wheel. Jay was in the rear of the car, headphones clamped to his ears, making adjustments continually on the control board to which all apparatus in the truck was connected. Atop the truck, supported by a wood framework which could be rotated by means of a hand wheel under the roof, was a unique array of short metal rods arranged to form the antenna system for the special micro-wave receiver now being used to trail the Murder-Master.

The object tossed into the satchel of the fleeing criminal the night before had been a tiny micro-wave transmitter, another product of the Electronics, Inc. laboratory. Vacuum tubes scarcely larger than acorns, and batteries no thicker than lead pencils made possible this unique and compact transmitter which used a half-wave antenna scarcely one inch long and emitted an unmodu-

lated R. F. carrier on a wave length of only five centimeters (two inches). The batteries had an operating life of twenty-four hours, which meant that unless Jay was successful in picking up the carrier signal by nightfall, his one and only clue would be worthless.

Knowing the maximum distance from which the carrier of the micro-wave transmitter could be picked up by the receiver in the car under the most unfavorable conditions, such as when the transmitter was located in a basement or in a steel-framed building, Jay had plotted the route of the car accordingly in order to cover all of Washington and its suburbs.

Hour after hour passed without a recognizable sound from the receiver. There was no stop for lunch, despite Ozzie's protestations. As nightfall approached, the car reached the northern limits of the District, with the men anxious and weary, about ready to believe that the crooks had discovered and smashed their transmitter or had taken it entirely out of the Washington area.

Ozzie headed the car down Military Road into Rock Creek Park. Just as they crossed the creek, Jay sprang to attention and signaled for an immediate stop. A faint whistle could be heard in the headphones; it grew louder as he adjusted the beat frequency oscillator in the receiver. Next he flipped a switch which changed over the antenna from a non-directional to a highly directional array, then grabbed for the wheel above his head and rotated the antenna for maximum signal strength.

"Our transmitter's up there on the hill, Ozzie, back of those trees. Circle around to Rollingwood Lane and we'll take another bearing."

Ozzie did as directed, and now the highly directional antenna pointed an unwavering finger at a large house, almost hidden by the trees and topped by queer serrated stonework and many miniature towers.

"That's Ghordu Castle," exclaimed Ozzie. "It was built by some eccentric millionaire in imitation of an old Scottish castle, along with that gate-keeper's cottage perched atop the gate and that artificial lake below us which looks a little like a moat. He lost everything in the stock market crash and this place has been vacant for the last few years."

Parking the truck on a side street out of sight of the castle, the two men headed into the woods.

At a likely spot where the underbrush came almost up to the walls of the building, they crept up to a window.

From one of Jay's pockets came a thin blue-steel instrument; this he inserted in the crack under

(Page 21, please)

Electronics, Inc. Battles Crime with Radio (Continued from page 18)

the window and skillfully manipulated the tool for a few moments. The tremendous pressure forced the lock to yield, and slowly, inch by inch with scarcely a creak, the window rose. Voices drifted outward; judging from the conversation, the men inside were preparing to leave, and would return at nine that evening to receive new orders from the Murder-Master over a special radio set in the master bedroom. Clearly their voices were heard boasting about the cleverness of their Master in sending out a radio broadcast which only they could understand.

After the men had gone, Jay and Ozzie crawled through the window, located the master bedroom on the second floor, and examined it carefully while using their flashlights as little as possible. In one corner were two satchels which they recognized; from one of these Jay retrieved the micro-wave transmitter. On a table was a cabinet containing what appeared to be an ordinary short-wave receiver. Jay looked this over carefully, noted that the power cord ran near a stack of boxes along one wall, then signaled to Ozzie that they were going back to the truck.

In less than ten minutes they had secured necessary equipment from the truck and were back in the master bedroom again. Working at top speed, they soon had their apparatus concealed in one of the boxes and connected unobtrusively to the nearby power cord. Whatever message the Murder-Master might send tonight, Jay was satisfied that he would learn its import. What he wanted to know now was the location of the transmitter from which this message would be broadcast.

Back in the truck again, Jay substituted a large loop antenna for the micro-wave array on the roof, and tuned the truck's ordinary short-wave receiver to the frequency to which the receiver in the castle had been set. Now all they could do was to wait until the Murder-Master came on the air.

Inside the master bedroom at Ghordu Castle faces became tense as the hands of the clock crept to nine. The man known as Doc, who appeared to be in charge, turned on the radio set and adjusted the tuning dial slightly. There was a whine from the radio. The short-wave broadcast was beginning—a chattering noise that would have done credit to a flock of blue-jays. Doc flipped another switch, and a tiny motor in the rear of the set whined as it came up to speed. The chatter from the radio changed in tone now as the special motor-driven switch cut out parts of the broadcast at regular but extremely short intervals. At last, when the speed of the motor was made exactly correct by adjusting a field rheostat and was synchronized with the signal by rocking the motor frame, a voice predominated—a crackling

tone which brought pleased grins from the listening ex-convicts.

"What a laugh the Master has," commented Doc. "He always cuts loose with it at the start to give us time to tune in."

The voice dropped to a lower pitch and became precise, emphatic in its delivery. The listening crooks drank in every word. At the end of seven minutes the Murder-Master finished with a sudden gloating crackle.

In the meantime, Jay and Ozzie had not been idle. They, too, had picked up the blue-jay chatter on the short waves. It took but a minute to secure a bearing on the transmitter by rotating the loop antenna for maximum output, and again they were in action. If they could reach the end of their radio beam trail before the message was ended, they stood a good chance of learning the identity of the Murder-Master.

Luckily the trail proved short. In Chevy Chase, an exclusive suburb northwest of Washington, the loop aerial pointed accusingly at a home familiar to both of them—the mansion of Parole Board member Graham Thorne. But how could this respected and widely known man be involved in as fiendish a crime set-up as this? Jay had no answer to this question as yet but knew definitely that some one in that house was the Murder-Master.

"Let's get back to the castle and get our apparatus; perhaps it will give us some more clues," suggested Jay as the monkey-chatter broadcast ended.

A few minutes later they were again in the master bedroom just vacated by Doc and his men; here it was but the work of a few minutes to remove the microphone, the electric phonograph turntable and the audio amplifier which Jay had arranged to be turned on automatically when the flow of current through the power cord to the special receiver had actuated a sensitive relay. The mike then picked up all sounds in the room and fed them into the audio amplifier at a level of about -70 db for tremendous amplification. The amplifier output was fed in turn to the recording head, where it made the cutting needle vibrate in unison with the sound signals, cutting sound tracks in the pregrooved aluminum disc on the turntable. Jay noted with satisfaction that the aluminum disc was practically filled.

Back to the truck they went with the equipment, leaving no signs of their presence in the castle, and there they played back the transcription, hearing a repetition of all that the Murder-Master had said. That one aluminum disc gave

them vital facts concerning coming crime.

Tomorrow night, the reigning king of crime intended a stupendous robbery. He had found a weakness in a hitherto impregnable place, the main vault of the Empire National Bank in downtown Washington, and had given to his men instructions for carrying out every detail of the stupendous robbery.

Now Electronics, Inc., had something tangible to present to the law. A single playing of the record in the office of the Chief of Police brought immediate action. Orders were issued to transfer all funds from the bank vault to other locations, to substitute packages of secretly marked banknotes padded with wads of green paper, and to set a cordon of police around the bank. Jay made no mention of the Thorne home to the police, for he knew that such information would be ridiculed and might even invalidate the evidence he had already presented.

Twelve o'clock of the next night found Jay and Ozzie concealed in the shadows of shrubbery on the lawn of Thorne's home, waiting to trap the Murder-Master himself while the police took care of his cohorts. Those who succeeded in escaping the police trap would, Jay believed, report immediately to the Master for protection.

Jay's reasoning proved correct, for soon a car was seen rolling down the alley in back of the home, with lights out. It stopped; two men dashed into the house through the back door. During the excitement inside, Jay and Ozzie were able to clamber up ivy vines to the second floor balcony without being noticed. From this vantage point they could peer underneath a shade into the only illuminated room in the house. Inside were two men, gesticulating wildly in front of Thorne; they were just a few feet from the window, but facing partly away from it. The arm of one hung useless, broken by a gunshot wound, while beside the other was a satchel crammed to overflowing with pads of currency which Jay knew to be loot from the bank vault.

It was but the work of a few minutes for Jay to bring forth a glass cutter, trace a circle on the windowpane, and silently remove the disc of glass with the rubber suction cup taken from his pocket tool kit. He could take no chances of setting off a burglar alarm by attempting to force the window open.

Strapped to Jay's back was a powerful five-meter transmitter; this he switched on after Ozzie had extended the telescoping steel fishpole antenna and plugged its heavily-insulated connecting cable into the transmitter output jack. Anyone coming in contact with that gleaming eight-foot length of steel would be jolted into unconsciousness. The secret of the high voltage and

high power which the transmitter could deliver for short periods of time lay in the super-efficient midget batteries and a self-rectifying vibrator in the power pack.

Carefully Jay gripped the antenna by its insulating handle and inserted it through the hole in the window. Closer and closer to the unsuspecting criminals came the highly charged rod, as Ozzie held his breath in agonized suspense. A calculating glance showed Jay that he could just barely reach the necks of the three men with one swing of the antenna. A flick of his wrist—a cry of surprise from Thorne just before the rod hit him, and then all three were slumped on the floor unconscious. Jay knew they would remain there for at least five minutes before reviving, yet did not care to enter the room because of the burglar alarm system which might summon sleeping assistants of Thorne.

"Now if we can get the police here before those fellows revive, our work will be ended," stated Jay as he plugged a sending key into the transmitter and started this message flying through the ether in dot and dash form:

"QRR QRR any five-meter amateur—notify police immediately that Murder-Master has been captured in home of Graham Thorne in Chevy Chase, Maryland! Instruct police to secure necessary warrants, surround home and capture all who attempt escape!"

Alert radio amateurs and an efficient police radio system brought quick results. Screaming squad cars converged on the house from all directions, and soon all entrances were guarded by armed officers. There was a crash at the front door—gunshots—struggles—and police burst into the second-floor room just as the stunned men began to show signs of recovery. The satchel of bills lying in plain sight on the floor was all the evidence the police needed—in a jiffy handcuffs were on the men, a door to the balcony was unlocked, and Jay and Ozzie were allowed to tell their story.

In the morning papers, Jay and Ozzie were naturally the heroes of the day, with their elaborately-equipped truck and the shop of Electronics, Inc., likewise receiving much publicity. Thorne had confessed, describing scores of robberies planned by him and carried out by paroled convicts entrusted to his care. The three murdered men had independently become suspicious of Thorne's activities and had been demanding investigations; the murders ended this threat of exposure and made the Murder-Master's standing with his own men more secure. All other members of the crime organization had been captured in the trap at the bank, and once again Electronics, Inc. had checked a crime wave which threatened the property and lives of Washington citizens.

Novel Radio Items

—BY L. J. MARKUS—

Television Station Needs Big Staff!

The television station at Alexandra Palace, London, employs a staff of over 250 trained television technicians. This figure indicates a bright future for N.R.I.-trained Radiotricians and Teletricians when television sweeps this country.

— n r i —

African Natives Enjoy Philco Radio!

Somewhere in the African Sudan is a lone Philco radio receiver which plays to almost naked men squatted on the floor, their hair made up in wood ashes and mud, their black faces often painted in grotesque fashion. According to the missionary who operates the radio, nearly all the natives believe the receiver itself makes the music and words; they enjoy the programs, but just can't comprehend the miracle of radio.

— n r i —

English Sell Two-In-One Receivers!

Several firms in England this season are introducing all-wave receivers which function as superheterodynes for long-distance reception but can be switched over to straight T. R. F. circuits for high-fidelity local reception.

— n r i —

Apple Fixes Radio Set!

N. R. I. Student Gordon Carr, of Saskatchewan, writes in to tell about a customer who accidentally discovered that his set would work only when a damp finger was placed on the prongs of one tube.

and then used a slice of apple as a substitute! Mr. Carr found that the tube was defective; replacing it gave better results than did the apple!

— n r i —

Good Guessing!

A letter addressed simply to "Mr. J. E. Smith, Washington, D. C.," by an N. R. I. student reached the National Radio Institute promptly despite the fact that thirty other men in D. C. have the surname "Smith" and the same initials, "J. E.!"

— n r i —

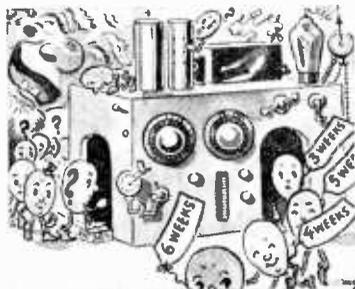
Loudspeakers Replace Church Bells!

The bells in the belfry of many an English church have been replaced by public address systems consisting of a phonograph, pick-up unit and audio amplifier in the church, with powerful loudspeakers in the belfry. Recordings of the original bells are used.

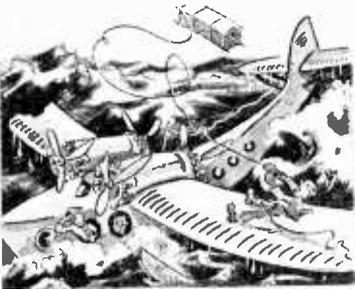
— n r i —

Danger—Low Notes!

A radio receiver having sufficiently good fidelity to reproduce faithfully the low notes of a cathedral organ can actually be dangerous to a home. The powerful bass notes set up sympathetic vibrations in the floors and walls of a room, and these can cause serious cracks and strains if the house is not built as substantially as a cathedral! As yet, radio transmitters, receivers and loudspeakers in commercial use have not approached the danger point.



RADIO REVEALS LETTUCE SEED SECRETS! It is reported that a California farmer measures the capabilities of different batches of lettuce seeds with a special ultra short-wave receiver, then separates the seeds into groups which will mature at definite periods of time.



KITE CARRIES EMERGENCY RADIO ANTENNA! A large waterproof kite, capable of being folded into a 6-foot aluminum mailing tube, has been developed by Pan American Airways for its new clipper planes. In the event of an emergency landing on water, the kite will carry the radio antenna aloft.



ELECTRIC EAR DETECTS INSECTS! In Hawaii, a special contact microphone is being used with a portable high-gain audio amplifier and high-sensitivity crystal headphones to make audible to human ears the noises made by insects as they nibble and move around inside growing fruit and vegetables.



N.R.I. ALUMNI NEWS

P. J. Dunn	President
Dr. Geo. B. Thompson, Earl Bennett	Vice-Pres.
Allen McCluskey, F. E. Oliver	Vice-Pres.
Earl Merryman	Secretary
Louis L. Menne	Executive-Secretary

A MESSAGE FROM THE PRESIDENT OF THE N. R. I. ALUMNI ASSOCIATION

FELLOW MEMBERS OF THE ALUMNI—GREETINGS!



Peter J. Dunn

It is indeed a happy privilege to greet you through the medium of our own NATIONAL RADIO NEWS. First of all I want to thank the entire membership for electing me, for a fourth time, as your National President. I promise you I will strive hard to prove worthy of the trust you have placed in me. I will do every-

thing in my power, with the help of our Vice Presidents, our Secretary and Executive Secretary, the officers of Local Chapters, and with the entire membership of our Alumni Association, to make 1938 the greatest year in the history of this organization.

Much as I appreciate the great honors which you have bestowed upon me, and much as I enjoy the work, I want to declare myself on one important point right now. I shall not be a candidate for re-election next year. I will be heart and soul in the work of the N. R. I. Alumni and will take an active part in whatever duties are assigned to me in the years to come. But I shall not be a candidate for re-election for only one reason. I don't want to be selfish. I realize it is but fair for me to step down to make room for someone of the many men who have served the N. R. I. Alumni Association so well. I want the work of these men to become better known to the members of the N. R. I. Alumni Association. I have monopolized the spotlight long enough.

Let me say again that I am extremely proud to be the leader of such a fine body of men. Much of our enthusiasm for National Radio Institute Alumni Association has been gained from Mr. J. E. Smith, President of National Radio Institute who takes much pride in the N. R. I. Alumni Association because it is a great influence and vital force in helping to bring about conditions decidedly to the advantage of Radio service men.

I am sorry I do not have the opportunity to meet each and every one of you in person. That is impossible, but we can exchange ideas through the medium of NATIONAL RADIO NEWS. I earnestly urge you to take an active interest in the affairs of your Alumni Association. And I again call your attention to the page set aside in this publication for personal comments. The "Here and There Among Alumni Members," has proved extremely popular. Through it we become better acquainted with one another. I read every line of it—I hope you do too.

I shall be glad to hear from any of our members personally at any time. You can address me in care of National Headquarters or at my home, 713 North Fulton Avenue, Baltimore, Md.

Sincere good wishes for your health, happiness and prosperity.

Very truly yours,
PETER J. DUNN, National President,
N. R. I. Alumni Association



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.

CROSLEY MODEL 170 IMPROVEMENTS

To improve the low frequency audio response by-pass the cathodes of the phase shifter and A. F. amplifier type 56 tubes to ground. For this purpose use 25 mfd. 25 volt electrolytic condensers. The tube cathodes are positive, the chassis being the negative condenser connection point. Decreasing the value of the diode load resistor from 500,000 ohms to 250,000 ohms will further improve the tone and will reduce the background noise.

————— n r i —————

EMERSON MOTOR-BOATING MODEL 350AW OR INTERMITTENT

Replace the .01 microfarad 600 volt condenser used to couple the detector to the control grid of the 43. Also reduce the value of the control grid resistor of the 43 to 100,000 ohms instead of 250,000 ohms.

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COLONIAL MODEL 600A INTERMITTENT

Install a new control grid lead for the 6A7 type tube using flexible wire for this purpose.

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COLONIAL MODEL 136 DEFECTIVE 25Z5

Carefully check the electrolytic condensers for leakage. If they are bad install new ones rated at 200 volts D. C. or more. Check the antenna series condenser and if one is not used on the particular receiver in question you may install a .001 mfd. mica condenser or a larger paper tubular condenser rated at 600 volts.

————— n r i —————

COLONIAL MODEL 85 DEAD

When this condition accompanied by lack of plate voltage on the power tubes occurs check the primary of the output transformer. This may be done at the speaker plug, the primary leads connecting to the two small prongs.

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COLONIAL MODEL 36 LOW VOLTAGE

This is generally caused by leaky coupling condensers which place a small positive voltage on

the grids of the 45s thus increasing the plate current. Due to the regulation of the power supply all of the voltages will be decreased. If only one coupling condenser is leaky only a single tube may be affected and withdrawing that tube will allow the receiver to play with but little distortion.

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COLONIAL MODEL 33-34 INTERMITTENT

Carefully check the phonograph switch controlled by the tuning condenser shaft. If it is defective and a phonograph is employed replace the switch otherwise it may be removed.

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SILVERTONE MODELS 1917, IMPROVED 1967 AND 1967A-C TUNING EYE CIRCUIT

The tuning eye control grid lead should be removed from its present position and connected to the end of the 1 megohm A. V. C. filter resistor feeding the 6K7MG control grid.

————— n r i —————

SILVERTONE MODULATION HUM MODELS 1986-1987

Modulation hum which occurs only when a station is tuned in may be eliminated by connecting .05 mfd. 600 volt condensers from each side of the power transformer primary to the chassis.

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SILVERTONE ELIMINATING WHISTLE MODEL 1988 AT 1930 KC.

A whistle due to a beat between the second harmonic of the 465 kc. I.F. (930 kc.) and a 930 kc. signal may at times be experienced. If the customer frequently listens to the station operating on 930 kilocycles you may shift the whistle to some other point where it will not be objectionable. This is accomplished by changing the I. F. frequency of the receiver. Determine at what point between 900 kc. and 960 kc. the whistle will be least objectionable. Divide this frequency by

(Page 27, please)

Here and There Among Alumni Members

Graduate R. Bourret of Miami, Fla., is Flight Radio Officer with Pan American Airways System on Clipper Ships flying to many Caribbean and South American ports. Plenty of adventure and thrills in that job.

Theodore Campbell of Hastings, Pa., was married recently. He is doing fine in his Radio servicing business and now advertises on the screen of motion picture theatres in neighboring towns.

P. E. Armstrong of Jamestown, N. Y., is in charge of Radio servicing for the Turner Radio Shop and has had his salary increased 50% since starting with them two years ago.

J. W. Meadwell has a real partner in his spare time Radio business. It's Mrs. Meadwell. Yes, sir, both are full-fledged graduates of N. R. I. We wonder who is the boss.

Dr. Willehado Torres, San Luis Potosi, S. L. P., Mexico, a physician, is a graduate of N. R. I. and a member of the Alumni Association. He operates short wave station XE2KL on a frequency of 7054 k.c. He will be glad to communicate with any amateurs in the U. S. A.

John Leone of Verona, N. J. reports he is doing well in automobile Radio servicing for Radio Service Bureau, Montclair, N. J.

This is your page for exchanging personal items, fellows. Send them in.

Walter H. Smith of Montreal, Que., Canada successfully passed the examination and has been issued a Certificate of Proficiency in Radiotelegraphy by the Canadian Government.

Howard Spangler of Knoxville, Tenn., who operates Spangler Radio Service Shop, took a long vacation with Mrs. Spangler, at Miami, Fla. He points out that this is one of the advantages of being in business for himself.

Speaking of Spangler, he also sent us a letter he received from student William Lafstrom who enrolled upon the recommendation of Spangler. Lafstrom is elated with his progress. He is a showman and has a troupe of trained monkeys and baboons. He plans to go into Radio full time, as soon as he completes his Course. Stubborn Radios will be a cinch for him.

Graduate Alvin Smith is now associated with broadcasting station KSCJ, Sioux City, Iowa, principally doing transmission work. He has a good job with a fine station.

John A. and James F. Gillespie, 29 year old twins

Page Twenty-six

of Philadelphia, recently graduated and are now ready to expand from a spare time Radio business to full time. A couple of live wires.



For crying out loud! It just leaked out that James G. Hollingsworth of Headquarters and Dorothea Kelly of the Stenographic Department have been married for weeks. Congratulations--and we'll all be up and see you sometime.

And Margaret, Secretary to the Executive Secretary of the Alumni Association, who knows most of the members by their first names also came in one morning to practice a new signature—Mrs. J. J. Mantel. Why doesn't someone tell us these things?

Lester W. Pearce writes to say he is now assistant Radio Operator for the Department of Commerce, Bureau of Air Commerce, Lovelock, Nevada. He has a Civil Service appointment, having passed the examination with a grade of 88%. Mighty nice salary, too.

Ray Meunier who graduated in 1931 operates amateur station OQ5RM and is Chief Operator of the Official Wireless Station of Kindu, Belgian Congo, Africa, where he is employed by the Belgian Government.

K. D. Huddle, who graduated in 1932, is now Engineering Aide with the U. S. Department of Agriculture, Pierre, S. Dak.

Richard Price, Durban, Natal, South Africa, has been made Honorary Secretary for Division Five, of the South African Relay League. Congratulations!

John L. Ambrozich, Chisholm, Minn., is commander of a unit of the U. S. Naval Communications Reserve.

Graduate Dale Hoag of Saginaw, Mich. writes, "I have succeeded in placing two of your graduates in good paying positions with local distributors." That's the spirit, Hoag.

Alison A. Lomax, who has his own business in Spencer, N. C., writes from Havana, Cuba, "Having a great time here in Cuba and Miami. Won't trip selling Philco Radios." And he gives a lot of credit to his N. R. I. training. Nice going, Lomax.

2 which will give you the new I. F. frequency to which the receiver should be aligned. If for example it is determined that a whistle at 915 kc. would not be objectionable the I. F. should be realigned at 915 divided by 2 or 457.5 kc. As this change in intermediate frequency will affect the dial calibration the pre-selector and oscillator must be realigned. Sometimes it is possible to overcome the whistle by using a very short antenna although this of course cuts down on the number of stations which may be received.

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SILVERTONE SPEAKER RATTLE MODEL 1989

There are two adjusting screws at the rear of the speaker and speaker rattle can be corrected by adjusting these screws. Tighten one and loosen the other slightly until the rattle is eliminated.

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SILVERTONE MODEL 1988 HUM

If hum is noted only with the tone control in the bass position it may be eliminated by making the following changes: 1. Remove the .01 mfd. condenser which is connected from the triode plate of the 6Q7MG to a tie lug. This tie lug may be identified by the fact that it connects to the tone control switch. 2. Connect a .05 mfd. 600 volt condenser from the tie lug to the plate of the 6F6MG tube near the 5Z4MG tube. 3. Remove the lead from the 6Q7MG cathode to the tone control switch. 4. Ground the switch lug from which this wire was removed to the ground lug of the broadcast antenna coil.

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SILVERTONE SIZZLING NOISE MODEL 1970

A frying noise in the electrolytic filter condensers may be noticed during the heat-up period if the line voltage is high. No defect is indicated and nothing in the receiver will be harmed. The frying noise however may be eliminated by connecting a 35,000 ohm ohmite "brown devil" resistor across the terminals of the sizzling condenser. This is the input condenser whose case is insulated from the chassis by means of the round fiber washer.

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SILVERTONE MODEL 1970 HUM

Examine the lead to the metal case of the bypass condenser which is connected to one side of the power line. This condenser is located near the center of the rear chassis wall. If the condenser lead is broken it should be resoldered. Also ground one heater lead of the 6C5 tubes to the chassis.

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SILVERTONE MODEL 1970 WHISTLE

Additional gain is obtained in this receiver due to regeneration which is obtained by coupling the output of the I. F. tube to the input of the tube.

The regeneration device is in the form of a wire which is connected at one end to the plate terminal of the 6K7 tube and at the other end to a tie point lug near the first I. F. transformer can. This wire is placed near the plate lead of the 6A7 tube. If the two wires are too close together oscillations will result and a squeal will be heard as each station is tuned in. Simply by bending the wire to the tie lug away from the plate lead the trouble may be eliminated. If this wire is bent too far away some of the normal sensitivity will be lost. By experiment you will be able to find the point at which satisfactory sensitivity is obtained without squealing. For best results the I. F. amplifier should be peaked while you are properly positioning the regeneration wire.

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SILVERTONE MODELS 1905, 1915, HUM 1955-1965

To eliminate hum from these models replace the input electrolytic filter condenser (can insulated from chassis) with a 25 microfarad high working voltage condenser. The original condenser had a capacity of 14 microfarads.

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SILVERTONE MODELS IMPROVED SENSITIVITY 1903-1953

When the customer desires more sensitivity it may be obtained by making certain changes in the receiver which are: 1. The resistor in the plate circuit of the 75 tube should be changed from 100,000 ohms to 250,000 ohms. 2. The 200 ohm resistor in the cathode circuit of the 6B6 tube may be replaced by a 100 ohm resistor. 3. The by-pass condenser connected at the cathode of the 610G type tube may be changed from a .1 mfd. unit to a .03 mfd. unit. 4. After making these changes realign the receiver.

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BALKITE CHARGERS NEW PARTS

Electrolyte for these various units may be obtained from the Chicago Service Station, 230 West Chicago Avenue, Chicago, Illinois. When ordering materials state the model number and if available the serial number of the charger.

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EMERSON MODEL 101-U

The filament voltage dropping resistor for this set is mounted under the chassis and the heat radiated from it often melts the sealing compound in nearby parts causing their rapid deterioration. To eliminate the trouble you may install a line cord resistor. You will note that a section of the original resistor was used as a shunt for the pilot light. This must still be employed and the radiation of heat from it is negligible. Therefore the resistance lead of the new line cord should be connected to the tap on the old resistance unit which feeds the pilot light. A 130 ohm line cord resistor will prove satisfactory.



New York Chapter

Following are the duly elected officers for New York Chapter for the year of 1938:

Joseph Barrette—*Chairman*
Alfred Stock—*Vice-Chairman*
Louis J. Kunert—*Secretary*
H. Struble—*Treasurer*

Our new Chairman, Mr. Barrette, is very progressive, extremely popular with the membership, and we expect him to do much to make our Chapter one of the finest in the N. R. I. Alumni Association.

Our Vice-Chairman, Mr. Stock, is a thoroughly experienced Radio man, a hard worker for the Chapter and not at all new in his position. At various times he has acted as Chairman of the Chapter during the absence of the regular Chairman.

The offices of Secretary and Treasurer were not contested. Both Mr. Kunert and Mr. Struble are very grateful to the members of New York Chapter for the fine vote of confidence which they gave to these two officers by making their election unanimous.

At one of our recent meetings we took up the matter of moving to a new meeting place. Some of the members felt that a more centrally located meeting place should be considered but after some discussion it was decided that we continue to meet at Dumanzeks Manor, 12 St. Marks Place, New York City, and arrangements were made for this hall, on our meeting nights, for the balance of 1938. The Chairman wishes attention called to the fact that the meeting place is at 12 St. Marks Place, New York City, and the street should not be confused with a similar street in Brooklyn.

Plans are well under way for a big, grand rally, at which the principal speaker will be a member of the Technical Staff of the National Radio Institute. Plans for this meeting are not complete as this issue goes to press, but due notice will be given to all members, students and graduates in the New York Metropolitan area.

Our members are greatly interested in our Round Table discussions. They are helpful and instructive. By these discussions we help one another and the less experienced members especially find these meetings very helpful.

Baltimore Chapter

The following officers for 1938 have been installed:

W. W. Jensen—*Chairman*
C. H. Hill—*Vice-Chairman*
I. Willett—*Secretary-Treasurer*
W. Giese—*Editor*
E. W. Gosnell—*Librarian*
C. Hachemeister—*Sergeant-at-Arms*
J. B. Gough—*Finance Committee*
O. J. Ruth, Jr.—*Finance Committee*

It will be seen that Chairman Jensen, who served the Chapter so faithfully during 1937, has been re-elected. Mr. Willett also is an experienced man in the duties of Secretary for Baltimore Chapter. J. B. Gough, a member of the Finance Committee, is the gentleman who was a candidate for Secretary of the National organization of the Alumni Association, and who ran such a strong race against Secretary Merryman.

Mr. Giese is the chap who did such a fine job as Editor of the Baltimore Bulletin and the members are delighted to know this snappy publication is to be revived, with Giese in the right spot as Editor.

Executive Secretary Menne administered the oath of office to National President Dunn in the presence of the members of the Baltimore Chapter and President Dunn, in turn, installed the Officers of our Local.

One of the high lights of our recent meetings was a talk by J. B. Straughn of Headquarters, who lead a very illuminating discussion on "Servicing Universal Receivers."

Remember, meetings are at Fishpaw's Hall, Baltimore and Gilmor Streets, on the first and third Tuesday of each month, at 8 P.M. Students and graduates of N. R. I. are cordially invited.

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Philadelphia-Camden Chapter

Our first big meeting of the year was held at Grand Fraternity Hall in Philadelphia and was attended by approximately a hundred members, students and graduates of N. R. I. It was a huge success, topped off with a fine talk by Mr. Joseph Kaufman, Director of Education, N. R. I., who spoke on Automatic Frequency Controls. Mr. Kaufman's presentation of the subject matter was very thorough and interesting.

A Supreme Fidelity P. A. System was loaned for the occasion through the courtesy of the Radio Electric Service Company, Philadelphia.

Detroit Chapter

Before the meeting and during the intermission, Mr. Hugh S. Scott of Gloucester, New Jersey entertained with a number of selections on the piano. Mr. Clarence Stokes, one of our leading members, presented musical selections through the medium of turntable records, and the above-mentioned P. A. system. The fellows seemed to enjoy these musical presentations so much that it was proposed we have a contest among members for the writing of words to a song fitted to some well known old-time air which would be accepted as the Chapter song, to be sung at all regular meetings. A prize is to be awarded to the member whose presentation is finally accepted.

The main door prize was won by Mr. Miles Bembery of Philadelphia. Other door prizes, one donated by the Radio Electric Service Company, 7th and Arch Streets, one by their branch store at 3145 North Broad Street, and one by the Century Radio Company, 120 North 7th Street, Philadelphia, were won by William E. Lennon, Huntingdon Valley, Pennsylvania, Charles Hickman, Sharon Hill, Pennsylvania, and Samuel Breyer, Camden, New Jersey, respectively.

The following elected and installed officers will serve during the year of 1938:

Charles J. Fehn, *Chairman*
Joseph Strano, *Vice-Chairman*
Allen Schiavoni, *Recording Secretary*
Herman Doberstein, *Financial Secretary*
Clarence Stokes, *Treasurer*
Alfred Wysockanski, *Librarian*
Adolph Zinter, *Sergeant-at-Arms*

Mr. Herman Doberstein was appointed Chairman of the Membership Committee, Mr. Robert M. Senderoff, Chairman of the Entertainment Committee (in charge of speakers), and Mr. Joseph Strano, Chairman of Publicity Committee.

Interesting programs have been arranged for all meetings. They are held regularly on the first and third Thursdays of each month. Temporary headquarters are at 3465 Kensington Avenue, where information as to a more permanent meeting place may be had by telephoning Nebraska 7163.

We Get Around

N. R. I. Alumni Association.
Washington, D. C.

Just returned from a trip to Wake Island by way of the China Clipper. Upon my arrival at the hotel in the island I found a copy of NATIONAL RADIO NEWS, believe it or not. Wake Island is the last stop of the Pan American Airways on the way to China.

CHAS. F. WEST,
San Francisco, Calif.

The following officers have been installed to serve the Chapter during the present year:

F. E. Oliver, *Chairman*
Jesse Perkins, *Vice-Chairman*
C. H. Mills, *Secretary*
William Wallace, *Assistant Secretary*
J. Stanish, *Financial Committee*
W. A. Fischer, *Financial Committee*
Robert Briggs, *Librarian*
Wm. C. Smith, *Assistant Editor*

The Chapter is pleased to report a number of new members, including E. Pike, Wm. C. Smith, Joseph Sperna, Geo. W. Bennett, Wm. L. Moses, Russell Sawyer, Alex Kiscen and Wm. Doner.

At one of our recent meetings a motion picture, furnished by the Ford Motor Company, was shown. Refreshments were served by the Chapter and everyone had a grand time. There is a lot of fine fellowship in the Detroit Chapter and all students and graduates of N. R. I. who live in this area are invited to join us at any of our meetings. They are held on the second and fourth Fridays of each month at 11305 Woodward Ave., beginning at 8:30 P. M.

I Met Mr. and Mrs. J. E. Smith

"To each of us comes at least one opportunity to rise above his immediate surroundings and view this wondrous world from a loftier height. Mine came today. In a few minutes it had come and gone. Gone—but leaving an afterglow of sweetest memories.

"It is futile to try and record the charm of the man, or the loveliness of his wife. After all, I am not a writer. A person who works every day for his livelihood has no business trying to pen sentimental phrases. When he is caught by a gripping human emotion there is pathetically little he can do.

"I met them both for the first time this morning. They were having breakfast in the hotel dining room in Birmingham. I came in answer to a telegram received the evening before. As I looked over the different ones there was no mistaking that face.—I had seen it so many times on the second page of Radio magazines. I walked up to the table, and for the next thirty minutes received a lesson in kindness, courtesy and manners that I shall never forget.

"Fleeting moments later and they rounded the corner in their car. Mr. Smith waved and called 'Goodby Allen,—and they were gone. A lump was in my throat. May God Bless you, Mr. and Mrs. J. E. Smith."

ALLEN MCCLUSKEY,
Birmingham, Ala.
Vice-President, N. R. I. Alumni Association.



Chicago Chapter

The Chicago Chapter recently put into effect a new plan of advertising for securing Radio servicing business. It is known as group advertising.

Roughly, the advertising matter is in the form of a mimeographed circular which can be mailed directly to prospective customers, or distributed in any other efficient manner. These circulars are supplied to chapter members at cost.

This advertising stresses the policies of N. R. I. Alumni Association and what membership in this organization means. It points out that members maintain a high standard of efficiency and fair dealing with a guarantee of absolute satisfaction to its customers. It is not necessary to add that the members are required to live up to this standard 100%.

Membership in an organization of technicians, even though the customer may never have heard of that particular organization, is evidence of competence and responsibility, and prospective customers are greatly reassured by it. This plan helps to overcome the hesitancy a customer might have when doing business with a serviceman for the first time.

When the public has been educated to the N. R. I. A. A. and the standard which it maintains, N. R. I. A. A. members will have little difficulty in obtaining business. It remains for the N. R. I. A. A. to keep up the fight for high standards and for its members to continue to keep them in mind in every contact with the public. The group plan of advertising is a very interesting experiment and should prove highly effective.

Chicago Chapter, always progressive, has another plan for stimulating interest in meetings. A question box has been provided to receive written questions. After disposing of the business at hand, the question box is opened and enough material to keep things lively for several hours is always assured.

Chairman Bennett has been giving some very fine lectures on aligning supers, covering his subject thoroughly and passing out some valuable tips and short cuts, which have made a big hit with the membership.

Chicago Chapter publishes its own bulletin, known as Chicago Chapter Chatter. It is admirably edited by the very capable C. B. Morehead, who is one of the pillars of the Chapter. The Technical Editor is Chairman Earl R. Bennett, whose name seems to crop up constantly because he is always in the front line whenever there is anything to be done. Incidentally, the Chicago Chapter Chatter is quite a technical paper in itself.

The Chicago Chapter meets on the first and third Friday of each month at 8:30 P. M. at the Hotel Sherman.

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Directory of Chapters

Baltimore—I. A. Willett, Secretary, 2411 Arunah Ave., Baltimore, Md.

Philadelphia-Camden—Clarence Stokes, Treasurer, 3405 Kensington Ave., Philadelphia Pa.

New York—L. J. Kunert, Secretary, 66-11 74th St., Middle Village, L. I., N. Y.

Buffalo—T. J. Telaak, Chairman, 657 Broadway, Buffalo, N. Y.

Toronto—Ed. Witherstone, Secretary, 363 Nairn Ave., Toronto, Ont., Canada.

Chicago—Sam Juricek, Secretary, 4223 N. Oakley Ave., Chicago, Ill.

Pittsburgh—Albert Maas, Secretary, 9 S. Howard Ave., Bellevue, Pa.

Detroit—C. H. Mills, Secretary, 5458 15th St., Detroit, Mich.

Page Thirty

Directory of Officers

(To Serve Until January, 1939)

President—P. J. Dunn, Baltimore, Md.

Vice-Presidents—

Earl Bennett, Evanston, Ill.

F. E. Oliver, Detroit, Mich.

Dr. Geo. B. Thompson, Los Angeles, Calif.

Allen McCluskey, Birmingham, Ala.

Secretary—Earl Merryman, Washington, D. C.

Executive Secretary — L. L. Menne, National Headquarters, Washington, D. C.

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"To cultivate fraternal relations among the Alumni of the National Radio Institute, to promote the welfare of each alumnus by interchange of helpful information, to foster the spirit of unity and loyalty to our Alma Mater."



We're Glad You Added "After First Reading"

Prefers Present Method for Service Forum

Regarding Mr. Wm. A. Beasley's item in the Mail Bag of February-March issue. He wants our service formulas printed on both sides of same leaf. Now, I always paste each formula on a separate sheet of my own along with other formulas for Radios of same make so as to save time when looking for information on certain makes of sets. I like your present way of doing it, by printing matter of no consequence after first reading, on reverse side of formula sheets.

With reference to the "Service Forum," the plan Mr. Beasley suggests was previously followed in the News. I personally feel that the present set-up is far superior.

I believe that by clipping out these service hints, pasting them on sheets and filing them alphabetically according to the name of the set in a loose leaf binder, it is easy to get the desired information. If it is a Phileo you have for repairs, look up the "Phileo" page and there you have all the service hints on those receivers. Mr. Beasley suggests that they be printed on both sides of the sheet so they can be filed. That would mean looking over every sheet to get the desired information, as there is no alphabetical order to the service notes as published in the magazine.

I agree with Mr. Giles and Mr. Kuntz about Electronics, Inc.—may we have more of same.
ALFORD CORNICK,
St. James, Mo.

HILBERT E. GLADE,
Milwaukee, Wis.

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Mr. Guichard Agrees with Mr. Beasley

Forecast Is "No Change"—No Storm Predicted

Here's a second to the motion of Wm. A. Beasley of Red Boiling Springs, Tenn., concerning the placement of the service formulas on both the back and front of the same leaf. It would be a big improvement and would eliminate the necessity of putting two leaves in a service manual.

I believe that the majority of our readers prefer the Service Notes as they are. They can be clipped out and pasted on cardboard in alphabetical order by name of set, and in this way make a more practical system than filing the whole page. A change from the present system would bring in a storm of protest. I strongly believe.

The article on Antennas in the February-March issue of the News was very interesting and helpful. I wish to see more "dope" on both transmitting and receiving antennas.

HENRY S. GUICHARD,
Everett, Washington.

MATT A. CIGELSKI,
Three Lakes, Wis.

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The Editor Likes You Too, Mr. Brunel

Real Stuff Indeed—and More to Come

I received my first copy of NATIONAL RADIO NEWS, and am more than delighted with it. The magazine is a complete surprise to me and I must say that I sat up 'till the early hours reading every word of it. The reading matter is both interesting and instructive.

Congratulations to you on your December-January issue of NATIONAL RADIO NEWS. The article on "Automatic Tuning Is Here to Stay" by Mr. Dowie was real stuff. Let's have more of these splendid up-to-the-minute articles. Every success to your magazine.

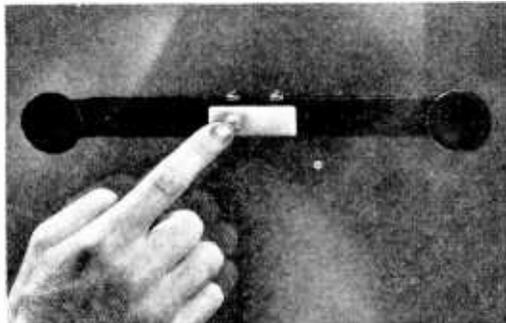
J. E. BRUNEL,
Ramsayville, Ont., Canada.

MAURICE E. MERCER,
Vancouver, B. C., Canada.

Pressure on Glass Window Operates Phantom Control Switch

Do you know that you can tune a radio set to any desired local station simply by pressing with your finger at the proper location on a plate glass window?

This amazing feat is made possible by the Phantom Control, a simple gadget which consists of a sensitive micro-switch mounted in the center of a short length of channel iron. Rubber suction cups, one at each end of the Iron bar, fasten the unit to the inside of the show window. When



Courtesy "Radio Retailing"

The slight bending of this plate glass window under the pressure of a finger is sufficient to operate the Phantom Control switch mounted on the inside of the window.

properly adjusted by means of a thumbscrew, a slight pressure of the hand on the outside of the window will bend the glass enough to actuate the switch.

For an attention-attracting show window display of a modern receiver having motor-driven push-button tuning, one Phantom Control is required on the show window for each push-button on the receiver. The terminals of a phantom switch are connected in parallel with the contacts of each of the receiver push-buttons; if fine enameled wire is used, it will be practically invisible and onlookers will be further mystified.

Signs should be used to indicate the station controlled by each switch. The receiver must, of course, be prominently displayed in the show window, with a loudspeaker placed outside the store door or above the window so it can be heard by people on the sidewalk. A showcard reading, "Press on glass over button of desired station to tune receiver," will give sufficient instruction.

Phantom Controls are obtainable from Andrews & Perillo, 39-30 Crescent St., Long Island City, N. Y. The switch contacts are rated at 10 amperes for 120 volts A. C., and at 100 watts for D. C.

Page Thirty-two

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FROM N.R.I. TRAINING HEADQUARTERS

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S. M. ARMSTRONG, MANAGING EDITOR

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Index

Article	Page
Servicing Universal A.C.-D.C. Receivers ..	3
The Laboratory Page	9
Cover Photo—One Person Loud Speaker ..	12
Data Sheet—Fada Models 360-370	13
New Radio Gadgets	15
Electronics, Inc.	16
Data Sheet—Emerson Model Q157	19
Novel Radio Items	23
Alumni News	24
The Service Forum	25
Here and There Among Alumni Members	26
The Mailbag	31