DEC. 1936-JAN. 1937

Vol. 7 No. 6

IN THIS ISSUE:

The Yuletide, for some reason, seems to intensify our lot in life. If we have a sorrow, it is much worse around Christmas than at any other time; if we are blessed with good fortune in one form or another, it is increased tenfold during the Holidays.

Just why this is so I am not prepared to say but it is nevertheless true that at no other time can we so fully appreciate security and material possessions, for it is through them that we can give ourselves over to the goodness and fullness of life during the Christmas Season and help brighten the existence of others around us who are perhaps less fortunate.

To just the extent that you have made yourself valuable and forced the world to recognize that value, to just that extent can you enjoy the season through the fruits of your labor—income, security, comforts and luxuries for you and your family. If you have a good measure of these, then rest content and enjoy them to the full, for you have earned them.

If prospects for such a Christmas are not so cheerful—whether because of misfortune during the year, or because you have not done your best and made greater effort—then resolve that *next* year will hold a Yuletide of prosperity and plenty for you and yours.

The Staff of the National Radio Institute extends to each and every N. R. I. student:

"A Very Merry Christmas and A Happy New Year"

J. E. SMITH, *President*
E. R. HAAS, *Vice-President*

Television Progresses

The Television Division of the Don Lee Broadcasting System staged a noteworthy demonstration when, for the first time, the "sound" phase of a newsreel was broadcast over KHJ, the "sight" portion over W6XAO, simultaneously, and the united sight-and-sound picked up at a private residence, 3½ miles from both transmitters. The demonstration was given as a feature of a special joint meeting of the Los Angeles sections of the Institute of Radio Engineers and the American Institute of Electrical Engineers.

The location of the Television receiver with respect to that of the transmitters is especially significant. Says Harry R. Lubcke, Director of Television of the Don Lee Broadcasting System. "It is notable that the receiver location is behind two hills, as viewed from the transmitter. This is an 'unfavorable' Television location, because of the straight-line propagation characteristic of ultra-short Television waves, and is equivalent to a more accessible location at two or three times the distance."

Of exceptional interest to the assembled engineers was Lubcke's emphatic statement that, "It will not be possible to receive sound and Television on the present Radio receivers. They are capable of receiving only sound and can never be adapted to receive Television. Television requires wide frequency bands; sound Radio does not. Just as a truck requires a large width of road for its passage, and a bicycle does not, so it would be impossible to drive a truck down a narrow alley wide enough only to pass bicycles."

Information on how Television images may be received can be secured by addressing a stamped, self-addressed envelope to:

Television Division
Don Lee Broadcasting System
7th & Bixel Streets
Los Angeles, California

American Methods Impress Australian Condenser Manufacturer

The fact that a manufacturer travels half-way round the globe in order to study American Radio production methods and to purchase American machinery, speaks volumes for our Radio technique.

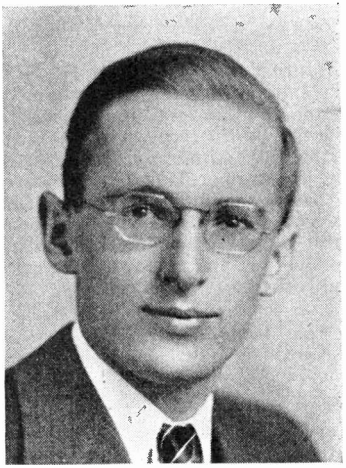
F. W. Clarke, Managing Director of the Continental Carbon Co., Melbourne, Australia, has just completed his stay in this country and left for home. For more than two months Mr. Clarke has been studying the electrolytic and other condenser production methods of the Aerovox plant in Brooklyn, N. Y., under whose patents and processes he is to manufacture corresponding products in far-off Australia.

"There is no doubt but that you Americans lead in the mass production of really good Radio products at attractive prices," Mr. Clarke states. "That is, why we Australians turn to you for methods and machinery. Because of the high transportation costs and strict restrictions on foreign manufactured goods, we are obliged to make our own Radio components and sets in Australia, and therefore seek the means of duplicating American products. Our company manufactures condensers and resistors under American licenses and with American machinery and methods.

"The Australian Radio art is closely patterned after American practice. We follow the same general designs and make use of American type tubes. Because of our isolated position in the world, far away from our English-speaking friends in Great Britain and the United States, whose broadcasts we want to hear, our Radio sets must necessarily be highly efficient. For that reason the bulk of our Australian set production is of the better grade, and most sets are bought with the understanding that they can tune in your West Coast stations with fair regularity, which means an average distance of over 8,000 miles. That is a challenge to any set manufacturer."

The Aerovox Corporation also announces the issuance of their new and enlarged catalog, covering an extensive line of condensers and resistors for Radio and allied applications.

The outstanding feature is an entire section devoted to exact duplicate replacement condensers, listing standard sets and their condenser replacements, in order that the serviceman can secure replacements precisely matching original equipment. Many new condensers are announced for the first time. Extensive price reductions reflect the popularity of certain standard items. A copy of the catalog may be obtained from the local Aerovox jobber or by writing the Aerovox Corporation, 70 Washington St., Brooklyn, N. Y.



L. J. Markus

Building "Scottie,"

By L. J. MARKUS,
N.R.I. Associate Technical Writer

Meet "Scottie," a genuine radiofied dog! Turn that shiny black knob just back of the head and his cheery brown eyes light up in friendly greeting; in a few seconds "Scottie" begins to sing, for he's always tuned to a station. Flip his tail back and forth and you hear other stations—four of them—all perfectly tuned in by the wagging tail.

The body of "Scottie" is made from quarter inch plywood, to the dimensions given in Fig. 1, while the head is made from one inch (actually ¾" thick) pine or hardwood pieces glued and nailed together as indicated in Fig. 2. Pilot lights mounted behind glass marbles provide the cheerful twinkle in the eyes. The power switch is

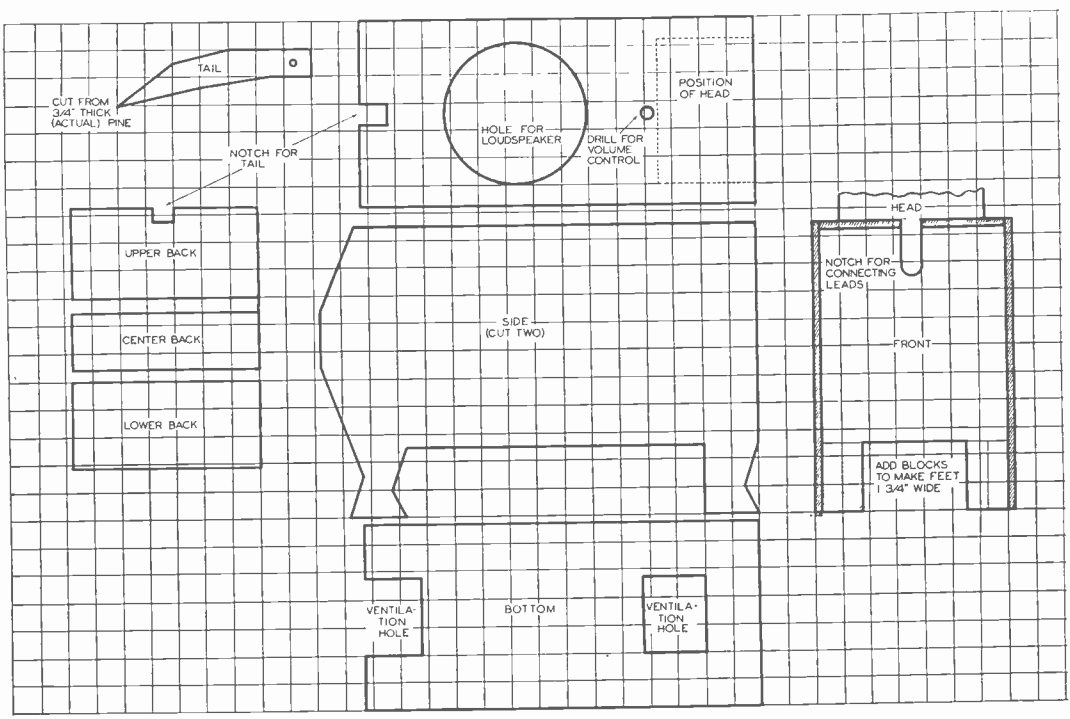


FIG. 1. Dimensions for any pieces needed in building the body of "Scottie" can be obtained from this diagram by counting the squares covered by that piece, for each square represents a distance of ONE INCH on the finished piece. Sides cover top, back, front and bottom pieces; head fits over and is attached to top piece. Loudspeaker, volume control switch and selector switch are mounted on top piece. Cut holes in bottom of body for ventilation, locating one hole directly under the power transformer. If chassis is attached to top of body with strap metal as shown in Fig. 3, entire receiver can be lifted out of body by removing a few screws at front and rear.

A Novel Radio Cabinet

mounted on the volume control; the only other control is the tail, which operates the station selector switch. Four pairs of midget trimmer condensers, each pair tuned to a particular station, replace the usual gang tuning condensers; once these condensers are set, tuning is accomplished automatically by changing the position of the tail. Since midget receivers are seldom used for distant reception, the four-station tuner is quite satisfactory in most cases; of course, any other number of stations can be received by adding or decreasing the number of pairs of trimmers and changing the number of switch contacts to correspond.

The completed cabinet appears in Fig. 3. Any good midget receiver can be built into this cabinet; choose one having a long, narrow chassis not much more than six inches wide if you are building the cabinet to the dimensions given on the diagrams. Either a four or five tube T.R.F. or superheterodyne circuit having two tuned stages will be satisfactory; the speaker should not be more than six inches wide. Although the receiver shown in Fig. 4 is an experimental set (a four-tube superheterodyne), you will find it cheaper and more satisfactory to use a factory-built radio chassis for this project. Only a few changes need be made.

Remove the combination volume control and power switch from the chassis and mount it just

(page 6, please)

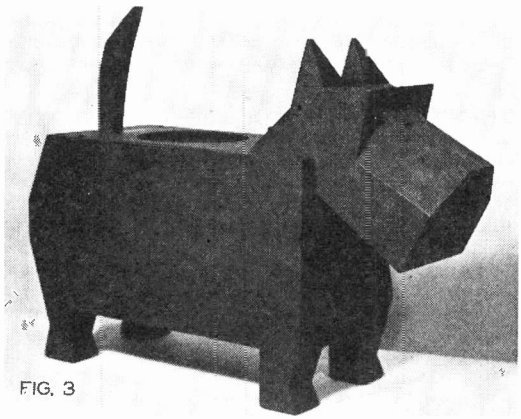


FIG. 3

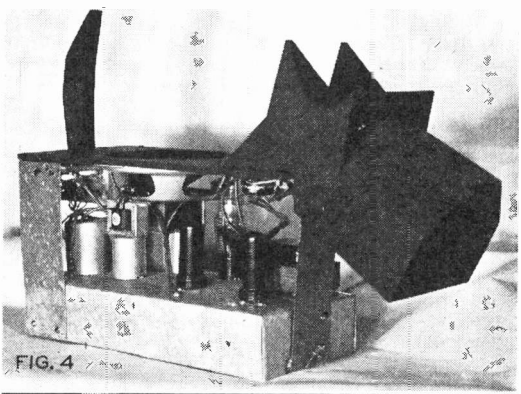


FIG. 4

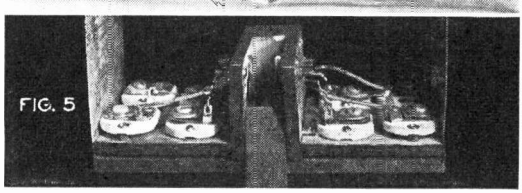


FIG. 5

FIG. 3. The completed "Scottie" dog cabinet. Note that the head is narrower than the body. The tail flips back to an angle of about 45° with the vertical.

FIG. 4. Chassis, top of body and head lift out of cabinet.

FIG. 5. One way of making your own selector switch for tuning. Trimmers are mounted underneath tail.

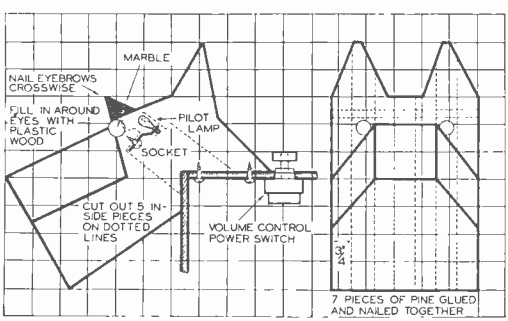
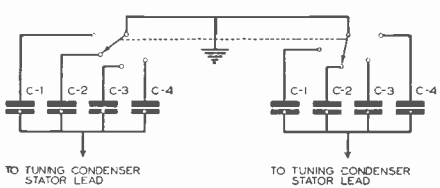


FIG. 2. Construction of head; each square represents ONE INCH. Pilot lamp sockets are mounted directly behind eyes, in hollowed-out central part of head. Dotted vertical lines in front view of head indicate how head is built up from seven pieces of ¾" thick wood.

FIG. 6. (below) Schematic diagram showing how trimmers are connected to receiver and to selector switch. Regular gang tuning condenser can either be removed from chassis or disconnected and its plates wedged tightly in the minimum capacity position. Suggested trimmer condenser values are: C1—7 to 80 mmfd.; C2—27 to 180 mmfd.; C3—27 to 180 mmfd.; C4—90 to 400 mmfd.



Build "Scottie" A Novel Radio Cabinet (Continued from page 5)

back of the dog's head, reconnecting it with long flexible leads. Connect the two pilot lights (in the head) together in parallel, then run two leads, twisted together, to the filament terminals of the power transformer. The pilot lights should be of the same voltage as the tube filaments.

The loudspeaker can be mounted either on top or on one side of the cabinet, whichever is more convenient. A five-inch diameter hole cut in the cabinet will be about right for a six-inch speaker. If ordinary tuning is desired, simply mount the dial on the side of the cabinet in the proper position. The tail tuner is not hard to make; however, you will need one pair of trimmer condensers for each station to be received, and a two-gang rotary switch having as many pairs of contacts as pairs of trimmers. The two-gang tuning condenser is not used in this case. An 11-pole double-throw rotary switch, available at radio supply houses, can be used in place of the home-made switch if the set is to be tuned by "wagging" the tail; use as many contacts as are required. This receiver could also be made to tune when the tail is twisted by making a few changes in the tail mounting scheme.

Stations in the upper third of the broadcast band (highest frequencies) can be picked up with a pair of 7-80 mmfd. Isolantite trimmer or padder condensers; stations in the lower third of the band will be heard with 90-400 mmfd. units or smaller trimmers connected in parallel with fixed mica condensers. Middle-band stations will be heard with 27-180 mmfd. trimmer condensers. The pairs of trimmer condensers are mounted on plywood pieces, one condenser of each pair on either side of the selector switch.

If you prefer to make your own tuning switch, cut two contact arms from spring brass and mount one on each side of the lower end of the tail, so the lower ends of the arms swing over four pairs of V-notched bolts as the tail is moved. Use ordinary 6-32 machine screws, filing the notches with a three-cornered file. Changing the position of the tail grounds a terminal of one condenser on each side of the tail at a time, the contact arms being grounded to the receiver chassis by a flexible lead. Naturally this type of switch can be used only where the receiver originally had a two-gang tuning condenser. Figure 5 is a photograph of this switch, while connections to the switch are given in Fig. 6.

Antenna, ground and power cord leads are run out through a hole in the front cabinet, just under the dog's head. In many cases no antenna will be needed; experiment with various combinations of antenna and ground, and try connecting the receiver antenna post to one side of the power line through a .005 mfd., 400 volt cartridge condenser.

In setting the tuning condensers, use a very short screw-driver with an insulated handle, so body capacity will not affect the settings. Adjust each pair carefully for maximum volume, checking the programs heard against another receiver to be sure you are getting the desired stations.

Here are a few hints regarding the head: Cut the pieces to shape with a coping saw, cutting out the inside portions on all but two of the pieces to provide room for the pilot light sockets, then fasten the pieces together and cut out the ears and nose bevels with the saw. Smooth out irregularities with a sharp plane blade or a flat file. The eyebrows are made from a separate piece, nailed crosswise to the head. Drill holes for the eyes, set in the marbles and fill in around them with plastic wood.

Sand down all parts of the cabinet carefully and apply an enamel undercoat (a white enamel) which seals the pores of the wood. Sand this down lightly with fine wet-or-dry sandpaper, using water liberally, then wipe off carefully and apply one or two coats of *dull* black enamel.

This completes the construction of "Scottie." You will be agreeably surprised with the tone quality obtained with this cabinet, for the baffle area is the equivalent of that provided in many of the higher-priced receivers.

Have You Ever Wondered About This?

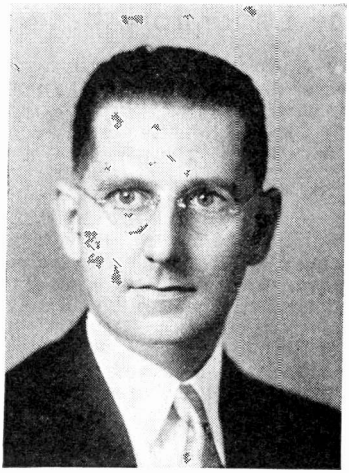
Is there a theoretical limit to the number of Radio receivers which can receive a broadcast from a particular station, asks a Radio fan of General Electric's engineers. By rough calculation, engineers have estimated that within a 100 mile area of WGY in Schenectady, it would be eight hundred billion. That number of sets all working at once in the area would probably absorb the energy output of the station; but there are approximately only a billion people in the world, so there seems no danger of this ever happening.

The Laboratory Page

By GEORGE J. ROHRICH

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.



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

EXPERIMENT NO. 53

Object: To show that a coiled resistor conducts direct current better than alternating 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. 81 and Fig. 82 in preceding laboratory page; a 10-watt lamp; test wires or test prods attached to plug; audio frequency transformer (Item No. 24); an extra socket connected to two 45-volt batteries (or any combination of batteries of the A, B or C battery variety for providing 90 volts to 120 volts D.C.) Of course, if you also have 110 volts D.C. available at an outlet then the batteries are not necessary.

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. or D.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 power line. Insert the plug with test wires in socket No. 2. Place one 10-watt lamp in one of the lamp sockets in the power limiting panel.

Experimental Procedure:
1. Insert Plug No. 1 in the socket No. 1 for A.C.

2. Touch the two test prods together and note that the lamp lights.

3. Hold the test prods on terminals P and B of the audio transformer (Item No. 24) and note that the lamp lights again although somewhat more dimly.

4. Remove plug No. 1 from the A.C. socket and insert it in socket No. 1 for D.C.

5. Repeat experimental procedures Nos. 2 and 3, noting in each case that the lamp lights. It is advisable to make these tests with D.C. of short duration as the drain of approximately 50 to 90 milliamperes from the batteries for lighting the lamp will quickly exhaust the small cells used regularly in B and C type batteries.

6, 7 and 8. Repeat experimental procedures Nos. 3, 4 and 5 while holding the test prods on terminals F and G of the audio transformer. Allow these tests Nos. 6 and 8 to remain connected for longer periods than for tests 3 and 5.

Observations: The observations from tests Nos. 3 and 5 allow you to draw your own conclusions that current from an A.C. or D.C. source will pass through the wiring of the transformer winding, proving that the wiring is continuous. However, the lamp will light brighter when using D.C. than when using A.C. Here we note further peculiarities which I mentioned in Experiment 51 would exist. Peculiarities like these are called "properties." One prop-

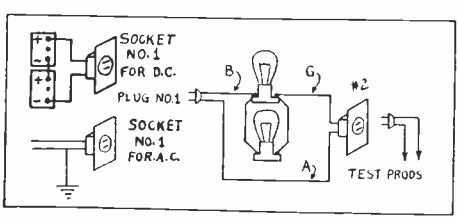


Fig. 83

(*Page 8, please*)

The Laboratory Page (Continued from page 7)

erty of this wire is that it conducts A.C. with greater difficulty than D.C. Another property of this wire, which we will not attempt to prove, is that it would light the lamp as bright with A.C. as with D.C., if the wire were not coiled.

In Experiment 51 I pointed out the difference between the "conducting ability" and the "resisting ability" of a wire. If we measured the "resisting ability" of this wire between P and B on the transformer while it was not coiled we would find that it has a value of approximately 600 ohms for A.C. as well as D.C. Even when the wire is coiled it has a "resisting ability" of 600 ohms for D.C. However, with 60 cycle A.C. it has a "resisting ability" of approximately 5500 ohms.

We must therefore distinguish between these two kinds of "resisting ability." This is done by naming the one property "resistance," which identifies the "resisting ability of the uncoiled wire." The other property is named "reactance" and identifies only the "resisting ability of the coiled wire."

A careful consideration of our case shows that this coiled wire is a *combination* of "resistance" *and* "reactance." So we must use a third name to identify this combination of "properties." This combination is called "impedance."

I can now tell you that the resistance of the wire has a value of 600 ohms and that the impedance of the wire has a value of 5500 ohms for the 60 cycle per second A.C. Had we used a wire with less than one ohm "resistance," but coiled in the same manner, then the "impedance" would be 5460 ohms. This value of 5460 ohms can be called the "reactance" of our coil between P and B on the transformer because it is that property which identifies only the "resisting ability of the coiled wire."

Should you test this coil between P and B on the transformer with 25 cycle per second A.C., you would find that the impedance has a value near 2300 ohms and that the reactance has a value near 2230 ohms. In other words, you would expect and then find that the lamp lights brighter while testing with 25 cycle per second A.C. than when testing with 60 cycles per second A.C.

Similar observations are made while testing the coil which connects to F and G on the transformer. The lamp lights brightest when testing with D.C. The lamp does not at once light to the greatest degree of brilliancy even when using D.C. This last peculiarity is due largely to another property of the wire being coiled. This property is called the "inductance" of the coil. Its presence is noted more easily in test No. 8 than in test No. 5 because the wire is coiled more between F and G than between P and B.

When the D.C. is first applied, the rush of current builds up a magnetic field which changes in its strength. This changing magnetic field induces a voltage in the coiled wire which opposes the voltage applied from the battery. Very little current flows during this period so the lamp fails to light until the magnetic field ceases to change. Then the resistance of 3000 ohms alone prevents additional current being conducted through the lamp.

It is the "inductance" property which also accounts for the change in reactance values when using 25 c.p.s. and 60 c.p.s. A.C.

An interesting peculiarity to be noted by those interested in working with arithmetic is that the numbers which represent the "inductance," "reactance" and "frequency" may be multiplied together and divided in a certain way so the answer will always produce the number 6.28.

When we measure the "inductance" in "henries" and the "reactance" in "ohms" and the "frequency" in "cycles per second" and carry out the procedure of multiplying and dividing their units as shown below, then we always get the number 6.28 for an answer. In other words:

$$\frac{\text{Inductive reactance}}{\text{Frequency} \times \text{Inductance}} = 6.28$$

As the above equation has been proved to hold true under all conditions we can find the number of units in one of the properties provided we know the value of the units of the other two properties. Such an equation is:

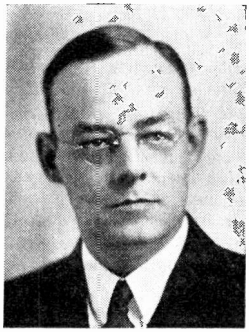
$$\text{Inductance} = \frac{\text{Inductive reactance}}{6.28 \times \text{Frequency}}$$

I am sure you will agree that these facts are very interesting. It is not necessary to memorize these equations; they are given only for the purpose of showing the relation existing between two or more properties and if you understand this relation then this is all that is necessary.

You will now understand that I use this last equation and find that the inductance of the smaller coil has a value near 14.5 henries.

I had difficulty in measuring a noticeable current when using 60 c.p.s. in the laboratory with the larger coil. So I can only estimate that the reactance of the coil for 60 c.p.s. is greater than 40,000 ohms and that this would make the inductance have a value greater than 100 henries.

From this you can readily see why the lamp will not light when testing the larger coil with A.C.



The Service Forum

Conducted by

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

I wish to thank students H. Strickland, H. A. Jenkins, B. J. Valour and M. C. Rhynes for their aid in preparing the Service Notes for this issue of the NEWS.

PHILCO MODEL 680X — DISTORTION

If radio distorts check for plate voltage on second audio and AVC. tube. If there is no plate voltage check condenser .02 microfarad which is located underneath the fiber board. The part number of this condenser is 30-4215S and is used to couple the audio choke to the grid of the 42 type driver tube.

———*n r i*———

PHILCO MODEL 655X — DEAD AND SMOKES

If the plates of 80 tube gets red hot check one of the condensers which comes off the speaker socket to the voltage divider resistor. If this resistor smokes check the two condensers which leave the speaker socket and return to the resistor. These condensers have a capacity of .006 microfarad part number 30-4125.

———*n r i*———

PHILCO MODEL 37-630X — DEAD ON BROADCAST

If the receiver is alive on the short waves take the bottom cover off and see if the R.F. broadcast transformers are not broken or open. A broken connection at this point some times occurs.

———*n r i*———

ATWATER KENT MODEL 325 — INTERMITTENT

Replace the coupling condenser between the second detector plate and first audio grid regardless of how the condenser may test. This condenser may short after the set has been in operation for some time and when taken out tests O. K.

———*n r i*———

PHILCO MODEL 96 — DEAD

Watch for a short between the pilot light bracket and the dial assembly.

RCA MODELS 118 AND 211 — MOTORBOATING

Check the electrolytic filter condenser in the screen grid circuit of the first detector and oscillator tube. This is a 4 microfarad condenser in the corner of the chassis near the range switch.

———*n r i*———

APEX MODEL 7A — WILL NOT ALIGN

Inability to peak the I.F. trimmer condensers generally indicates moisture absorption by the I.F. transformers. After marking the leads remove the transformer and look for corroded connections or breaks in the leads to the trimmer condensers. Bake the transformer in an oven to drive off moisture. Also be on the lookout for green corroded spots in the wiring.

———*n r i*———

ATWATER KENT MODELS H-1 AND H-2 — INOPERATIVE

Check for an open antenna choke and for shorted I.F. trimmers. If an I.F. transformer replacement is used the I.F. amplifier should be realigned at 130 kilocycles.

———*n r i*———

CASE MODEL 80 — RESTRINGING DIAL CORD

To make this job easy remove the coil shield to the right of the condenser gang when facing the front of the chassis and also the righthand condenser shield. When the dial is turned to either extreme there should be at least two turns of the cord remaining on the worm gear. If this precaution is not taken a repeat call will soon result as the cord will break at the retaining hole.

———*n r i*———

CLARION MODEL 60 — VOLUME CONTROL BURNS OUT

Check the resistor shunting the volume control making sure that it is not open and that it has not changed in value. If this occurs the new replacement control will soon burn out.

(*Page* 21. *please*)

Molded-Seal Armored Resistors

Combining the advantages of Bakelite molded insulation with those of the usual metal jacket, the new Clarostat Series MR wire-wound metal-clad resistors present a radical departure from any previous technique. Thorough hermetic sealing provides maximum protection against humidity and electrical leakage. Continuous contact between winding core and the Bakelite molded insulation, plus a snugly fitted metal jacket clamped flush against the metal chassis, provides maximum heat dissipation.

The resistance element is fully imbedded in Bakelite insulation molded within the metal jacket. Turns cannot slip. Moisture cannot reach winding. No leakage. No electrolysis. No air pockets to cause hot spots. Units rated at 5 watts per winding inch when mounted flush on metal radiating surface. Safe overload of 100%. In free air, wattage per winding inch is 2½ watts. Units available in wide range of resistance values, any number of taps, and in lengths up to 10 inches by 13/16 inch wide by ¼ inch thick. Higher operating wattages, made possible by unique construction, mean units half as long as the plain metal-clad resistors heretofore available.

Complete engineering data as well as quotations may be obtained by writing Clarostat Mfg. Co., 285 N. Sixth St., Brooklyn, N. Y.

A Kansas Hopper Tells A Whopper Via Radio

The grand-daddy of all "hoppers" faces the mike in this man-on-the-street broadcast—at least, so it appears from the photo, which was taken by F. D. Conard, professional photographer and

owner of KIUL in Garden City, Kansas. During the "hopper plague" this season he snapped 14 different views, and within six weeks sold 36,000 postcard size prints! Trick photography, of course, is the secret.

A Model Plan of Study

The letter below, from Student James W. Freeland, is reproduced herewith because it outlines as nearly perfect a method of study combined with a strong sincerity of purpose as we believe could be devised. Of course, not EVERY student is in a position to devote such intense concentration to his training. But it is well to keep Student Freeland's plan and attitude of mind before you, nevertheless, for we all succeed in ANY undertaking in proportion as we approach this model.

"Under no circumstances have I at any time copied or attempted to copy any answer or part of an answer sent for your criticism.

"Never but twice have I failed to study at least one hour each day since I enrolled on June 2, 1936. On those two days, study was entirely impossible. I love to study—to read and re-read a lesson text. I have never laid aside a lesson until I was sure I could correctly answer each and every question. I have never gone merely 'answer hunting' through a lesson text, leaving the portions between only half studied. If I cannot answer a question, I again read the text through entirely, noting especially the section or sections covered by the question.

"A few days ago, I began a complete 'diagram-review' of all lessons so far covered. I have roughly but thoughtfully drawn hundreds of small picture-diagrams covering every part of my previously studied lessons. Everything in the past lessons is so much clearer now than when I first tackled them. I just imagine that I can see countless millions of vibrating electrons relaying their action down a conductor—see them vibrating in a steel mast—see them setting up magnetic-fields about a charged wire—alternating at high frequencies peeling-off magnetic impulses in every direction. I can see a condenser block D.C. current and pass A.C. current. I know now why these wonders take place just as they do. This review I have started fits in so well with my more advanced studies, makes them so much clearer, that I believe it will be profitable to continue with it as time permits.

"If there be any improvements that you desire me to make, please write me frankly. Remember, I am determined to be entirely fair and do my part."

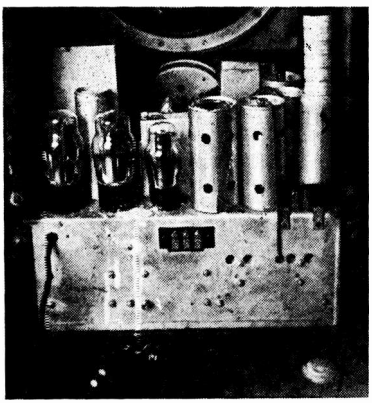
Sincerely yours,

JAMES W. FREELAND,

Tunnelton, W. Va.

Oriental Boom!

Student Lai Chee Choy of Singapore, Straits Settlements, sends photographic proof that Radio sets do "blow up" at times, and describes the event as follows: "The part marked X on the photo exploded, its cap shooting up like a bullet, and a white liquid was thrown all over the interior of the set, like a volcano during eruption. The report was as loud as a gun. The set was not in use at the time."



How many other students have encountered this same experience? Of course, it was a wet electrolytic condenser which blew up (you can see the cylindrical anode projecting out of the aluminum container). The gas vent became stuck or clogged and gas pressure inside forced off the cap.

New Device to Replace Umpire

Looks like we're going to lose that ancient and honorable custom of disagreeing with the umpire by way of pop bottles, seat cushions or what-have-you hurled in his general direction when he gives a distasteful decision. Along comes a feller, Guy T. Luntsford by name, who invents a gadget to call "out" on the umpire.

Luntsford's device, for which he has applied for a patent, operates with photo electric cells. With his system installed, a pitched ball must pass over the plate in order to interrupt a light ray and sound a gong to indicate a strike. Failure of the gong to sound would prove that the pitched ball did not pass over the plate, that the delivery was a ball—and no argument.

Oh, well, somebody's always taking the fun out of life!

Peak Voltages and Condenser Failures

Occasionally, condensers in a given circuit break down for no apparent reason. A D.C. meter placed across the condenser indicates the potential is well below maximum rating. Why?

In explaining this seeming mystery, the Engineering Department of Aerovox Corporation points out that a contributing cause is found in the presence of alternating voltages not shown by the meter, which subject the condenser to potentials above the maximum allowable limit. In addition to constantly recurring peaks of this nature, there may be occasional peaks due to surges in the line or sometimes when switching the apparatus "on" or "off."

A typical example of a condenser subject to peaks is the first filter condenser in a power pack. Blocking condensers in an output stage have an alternating voltage super-imposed on the direct voltage. So, instead of being subjected to only 250 or 300 volts, the potential across such a condenser may vary between 50 and 500 volts. When a receiver is not operating properly it may be that conditions exist which cause abnormally high peak voltages.

Before blaming the condenser for its failure, therefore, test the circuit for peak or surge voltages which, as pointed out, may be quite aside from known operating voltages. The cathode ray analyzers now available are particularly adapted to this kind of testing, since they enable the user to observe wave shapes and to measure voltages. A peak voltmeter may also be employed. Such an indicator is readily constructed, and a simple description appears in the June 1936 issue of the Aerovox Research Worker, a free copy of which will be sent to anyone addressing the Aerovox Corporation, 70 Washington St., Brooklyn, N. Y.

The Go-Getter

The Go-Getter goes till he gets what he goes for;
The Go-Getter works till he reaps what he sows for.
He fixes a goal and resolves when he sets it,
The way to a goal is to go till he gets it.
The pushers are legion who push to begin,
But pushers are rare who will push till they win.
The booster we need is the one who will boost,
Till the cattle come home and the hens go to roost.
The Go-Getter goes till he gets what he goes for;
The Go-Getter works till he reaps what he sows for.

—Robert B. Thurber

New Line of Lightweight Pocket-Size Instruments

A complete new line of pocket-size voltmeters, ammeters, and milliammeters, which is designated Type AS-5 and supersedes the Type AS-3, has been announced by the General Electric Company. The new instruments incorporate a new type of element with higher torque and improved characteristics. The over-all dimensions of the standard unit are 5½ inches by 3½ inches by 2 inches, and the weight is only 12 ounces. All the instruments have an accuracy of one per cent of full scale value.

The New G-E Pocket-size Voltmeter

The instruments have magnetic damping, a Permalloy moving vane, and are shielded from stray magnetic fields. All have a knife-edge pointer and a mirror scale for accurate reading. On the double and triple-scale instruments, a convenient switch on the face makes it possible to change ratings without removing or rewiring terminal connections.

Meter Goes Around and Around, and Music Comes Out There

When the slumbers of Charles K. Munn of Union, N. J., were first broken by strange voices and mumblings rising from his cellar, he searched the basement with a flashlight in one hand and a baseball bat in the other. He found nothing.

Later, he began wondering if his gas meter could be acting as a Radio set. Long vigils were rewarded one night when the call letters of a local amateur radio operator came from the meter. Munn summoned the amateur and made him listen. Skeptical at first, the amateur agreed there is a unit in the meter which intercepts Radio waves and, by vibration, acts as a speaker.

Father of Resistance Welding Honored

Prof. Elihu Thomson, one of America's greatest pioneers in the field of electrical science and holder of more than 800 patents, was honored Friday night, October 16, when the Detroit section of the American Welding Society dedicated its program to the fiftieth anniversary of one of Prof. Thomson's greatest inventions, that of resistance welding. The basic patent on this method of joining metals by putting them in contact with one another and then passing through them an electric current which fuses and unites the pieces was granted in 1886. The anniversary program was presented in the Detroit Edison Auditorium.

Through arrangements made by Albert E. Hackett, chairman of the Detroit section of the society, the original welding transformer perfected by Prof. Thomson, now the property of the Franklin Institute in Philadelphia, was brought to Detroit. A. L. Rohrer, former electrical superintendent of the General Electric Company, who helped Prof. Thomson with the original experiments fifty years ago, spoke from the exact spot where the welding development work took place on the second floor of an old G-E factory building in Lynn, and his voice was carried by wire and reproduced at the meeting by a public address system.

Prof. Thomson's health is such that he was unable to make the trip from his home in Swampscott, but he sent a special message which his son, Malcolm, read to the society.

Prof. Thomson, now in his 84th year, is one of the co-founders of the General Electric Company. He is the holder of numerous medals and awards and is the only scientist in the world who possesses the three most coveted awards of English scientific and engineering institutions, the Faraday, Kelvin and Hughes medals.

In Our Next Issue

Mr. Joseph Kaufman, N. R. I.'s Supervisor of Education, promises us an article on a subject of great importance to every Radio technician and one to which every student will do well to devote special attention and study. The subject of this article to appear in the February-March issue will be "Hints on Reading Circuit Diagrams."

In this article Mr. Kaufman will show why so many servicemen have difficulty in reading diagrams and will explain the correct method of using them to simplify receiver repairs and thus effect a great saving in time and labor.

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

ZENITH MODELS

4B-106, 4-B-131, 4-B-132
CHASSIS NO. 5406

SOCKET VOLTAGES

Tube	Position	Ef	Ek	Eg^1	Eg^2	Eg^3	Ep
15	1st Det. Osc.	2	8	0	115	—	155
15	I. F.	2	3.5	0	115	—	155
75	2nd Det. A.V.C.	6	1.5	0	—	—	30
38	PWR	6	14	0	155	—	148

f—filament; k—cathode; g^1—control grid; g^2—screen grid; g^3—suppressor grid; p—plate.

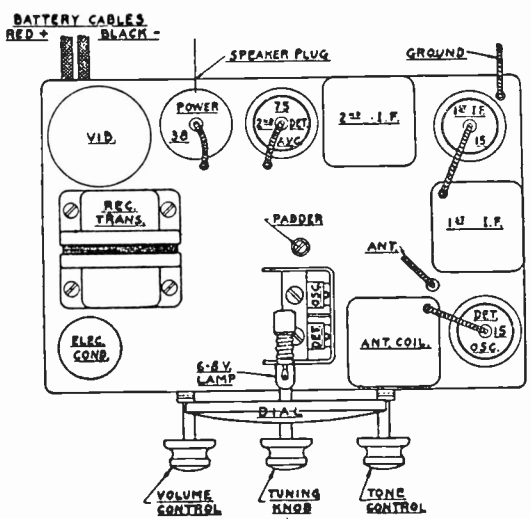
All measurements taken from point indicated to ground using a 1000 ohm per volt D. C. meter with antenna and ground disconnected.

Battery Voltage 6V.

Battery Drain 1.7 amperes.

Power Output 1 watt.

TUBE POSITION



Alignment Procedure

(1) Connect the output leads of the signal generator to the grid of the first detector and receiver ground lead. Also connect an output meter across the speaker leads.

(2) Set the signal generator at 456 K. C. and carefully adjust the four I.F. trimmers to the point giving the greatest output reading. These I.F. transformers are of a very high gain, selective type, and the adjustments should be repeated several times for greatest accuracy.

(3) Change the signal generator leads to the antenna and ground leads of the receiver.

(4) Set the signal generator at 1400 K. C. Set the pointer on the receiver dial at the same frequency.

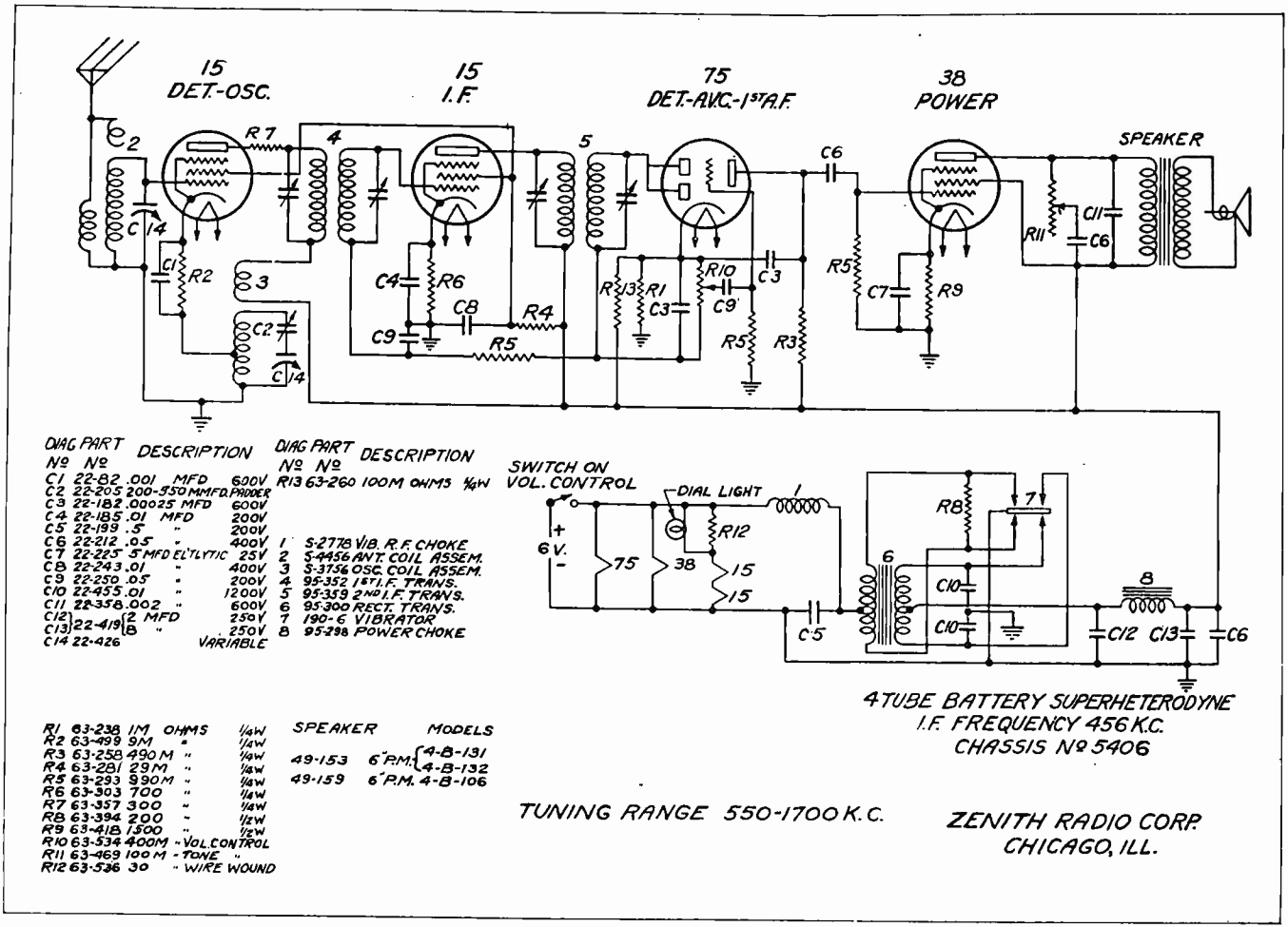
First adjust the oscillator and then the detector trimmers on the gang condenser to the point giving the maximum reading on the output meter, using as small a signal from the generator as possible so as to prevent the A.V.C. action from affecting the ouput readings.

(5) Reset the signal generator to 600 K.C.

(6) Slowly rock the pointer past 600 K. C. on dial meanwhile adjusting the osc. padder (located in rear of gang condenser) to the combination giving the greatest output reading.

(7) Repeat operation No. 4.

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



DIAG Nº	PART Nº	DESCRIPTION	
C1	22-82	.001 MFD	600V
C2	22-205	200-550 MMFD. PADDER	
C3	22-182	.00025 MFD	600V
C4	22-185	.01 MFD	200V
C5	22-199	.5 "	200V
C6	22-212	.05 "	400V
C7	22-225	5 MFD ELECTROLYTIC	25V
C8	22-243	.01 "	400V
C9	22-250	.05 "	200V
C10	22-455	.01 "	1200V
C11	22-358	.002 "	600V
C12	22-419	2 MFD	250V
C13	22-419	8 "	250V
C14	22-426	VARIABLE	

DIAG Nº	PART Nº	DESCRIPTION
R13	63-260	100M OHMS 1/4W
1	5-2778	V/B. R.F. CHOKE
2	5-4456	ANT. COIL ASSEM.
3	5-3756	OSC. COIL ASSEM.
4	95-352	1ST I.F. TRANS.
5	95-359	2ND I.F. TRANS.
6	95-300	RECT. TRANS.
7	190-6	VIBRATOR
8	95-298	POWER CHOKE

R1	63-238	1M OHMS 1/4W
R2	63-499	9M " 1/4W
R3	63-258	490M " 1/4W
R4	63-281	29M " 1/8W
R5	63-293	990M " 1/8W
R6	63-303	700 " 1/4W
R7	63-357	300 " 1/4W
R8	63-394	200 " 1/2W
R9	63-418	1,500 " 1/2W
R10	63-534	400M " VOL. CONTROL
R11	63-469	100 M " TONE "
R12	63-536	30 " WIRE WOUND

SPEAKER		MODELS
49-153	6" P.M.	4-B-131, 4-B-132
49-159	6" P.M.	4-B-106

CIRCUIT DIAGRAM—Models 4-B-106, 4-B-131, 4-B-132. (Chassis No. 5406)

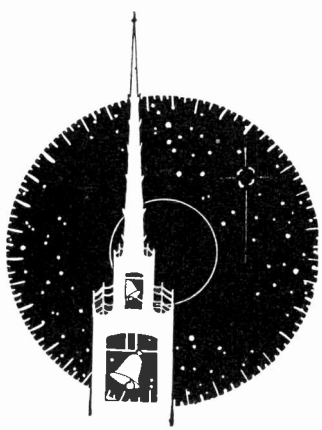
Let's Go Amateur Sleuthing

By ALBERT DOIG,
PRODUCTION MANAGER

Secret Operative Number 91! What shrewd miracles of sleuthing HE would perform to solve the baffling mystery of the disappearing textbooks! How faithfully, how relentlessly, he would follow the mingled trail scents of printers' ink and midnight oil that every home study student knows so well, if we put him on the job every time a student writes US, "Textbook number so and so never reached me. Where is it?"

Where, Oh Where? *We determined to find out.*

Not that very many do disappear. The actual number over a period of time averages only 3 out of every 2000 books mailed out. That may be considered a good record, not a bad one. But if you, dear reader and student, happen to be one of those three, why, you stand up on your hind legs, so to speak, and holler about not getting your textbooks, don't you?



Fair enough. We want you to, so we can replace the missing book—pronto. Don't fail to let us know when books fail to reach you. (Or NATIONAL RADIO NEWS. Editor). Or anything else.

Just the same those three books worried us. Where did they go? We determined to find out.

There are no Sherlock Holmeses on the N. R. I. Staff, no crackerjack secret operatives, no G-Men, or T-Men, or what have you. We know our own business through and through, but otherwise we are rather much like everybody else.

So the thought came to us as we talked about these missing textbooks, suppose *we* were taking the Course. Suppose these graded lessons and new books were being mailed to us in our own homes. And suppose once ever so often we didn't get one. Where could it possibly go?

Do we *always* get all our mail? If not, why? Who could tell us? We asked each other. We asked our friends. We asked Students who came to Washington. We got a lot of answers. They told us some things that may help you.

Most mail is delivered but very little is ever handed direct by the postal carrier or postmaster to the addressee. That means to you and to me.

How is it delivered, then? It is put in post office boxes, in R. F. D. boxes, in mail boxes at front doors, or pushed through a slot in the door where it falls on the floor.

Sometimes it is handed to Bill Jones who promised to take Sam Brown's mail by. Once in a while Bill gives it to Sam's cute little Susie who may be a wonderful youngster but not a very dependable mail carrier, as even Sam will admit after he finds his gas bill under the front porch and his next N. R. I. lesson text in Susie's doll carriage or out in the garage.

What else happens to mail that has been promptly and properly delivered however?

Before giving you this sad picture, let me tell you a funny story. It is funny because the man who told me laughed about it even though his neighbor didn't. Anyway it's true.

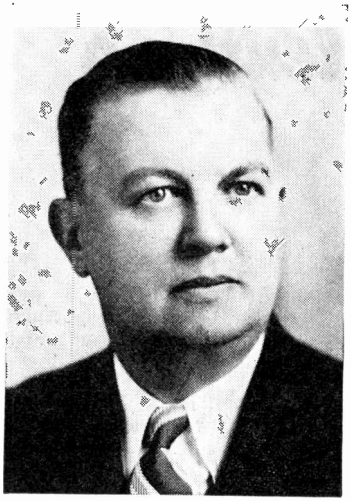
It's about a little boy instead of a little girl. His name was Junior. Such a smart kid, too. Too smart!

After several days of watching the postman put mail in the letter box next door, this bright little fellow got so curious he investigated. Junior was too small to read, but the envelopes intrigued him so he tore them open. Then since he didn't know what else to do with the letters inside, he played postman, and put them in other folks' mail boxes. And was there a scandal!

If Junior's daddy had been taking a Radio Course and those had been daddy's textbooks that got pulled out of their envelopes and distributed to the neighbors, there would have been no scan-

(*Page* 24, *please*)

1937 Radios Pre



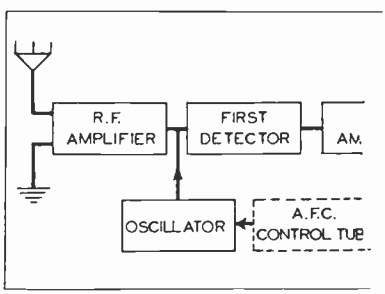
J. A. DOWIE

YOU have undoubtedly noticed the fact that highly selective broadcast superheterodyne receivers must be tuned to the exact frequency of a station in order to obtain good fidelity with minimum background noise; even small errors in tuning cause distortion. The majority of broadcast listeners do not have the patience required to tune these highly selective receivers accurately enough to obtain the fidelity which the receivers are capable of delivering. Then, too, many listeners actually cannot tell when the receiver is tuned properly.

Several years ago receiver manufacturers added tuning indicators of various types to their receivers; these devices gave visual indications of the accuracy of tuning, but did not insure that the receiver would remain correctly tuned. Many types of mechanical tuning systems, using push-buttons or levers for each station, were tried with varying results; these devices depended upon the accuracy with which they were originally adjusted and upon the permanence of the adjustment.

It was quite logical, then, that engineers designing the 1937 models of Radio receivers—sets which are more sensitive and more selective than ever before—should seek some means for making the receivers self-tuning. Automatic frequency control, abbreviated A.F.C., is the solution to this tuning problem and is the outstanding feature of the better types of 1937 Radio receivers. A.F.C. automatically compensates for improper tuning once the listener has tuned approximately to the desired station, and keeps that station properly tuned until the tuning dial is reset to a new station. In other words, this device compensates for oscillator frequency drift due to the heating of elements within the oscillator circuit and fluctuations in line voltage.

Advantages of A.F.C. To bring out more clearly the advantages of automatic frequency control, let us assume that we are going to tune in a certain station on a 1937 superheterodyne receiver having an automatic frequency control circuit, such as the receiver shown in block diagram form in Fig. 1. A switch is provided on the panel of this receiver to cut A.F.C. in and out; suppose that we turn this to the A.F.C. OFF position for the present. The receiver can now be roughly tuned to the desired station frequency, using either your ear or the visual tuning indicator as a guide. No attempt need be made to tune the station in accurately, for turning on the A.F.C. switch will cause the receiver to tune itself automatically to within a few cycles of the exact station frequency. The improvement in tone quality when A.F.C. is turned on will be quite noticeable, especially in the case where the original dial setting was so far off that distortion of the signal was quite evident.



F

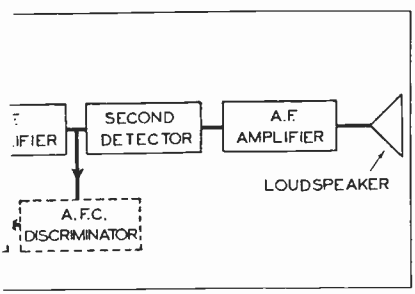
Sketch showing the various parts of a modern Super-

The average automatic frequency control circuit is designed to compensate for errors in receiver tuning and frequency variations of up to 5 kilocycles. In other words, automatic frequency control does not operate until the receiver is adjusted to within 5 kilocycles of the desired station. The operating range is definitely limited to this value in order to prevent the A.F.C. circuit from swinging the receiver from one station to another in case of fading, when the signals of two stations 10 kilocycles apart in frequency are of nearly the same intensity.

ésent Automatic Frequency Control

By J. A. DOWIE, Chief Instructor

If a receiver is tuned to a station with the A.F.C. system in operation, the action will be such that the signal will be snapped into perfect tune when that point on the dial where the particular signal is ordinarily received is approached; on a strong signal, such as from a local station, there may be a considerable area on the tuning scale over which the tuning indicator will show that the station is properly tuned. When the tuning dial has been moved out of this area, the A.F.C. circuit is no longer able to correct the error in tuning; if there happens to be another strong signal in the direction toward which the dial has been turned, the receiver will pick up first one signal, then the other automatically. A.F.C. is entirely electrical, being accomplished without any manual or mechanical movement of the tuning control once the approximate setting of the dial has been made by the operator.



IG. 1

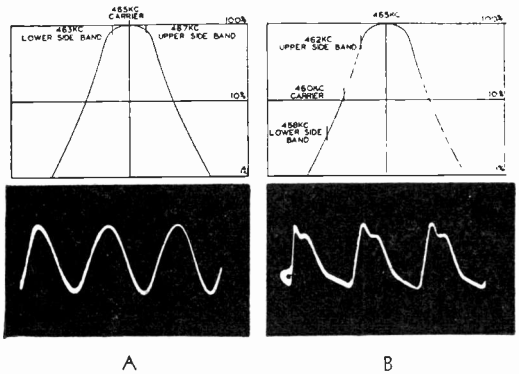
heterodyne Receiver employing A.F.C.

Principle of the Superheterodyne. Before explaining the operation of the A.F.C. circuit, I will review briefly the operating principle of the superheterodyne receiver. The stages represented by the solid lines in Fig. 1 are those to be found in the ordinary superheterodyne: the signals picked up by the antenna are fed into a stage of tuned radio frequency amplification, which amplifies the desired signal more than the other signals which may reach this stage.

The amplified R.F. signal then reaches the first detector, where it is mixed with the output of an oscillator stage to produce a lower or intermediate frequency. Tuning the receiver changes the frequency of the oscillator, producing an I.F. signal which is always of the same frequency. For example, if the intermediate frequency of a certain receiver is 465 kc., and the receiver is tuned to a 1,000 kc. signal, the oscillator would be producing a frequency of exactly 1,465 kc. (1,000 + 465) which, when mixed with the 1,000 kc. signal, would produce the required intermediate frequency signal of 465 kc. This I.F. signal would, of course, be modulated just as was the original carrier signal. After amplification the I.F. signal is fed to the second detector, which separates the I.F. frequency signal from the modulation signal, passing on the audio signal to the A.F. stages for additional amplification before it reaches the loudspeaker.

This brief explanation of a superheterodyne receiver shows you that when the receiver is properly tuned, a frequency of exactly the I.F. frequency (465 kc. in our example) is fed into the I.F. stages; suppose, however, that the receiver is improperly tuned and the detector is feeding a 460 kc. carrier into the I.F. stages. If the carrier is modulated by a 2,000 cycle note, there will be a 2,000 cycle side-band on each side of the carrier frequency. These side-bands receive equal amplification when the receiver is properly tuned, as shown at *A* in Fig. 2, but are amplified unequally when a 460 kc. carrier is fed into the I.F. stages, as shown at *B* in Fig. 2. The oscillograph picture underneath the first curve shows that when tuning is correct a perfect sine wave is passed into the second detector, while when tuning is improper the wave is considerably distorted. I will now explain how automatic frequency control changes a receiver from the condition shown at *B* in Fig 2, where the set is tuned 5 kc. off the station frequency, to that shown at *A*, merely by

(page 18, please)



A B

FIG. 2

(Courtesy General Electric Co.)

1937 Radios Present Automatic Frequency Tuning (Continued from page 17)

changing the frequency of the oscillator.

Operation of the A.F.C. Circuit. A simplified schematic diagram of an automatic frequency control circuit (the *General Electric* circuit) is given in Fig. 3; the operation of this circuit is in general characteristic of other A.F.C. circuits developed recently. The circuit consists of an I.F. amplifier tube, a special I.F. transformer and a discriminator circuit containing a 6H6 tube and a control tube; the latter tube is coupled to the regular oscillator tube of the superheterodyne receiver. The control tube automatically increases or decreases the oscillator frequency from its normal value to make up for errors in the gang tuning condenser setting; the tube acts very much like a variable inductance which is connected in parallel with the oscillator inductance and which can be made larger or smaller by varying the bias applied to its control grid.

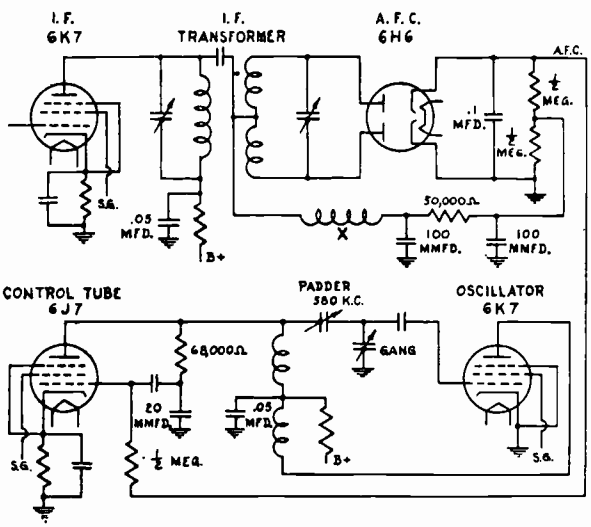


FIG. 3

(Courtesy General Electric Co.)

Here is an example of how A.F.C. acts. If we wanted to hear a 1,000 kc. station and set the receiver tuning dial at 996 kc. (4 kc. off), without A.F.C. the oscillator frequency (which here depends only upon the tuning dial setting) would be 996 + 465 or 1,461 kc. The desired 1,000 kc. station signal, beating with this 1,461 kc. oscillator signal, would give a 461 kc. I.F. carrier; this results in a badly distorted signal. If, now, A.F.C. were turned on with the receiver dial still at 996 and a 1,000 kc. station on the air, A.F.C. would automatically change the oscillator frequency enough to give a 465 kc. I.F. carrier for the signal. The new oscillator frequency would then be 1,000 +465 or 1,465 kc. Note that this oscillator frequency is exactly the same as the oscillator frequency would be if the set were *correctly tuned* to the 1,000 kc. station without A.F.C.

Why a Vacuum Tube Can Behave Like a Variable Inductance. It is a well-known fact that when an inductance. is connected into an A.C. circuit the current through the inductance will lag behind the voltage applied to it (the current and voltage are out of phase). If the type 6J7 control tube is made to draw a lagging current from the oscillator circuit, then this tube will be behaving exactly like an inductance. When no excitation is applied to the grid of the control tube (no signal is fed to it from the 6H6 tube), the plate circuit of the control tube simply acts like a resistance, and has no appreciable effect on the oscillator frequency. Now if the control tube grid is excited with an A.C. voltage from the oscillator grid coil—a voltage which lags behind the voltage applied to the plate of the control tube, we will obtain the desired effect, a lagging current flowing in the control tube plate circuit. This lag in phase is produced in this particular case by a network consisting of a 68,000 ohm resistor and a 20 mmfd. condenser in the grid circuit of the control tube; the condenser and resistor combination makes the R.F. voltage on the control tube grid out of phase with the plate voltage of this tube (supplied by the oscillator) and the current drawn by the control tube will lag behind its plate voltage. Here is the condition where the tube acts as an inductance; since the control tube is connected in parallel with the oscillator coil. we have two inductances in parallel.

Coils in parallel act like resistors in parallel, their combined impedance *always* being less than that of the smaller unit. If we used two coils in parallel with each other instead of a single coil, we could make the total inductance larger or smaller by making one of the coils (the inductance of the control tube) larger or smaller. The smaller the total inductance becomes, the higher will be the frequency of oscillation, and the larger it becomes the lower the frequency.

When the D.C. bias supplied by the 6H6 tube causes the control grid voltage to become more negative, this tube draws less lagging current from the grid circuit of the oscillator, and accordingly looks like a larger inductance (a larger

(Page 22, please)

RADIO-TRICIAN
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Service Sheet
Compiled Solely for Students and Graduates
NATIONAL RADIO INSTITUTE, WASHINGTON, D.C.

ZENITH MODELS

5-S-119, 5-S-126, 5-S-127, 5-S-150, 5-S-151, 5-S-161.
CHASSIS NO. 5516

SOCKET VOLTAGES

Tube	Position	1	2	3	4	5	6	7	8	9
6A8	1st Det Osc.	0	0	240	85	-1	166	6ac	4	0
6K7	I F	0	0	240	85	3	—	6ac	3	0
6Q7	2nd Det A V C	0	0	75	1	.1	—	6ac	1.5	0
6F6	Power	0	0	230	240	-5	—	6ac	0	—
5Y3 5W4	Rectifier	0	240	—	AC	—	AC	—	240	—

BOTTOM VIEW OF SOCKET

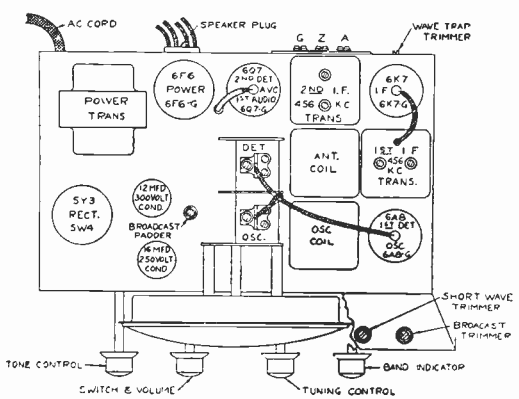
All voltages measured from point indicated to ground, using a 1000 ohm per volt meter with antenna and ground disconnected.

Line Voltage 112V.

Current Consumption 55 watts.

Power Output 3 watts.

TUBE POSITION



Alignment Procedure

(1) Connect output leads of signal generator to grid of the first detector and receiver chassis. Also connect an output meter across the speaker transformer leads.

(2) Set signal generator at 456 K.C. and carefully adjust the four I.F. trimmers, to point giving highest reading on output meter. The output transformers are of very high gain, selective type; adjustments should be repeated several times to secure maximum accuracy.

All adjustments should be made using as weak an output from signal generator as possible to prevent the A.V.C. action from affecting output readings.

(3) Change signal generator leads to antenna and ground terminals of receiver.

(4) Adjust the wave trap for minimum output reading.

(5) Set signal generator at 6 M.C. Switch receiver to band B, and adjust osc. trimmer on gang for correct dial reading.

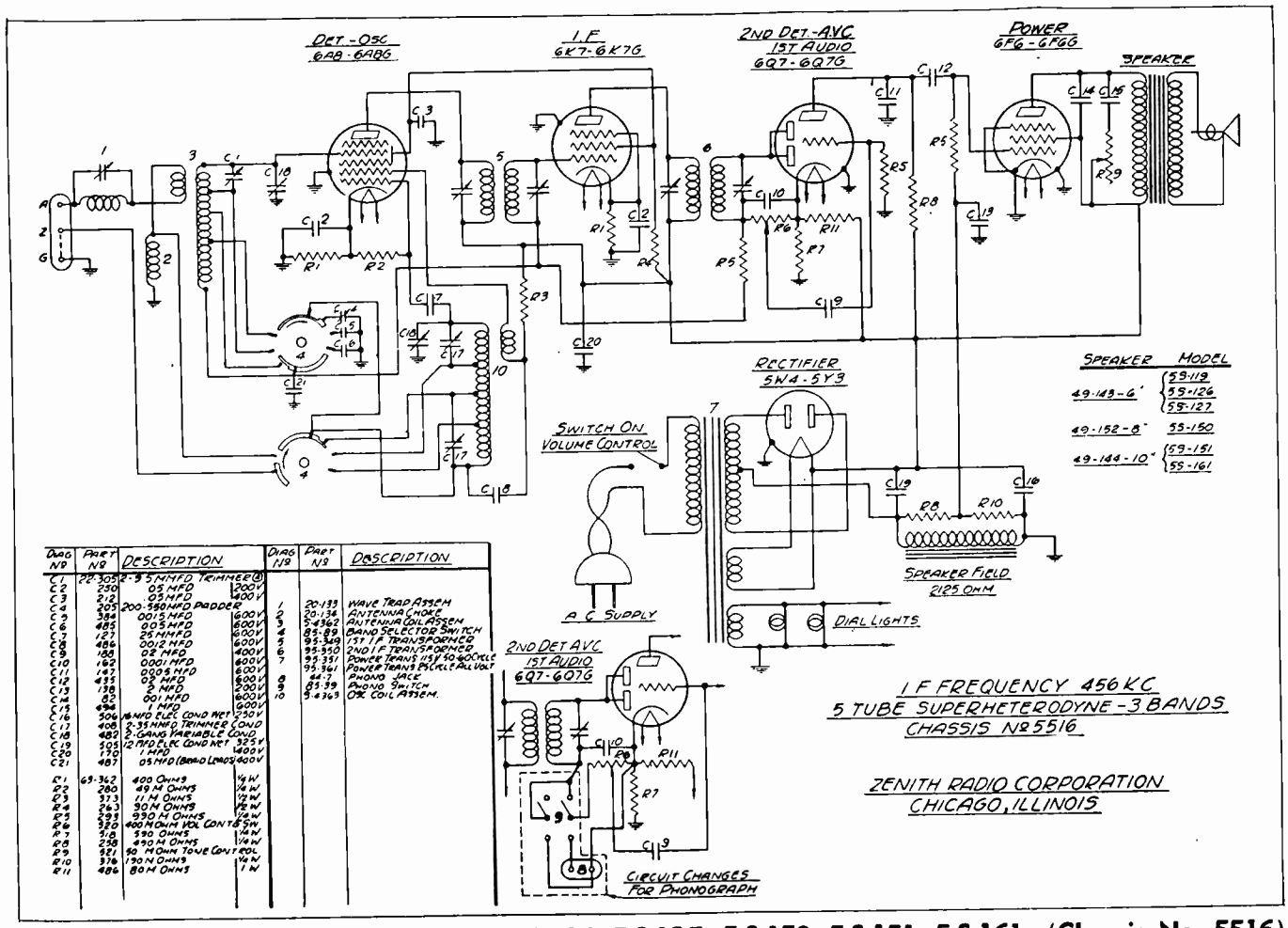
(6) Set signal generator at 1400 K.C. Switch receiver to band A and adjust broadcast trimmer for correct dial reading. Also adjust antenna trimmer on gang to resonance.

(7) Set signal generator at 18 M.C. Switch receiver to band C, and adjust the short wave trimmer while rocking the pointer past 18 M.C. on the dial to the combination giving the greatest output.

(8) Set signal generator at 600 K.C. Switch receiver to band A, and rock pointer past 600 on dial while adjusting broadcast padder to combination giving greatest output reading.

(9) Readjust broadcast and ant. trimmers at 1400 K.C. (as in operation 6).

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



DIAG NO	PART NO	DESCRIPTION		DIAG NO	PART NO	DESCRIPTION
C1	22-305	2-35 MMFD TRIMMER	⊕			
C2	250	.05 MFD	200V			
C3	212	.05 MFD	400V			
C4	305	200-580 MMD PADDER		1	20-133	WAVE TRAP ASSEM
C5	384	.0015 MFD	600V	2	20-134	ANTENNA CHOKE
C6	485	.005 MFD	600V	3	5-4362	ANTENNA COIL ASSEM
C7	127	.25 MMFD	600V	4	85-89	BAND SELECTOR SWITCH
C8	486	.0012 MFD	600V	5	95-349	1ST I.F. TRANSFORMER
C9	188	.02 MFD	400V	6	95-350	2ND I.F. TRANSFORMER
C10	162	.0001 MFD	600V	7	95-351	POWER TRANS 115V 50-60 CYCLE
C11	187	.0025 MFD	600V		95-361	POWER TRANS 25 CYCLE ALL VOLT
C12	435	.05 MFD	600V	8	44-7	PHONO JACK
C13	138	.1 MFD	200V	9	85-39	PHONO SWITCH
C14	82	.001 MFD	600V	10	5-4363	OSC. COIL ASSEM.
C15	494	.1 MFD	400V			
C16	506	16 MFD ELEC COND NET	250V			
C17	408	2-35 MMD TRIMMER COND				
C18	482	2-GANG VARIABLE COND				
C19	505	12 MFD ELEC COND NET	325V			
C20	190	1 MFD	400V			
C21	487	.05 MFD (BOARD LEADS)	400V			
R1	69-362	400 OHMS	½W			
R2	280	49 M OHMS	½W			
R3	373	11 M OHMS	½W			
R4	363	30 M OHMS	½W			
R5	293	930 M OHMS	½W			
R6	320	400 M OHM VOL CONTROL	SW			
R7	318	390 OHMS	½W			
R8	258	490 M OHMS	½W			
R9	321	50 M OHM TONE CONTROL				
R10	376	190 M OHMS	½W			
R11	486	80 M OHMS	1W			

I F FREQUENCY 456 KC
5 TUBE SUPERHETERODYNE - 3 BANDS
CHASSIS NO 5516

ZENITH RADIO CORPORATION
CHICAGO, ILLINOIS

CIRCUIT DIAGRAM—Models 5-S-119, 5-S-126, 5-S-127, 5-S-150, 5-S-151, 5-S-161. (Chassis No. 5516)

The Service Form (Continued from page 9)

CROSLEY MODEL 515 **INTERMITTENT**

Replace the .02 microfarad cathode by-pass condenser on the 6D6 tube regardless of the way in which it may test.

———*n r i*———

CROSLEY MODEL 171 **WEAK**

When this symptom together with improper operation of the quiet automatic volume control system occurs check the resistors in the candohm.

———*n r i*———

MODEL 148 **INTERMITTENT RECEPTION**

This is sometimes due to a partial short in the oscillator padding condenser. Carefully clean the condenser to remove any dust or dirt. Alcohol or carbon tetrachloride may be used for this purpose.

———*n r i*———

GENERAL ELECTRIC MODEL A-67 **NOISY**

Try a new 500,000 ohm resistor in the control grid circuit of the 6F6 tube. This resistor intermittently becomes open and changes in value.

———*n r i*———

GRUNOW MODEL 801 **HUM**

Try a new 6B7 tube.

———*n r i*———

GRUNOW MODEL 500 **NO PLATE VOLTAGE**

Carefully check the speaker field as the leads to the field coil sometimes become open thus preventing any voltage being applied to the tubes.

———*n r i*———

PHILCO MODEL 11 **FUSES BLOW**

This condition occurs when the vibrator is O. K. check for a short between the speaker field housing and the off and on switch mounted on the volume control. If such a short is found tape that section of the field which is close to the volume control and cover the switch assembly with some insulating material.

———*n r i*———

PHILCO MODEL 95 **INTERMITTENT**

This is generally caused by a defective by-pass condenser on the low side of the volume control. The lead to this condenser will be found to go from the control, through a cable to the filter condenser block. A new condenser connected at the control and having a capacity of .5 microfarad will solve the problem.

PHILCO **ALL WAVE AERIALS**

In cases of intermittent reception or poor reception check the aerial transformer looking for a break in the twisted lead-in at the point where it emerges from the transformer.

———*n r i*———

PHILCO MODEL 80 **IMPROVEMENT**

Early models with a star stamped on the chassis may be improved by reducing the value of the grid resistor from 1 megohm to 500,000 ohms.

———*n r i*———

PHILCO MODEL 29 **SQUEAL WHICH IS NOT TUNABLE**

This is generally due to an open in the .09 microfarad I.F. cathode by-pass condenser. A .25 microfarad 200 volt replacement condenser will solve the trouble.

———*n r i*———

STEWART WARNER MODELS R-136, R-137 AND R-138 **WILL NOT TRACK**

This condition is due to a change in capacity of the oscillator fixed padding condenser. The condenser has a capacity of 11 micro-microfarads (.000011 mfd.) Replacement with another condenser of the same size will pep up the receiver at the low frequency end of the dial and make it possible to obtain proper tracking between the oscillator and pre-selector. The condenser is color coded brown, brown black.

———*n r i*———

SIMPLEX MODEL PA **SLIPPING DIAL**

Place a rubber grommet over the shaft and wind the cord around the grommet. The increased friction between the cord and grommet will prevent slipping.

———*n r i*———

SILVERTONE MODEL 1640 **IMPROPER A.V.C. ACTION**

Due to the .1 microfarad condenser employed in the A.V.C. circuit the automatic volume control functions too rapidly often cutting weak stations out when heavy bursts of static occur. Replace this condenser with another having a capacity of .01 microfarad.

———*n r i*———

SILVERTONE MODEL 1506 **DEAD**

Check for a short in the .01 microfarad condenser connected from the plate of the 47 tube to the chassis. A slight improvement in tone may be

(*Page 23, please*)

1937 Radios Present Automatic Frequency Control (Continued from page 18)

inductance would have a higher reactance, resulting in less current flow). A larger inductance increases the total inductance in the oscillator circuit and lowers the oscillator frequency. On the other hand, if the control tube receives a less negative voltage it draws a larger lagging current and thus represents a smaller inductance (it has less reactance, resulting in a greater current flow). A smaller inductance decreases the total inductance in the circuit and raises the oscillator frequency.

The Discriminator Circuit. A discriminator circuit, including the 6H6 tube, supplies the variable D.C. bias for the control tube. The circuit shown in the upper portion of Fig. 3 consists of a special I.F. transformer coupled to two individual diode rectifier circuits. At resonance the A.C. voltages applied to each diode of the type 6H6 tube are equal; inasmuch as each diode has its individual ½-megohm load resistor, the voltage developed across each load resistor will be equal. The two load resistors are connected in series and since there are equal voltages of opposite polarity across each, the two voltages cancel each other and there is no voltage across the combination. One end of the load resistor combination is grounded, and the other end (which goes to the control tube grid) is therefore at zero or ground potential. This, then, is the condition of resonance, when the receiver is properly tuned; the control tube receives no excitation and A.F.C. does not function.

When the circuit is out of resonance the A.C. voltage delivered to one diode plate is higher than the voltage delivered to the other, and consequently the voltage across one diode load is higher than the voltage across the other. The difference in the two voltages will be either positive or negative with respect to ground, depending upon which load resistance has the higher voltage, and this voltage will be applied to the control tube grid, causing the tube to draw a corresponding lagging current which will change the frequency of the oscillator just enough to compensate for the error in tuning.

When the circuit is improperly tuned (is off resonance and is producing an I.F. frequency different from that to which the I.F. amplifier is peaked), the A.C. voltage delivered to one diode plate is higher than the other because of the *phase relationships* of the various voltages in the discriminator circuit. The voltage across one half of the I.F. transformer secondary added to the voltage across choke X does not equal the sum of the voltage across the other half of the secondary and the voltage across choke X, even though this secondary winding is center tapped; these three voltages are out of phase with each other at all times, and must be added vectorially (with phase angles taken into consideration). The phase relationships between the three voltages in question change with the frequency of the signal which is fed into the I.F. stages.

The A.F.C. circuit is quite easy to adjust for best operation. The output of a signal generator, set to the peak frequency of the I.F. amplifier, is connected to the grid of the first I.F. amplifier tube. The condenser across the I.F. transformer primary (Fig. 3) is then adjusted for *maximum* signal response, while the condenser across the anodes of the type 6H6 tube is adjusted for no change in current through the cathode self-biasing resistor of the control tube as the A.F.C. switch is turned on and off.

"Old Timer" Reports

I took your course in Radio back in 1928. Since then I have been steadily in the game as Radio serviceman in this town. I cannot say enough for the N. R. I.; I believe it stands head and shoulders above the other schools in Radio training.

EDGAR LEE, *McLaurin, Miss.*

Finds Mr. Smith's "Talks" Inspiring

Mr. J. E. Smith, Pres.

I want to congratulate you on your wonderful magazine NATIONAL RADIO NEWS. It can't be beat. I like the articles you write on the first page. They keep up a fellow's ambition, just as those do appearing on the first page of your regular Course books. Again congratulations.

J. C. WYTHE, *Los Angeles, Calif.*

The Service Form (Continued from page 21)

noted by using a condenser with less capacity. A .006 microfarad condenser of the mica variety will result in the reproduction of more high notes.

———n r i———

SPARTON MODELS 930 AND 931 — DEAD

Trouble in these sets is often experienced in the R.F. choke in the amplifier and pre-selector circuit. In many instances the break occurs near the end of the winding and by removing a few turns repairs can be made.

———n r i———

WELLS-GARDNER MODEL 052 — WEAK

Check the .1 microfarad condenser from the screen of the 35 type tube to the chassis. The 250,000 ohm resistor feeding the plate of the 57 second detector sometimes changes in value. Install a 1 watt replacement resistor.

———n r i———

RCA VICTOR MODEL R-4 — MOTORBOATING

If this trouble occurs particularly at low volume levels connect a .1 microfarad condenser from the screen of the 35 R.F. tube to the chassis. There is already an 8 microfarad condenser in this circuit but sometimes such condensers do not make very good R.F. by-passes. Also check this 8 microfarad electrolytic condenser by substitution.

———n r i———

RCA VICTOR MODEL R-28 — MOTORBOATING

This is oftentimes caused by coupling through the wire feeding the screen of the detector oscillator tube. If a .5 microfarad condenser connected from the screen of the tube to the chassis does not eliminate the trouble use this condenser in conjunction with an R.F. choke, placed in the lead feeding the screen. The condenser is of course to be connected directly between the screen and chassis.

———n r i———

ZENITH MODEL 880 — DISTORTION

This is generally due to a short in the .0004 microfarad condenser located in the first R.F. coil can. The installation of a new condenser will clear up this trouble.

———n r i———

ZENITH MODELS 230, 240, 245, 430 AND 440 — OSCILLATION AND MOTORBOATING

Check the electrolytic filter condensers by substitution as the originals oftentimes decrease in capacity.

GRUNOW MODEL 6C — INTERMITTENT AND DISTORTED

Replace the .01 mfd. coupling condenser between the 75 and 42.

———n r i———

GRUNOW MODEL 6C — DEAD AND SMOKES

Check the condenser connected from the plate of the 42 to the chassis. This condenser has a capacity of .002 microfarad.

———n r i———

STEWART WARNER MODEL R-1400 — INOPERATIVE

Check the .01 microfarad buffer condensers inside the shell of the power transformer. This shell must be removed to get at the condensers which will be found to be shorted.

———n r i———

GENERAL MOTORS MODEL 110 — INTERMITTENT

The by-pass condensers in this receiver are generally the cause of this trouble and it is worth while to replace all of them with new ones. Individual condensers can be used to replace the small condenser blocks. Use condensers rated at 600 volts.

———n r i———

PHILCO MODEL 680 — DISTORTS ON HIGH VOLUME

This is generally due to a defect in the 1 microfarad condenser in the plate of the second A.F. and A.V.C. amplifier tube. This is one of four condensers in a single metal can located on the chassis wall next to the 5Z3 rectifier tube socket.

———n r i———

R.C.A. MODEL R-55 — NOISE WITH VOLUME CONTROL TURNED TO MINIMUM

The fact that the noise occurs when the volume control is turned off shows that the trouble is not due to outside interference coming in over the aerial. In most cases it is caused by a defect in the primary of the input push-pull transformer. Both this and the output transformer are contained in one case and either a duplicate replacement part may be used or two separate high grade transformers can be employed.

———n r i———

SPARTON MODELS 65, 104, 67, 83 AND 665 — DIAL SLIPS

A Planetary drive is employed in these models. To overcome slipping pinch with a pair of pliers the lugs which hold the drive assembly together. Be careful in doing this because too much pinching will make it difficult to operate the mechanism.

Let's Go Amateur Sleuthing (Continued from page 15)

dal, no question of any sort. The books would have been thrown away. And daddy would have wondered why N. R. I. didn't send him his textbooks. Wouldn't he? Which wouldn't have been so funny.

What can happen to mail that has been delivered to your home (probably when you are away at work, remember)? Here are answers from the every day folks we asked about it. They said their mail was taken in by:

"My landlady."
"Whoever thinks about it."
"My mother."
"My kid sister."
"The old man."
"The hired man gets it."
"Sometimes I get it—not always."
"Grandma—but she can't see good."
"One of the children."
"I don't know."
"Oh, anybody."

Who gets *your* mail? Always? Do they know you want it, all of it every time? And where is it put when it is brought in? We asked those same people. Here are a few of their answers:

"On the table, I guess."
"In the hall." (The hall is very dark.)
"On the mantelpiece."
"Anywhere it's convenient."
"In the front room."
"Under the sugar bowl."
"On the ice box or the table."
"With the papers." (Newspapers were meant.)
"Under my door."
"Downstairs."
"Under the door mat."
"Behind the clock."

Only one man said, "Under a paper weight on my desk." One man in a hundred!

Isn't it remarkable that only 3 texts in 2000 mailed get lost!

Other interesting facts came to light. Most men report that they do get personal letters but that they often fail to get bills, catalogs, circulars, and other printed matter even though it is important and they may have written away for it. Textbooks fall in this class, remember.

Most folks will hand you a letter or tell you about it sooner or later, but a bill or a catalog or a textbook will be left lying around a long time. This is often so. They get knocked down on the floor or pushed out of sight. They are gathered up with old newspapers, or stuck in among magazines. They get in the trash. Or someone uses them to stand on, or put a paint bucket on, or a greasy dish. While you, very likely, wonder why in thunderation N. R. I. doesn't send you that book.

P.S. Moral, etc. We make a mistake ourselves once in a while, but not so often. Not 3 in 2000 times, or someone would be looking for another job, believe you us. We use the best methods we know, the most careful way they can be used, to get our mail to you safely, promptly, personally.

Maybe, if you've read this far, you'll do something today to make sure that every piece of mail Uncle Sam brings to you—from other folks as well as from us, but every single piece without exception—is put in the same definite place, a safe one, for you every day.

The following questions will make a good check list for picking a good place for mail addressed to you:

Is the place handy?
(So folks will put your mail there.)
(So you can get it easily.)

Is there any way for the mail to be blown away, knocked off, pushed out of sight, or picked up by unauthorized persons?

Can children carry it away?

Can a dog or a cat knock it down?

Can it get mixed up with other papers, lost, or covered up?

Should you have a mail box or post office box of your own?

Do you always look for your mail?

Do you always put it away promptly?

Suppose *you* do a bit of amateur sleuthing and smoke out the facts to answer these questions. You may be surprised at what you find. It doesn't take a detective to figure out that it's a pretty good idea to arrange for some regular place where every envelope and package delivered by Uncle Sam's Post Office Department will reach you safely and promptly.

Novel Radio Items

—BY L.J. MARKUS—

A STATUE CALLS! The manager of a Chicago parking lot finds a new use for an old statue and a public address system. The bronze figure of a medieval herald, nearly twelve feet high and weighing three tons, is being wired for sound; motorists will soon hear the herald bellowing through his trumpet: "Calling all cars, calling all cars!"

Zoo Animals Televised!

Parrots, monkeys, snakes, alligators—dozens of other London Zoological Garden animals and birds are to appear on the first television broadcasts from Alexandra Palace, London. These will be sent out on two systems which alternate each week; one will use 240 lines, sequential scanning, 25 pictures per second, while the other will use 405 lines, 25 pictures per second, interlaced scanning; both are on 6.7 meters with sound on 7.2 meters.

———*n r i*———

Radio Unit Lights Mine!

Radio Station KMBC's motor generator unit played a heroic role at a recent Missouri mine disaster. The 1,000-watt portable unit supplied power for a 500-watt bulb over the mouth of the mine and another at the bottom of the shaft. In addition, Radio operators picked up sounds made by rescue workers at the bottom of the mine for broadcast to KMBC listeners.

———*n r i*———

Television Lands Planes In Fog!

Newest of blind landing equipment for aircraft uses a modified television system to show the pilot his position with respect to the airport. Direction-finding equipment at the airport logs plane's position and passes it on to a television transmitter, which indicates this position on a map in the plane.

Radio Transmitter Makes Cheese!

An Austrian scientist recently used an 800-watt short-wave transmitter operating on three meters to convert milk (mixed with a fermenting chemical) into well-ripened cheese. A test tube containing the milk was placed between two metal plates in the transmitter output.

———*n r i*———

Soviet Canal Gets Television!

Builders of the Moscow-Volga Canal in Soviet Russia plan to use television to allow operators of the locks to see approaching ships.

———*n r i*———

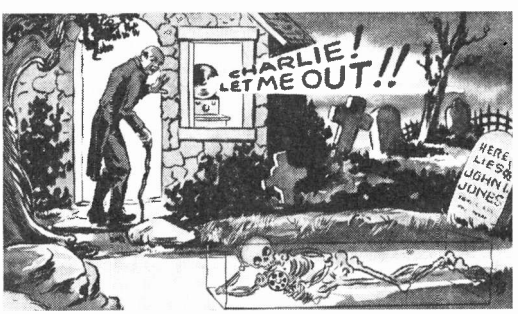
How Small Can A Radio Tube Be?

Chao-Ying Ming, research worker of California Institute of Technology, claims to have made the world's smallest radio tube—about the size of an ordinary marble. The tube generates ultra-high frequency waves having a wavelength of about 1 centimeter. The plate of the tube is only about 1/50th inch in diameter.

———*n r i*———

A World Series Sidelight!

Radio listeners in California heard the crack of a home run at the World Series game even before people in the stands; in fact, the radio signals could have gone around the world 7 times before those in the bleachers heard the sound directly.



SO THE "DEAD" MAY TALK! A microphone equipped coffin awaits the death of a certain Middle West business man whose greatest fear is being buried alive. The grave site is wired to the cemetery office, where the caretaker is under contract to listen regularly for one year after the funeral. An electric bell is mounted in the coffin for test purposes; all is okay if the caretaker hears the bell when he closes the switch in his cottage.

N.R.I. ALUMNI NEWS

A Message to the Alumni Association

—from the President of N.R.I.

It seems such a short time since that day, in the fall of 1929, when seventy-five of our graduates met in Washington for a convention to celebrate the fifteenth anniversary of the founding of N. R. I.

I can hardly believe it has been seven years; yet when I look about me, see what has occurred in the Institute, the industry, and in our Alumni Association, I can say: "Seven years well spent."

I have seen the Radio Industry make great strides in the perfection of transmitting and receiving equipment; become a more stable industry; definitely accept television as a coming commercial product; and promote the principle of electronics to an everyday commercial necessity. And what is particularly pleasing, I have seen our Alumni Association, the first of its kind, with no other similar association to pattern after, increase its membership from 75 to its present imposing strength in the few years of its existence.

I feel that associations, with the proper code and well managed, can be of great service to their members. I take great pride in my connection, even though it is an inactive one, as Honorary President of the N. R. I. A. A.

Let me say that I think you have a wonderful calling. When he addressed the charter members of your Association on the steps of the Senate Office Building, former Vice-President Curtis said: "There is no greater opportunity in America today than Radio for men and young men seeking a profession." I agreed with Mr. Curtis then; today I still agree with that statement.

To you, my fellow members in the Alumni Association of the National Radio Institute, I wish you and our Association great success.

J. E. SMITH, *President.*

—from the Vice-President of N.R.I.

I have watched with great interest the growth of the N. R. I. Alumni Association. From the outset, it was such a revolutionary idea that I had grave doubts as to its ultimate success. At the end of the first year it had not seen much progress, and I was ready to predict failure.

But during the second year the idea took hold. Its few members began a drive for more members. They attacked the problem with the good old N. R. I. spirit of "never say quit." The membership increased by leaps and bounds until today I see a membership list containing men from every state in the Union, and many foreign countries.

The graduates of N. R. I. are to be complimented upon the fine organization they have developed. What may seem an impossible task to individuals can be performed with ease by the properly regulated organization.

But we can't stop here, our Association is still in its infancy. It must have many more members —if the plans are to be carried through to their conclusion. We must drive for more members. "In union there is strength." Every man who holds a membership card in the world's first home study school alumni association must put forth his best efforts to help in this drive.

Every person on N. R. I.'s staff is pulling for the Association. They want it to be a success. No amount of work is too much if it is to help the Association carry out its good work.

I want it known, that I, although not an active member, am doing everything that I possibly can to further the interests of the N. R. I. Alumni Association, and that I am proud of my Honorary Vice-Presidency in the Association.

E. R. HAAS, *Vice-President.*

Baltimore Chapter News

The Baltimore Chapter promoted an enterprise never before attempted in the history of Radio in Baltimore! On the night of October 23rd, at the New Howard Hotel, a big cabaret dance was staged. This dance was designed to bring together the entire Radio industry of Baltimore and their friends in a big evening of merry-making. The main dining room at the New Howard was reserved for the capacity crowd which attended. We also had the pleasure of welcoming a large crowd from the staff of National Radio Institute.

Every effort is going to be made to make our next annual dance just as big a success. And we want to take this opportunity of thanking the Dance Committee for the fine program they put on.

Arrangements are being made to have quite a number of able Radio speakers for our winter meetings. Mr. Herzog of Service Magazine is scheduled to speak shortly. We have been most fortunate here in Baltimore to have some of the best Radio speakers in the United States visit our Chapter. You are urged to attend meetings regularly in order that you might keep up-to-date with the latest happenings in Radio, as well as aid the Baltimore Chapter in its endeavor to interest prominent Radio men to give talks before this body.

The Baltimore Chapter will put on a large membership drive in the very near future. We simply cannot let the New York Metropolitan Area Chapter take all the show in attendance. We have been watching with keen interest what these boys have been doing in New York. Recently Mr. Jensen made a special trip to New York and heard Mr. J. Kaufman, Director of Education at N. R. I., speak before the New York Chapter. Through the cooperation of National Headquarters, we hope to give the fellows here in Baltimore a well planned schedule of activities.

Our regular meetings are held the first and third Tuesdays of every month at the New Howard Hotel, 8 North Howard Street, Baltimore, Maryland. New N. R. I. students and graduates are always welcome!

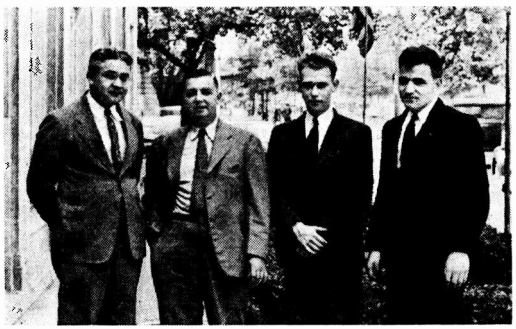
BALTIMORE CHAPTER STAGES ANNUAL DANCE

The photograph above shows a section of the Alumni dance in progress on the evening of October 23, at the New Howard Hotel in Baltimore. We ask you, was it a success!

New York Chapter Chairman Visits Washington

The N. R. I. NEWS photographer caught the little group below just as they were returning from lunch. From left to right — Joe Kaufman, Director of Education; Jim Dowie, Chief Instructor; Bob Murray, Executive Secretary; and Graduate Al Ardnt, Chairman of the New York Metropolitan Area Chapter.

Chairman Arndt is turning things upside down in the Big City to bring about one of the largest



Chapters ever attempted by the Alumni Association. Mr. Arndt and the Committee working on this project, are to be congratulated for the fine work they have already done, and the splendid turn out they have had at recent meetings. National Headquarters pledged itself to help any local Chapter who desires to put on an aggressive membership drive for the coming year.

Mr. Arndt had the pleasure of visiting Washington for the first time, and we all hope "Al" had a good time on his visit. On the return trip, we learn that he stopped off in Philadelphia to attend one of the Philadelphia-Camden Chapter meetings.

Special Notice

Every Chapter of the N. R. I. Alumni Association is urged to participate in a cooperative drive for new Chapter members. National Headquarters experimented quite recently with the special drive put on by the New York Metropolitan Area Chapter. The results were overwhelming.

R. B. Murray, Executive Secretary, and his staff, offer to help any Local Chapters who desire to get their organizations "pepped up." Arrangements will be made here in Washington to work out details of revised mailing lists and offer assistance in putting on the campaign.

Detroit Chapter

In recent months, Radio business practices—ethical standards in conducting a Radio service—have jumped into public prominence.

We of the Detroit Chapter have unanimously adopted the following resolutions to stimulate greater demand for preferred N. R. I. Radio service:

"To give honest service for honest pay—

"To make replacements, when needed, with the best material possible—

"To accept no compensation if customer is not perfectly satisfied (we have no record at present of any dissatisfied customers)—

"To strive to please, as this is the bedrock of our success—

"To expose incompetent Radio tinkerers by educating Radio set owners—

"To refer prospective new set buyers to N. R. I. men who are in the Radio sales business—

"To be in perfect harmony with the entire Radio industry, of which we are a part—

"To be loyal in word and deed to our ALMA MATER."

The boys here in Detroit were very happy to receive from National Headquarters a kit of Philco parts. We intend to divide the kit up into six sections and use them as door prizes. The kit was amply large to afford all of our members one or more prizes each.

Members are showing a keen interest in the subject of electronics. Recently a talk on this subject was given. We hope to receive the two new N. R. I. textbooks, now being published on this topic, just as soon as they are off the press for our library.

While on his western tour, Mr. P. J. Dunn, National President, stopped off at Detroit to attend one of our meetings. The boys gave him a grand welcome! We were all impressed here with the sincerity of Mr. Dunn and the outline of his plan for the coming year should he be re-elected.

We urge every N. R. I. man living in Detroit and vicinity to get in touch with this Chapter. You are entitled to make it your Headquarters—meetings are held twice a month—at 11305 Woodward Avenue, Detroit. You can receive full information concerning our activities by writing F. E. Oliver, Secretary, 218 Alter Road, Detroit, Michigan.

Chicago Chapter

For the benefit of those who failed to attend our recent meeting, let it be said here and now that they are the losers. After a very brief business session at our last meeting—and the enrolling of several new members who will be named shortly, the floor was turned over to Mr. Wallace of RCA for his lecture.

Mr. Wallace brought along all accessories necessary to his demonstration, including the oscillograph and rotary converter (the Hotel Sherman is in a D.C. district) modulated oscillator, analyzer and Radio receiver. Enough equipment for a real demonstration? Well, rather! A 6L7 tube had blown in the receiver so he had to take time out to get another, but the lecture and demonstration at last got underway. And we were more than repaid for the waiting.

Mr. Wallace touched only briefly upon the more common uses for the oscillograph, such as alignment and balancing, etc. Since we had seen and read so much along these lines already, he proceeded to demonstrate its more obscure capabilities.

Determination of receiver response in performing curves, stage gain, its use as a vacuum tube voltmeter, etc., then back to the location of distortion sources, fading, and the more routine application to servicing problems. The boys in Chicago thank Mr. Wallace sincerely for bringing his demonstration to our Chapter meeting.

We had hoped to have Mr. J. E. Smith, President of the National Radio Institute with us, but Earl Bennett had an air mail letter from him the day previous extending his profound regrets that he could not be present, promising faithfully, however, that he would be here sometime later this winter.

The second annual N. R. I. A. A. picnic is history. The last sandwich was devoured, the last stein hoisted, the last ball pitched, the last song sung, the dishes packed and the liniment and arnica stage reached.

It was a happy but tired crowd that left Cermak Park late that Sunday evening. We are looking forward to a riotous time again next year.

We have resumed the regular schedule of two meetings a month: the first and third Fridays. Place and time as usual, Hotel Sherman, 8:30 P. M. Let's see some of you new N. R. I. men down to our meetings—we assure you a good time as well as a profitable one.

Final Ballot for Election of National Officers for 1937

Again this year we take up that important step of electing officers to serve the N. R. I. Alumni Association during 1937.

We urge every member of the Alumni to submit a voting ballot—it is your duty to do this. Your choice of men to head the organization this year will play an important part in the service you will receive in the coming year. Sufficient votes were received on the nomination ballots to make these men eligible for the final choice of officers.

Many of these men have contributed considerable to the Association already—and their nomination proves that these men are worthy of your support. Use care in making your selections.

On the other side of this page you will find a handy ballot form. Vote one man for President, four men for Vice-President, one man for Secretary and one man for Executive Secretary.

Tear the ballot carefully on the dotted line. If you do not care to deface this issue of NATIONAL RADIO NEWS, you can prepare a facsimile of this ballot on a typewriter or with pen and ink, and sign and mail it to the address given.

Mail your ballot immediately to C. Alexander, Bookkeeper, National Radio Institute, 16th & U Sts., N. W., Washington, D. C. Return the ballot promptly so that all returns may be counted and the names of the new officers published at an early date. This is important!

Nomination Ballot

Fill in this ballot carefully, following instructions given on page 29. Mail your ballot to National Headquarters immediately.

FOR PRESIDENT (Vote for one man)

☐ P. J. Dunn, Baltimore, Md.

☐ L. J. Kunert, Middle Village, L. I., N. Y.

FOR VICE-PRESIDENT
(Vote for four men)

☐ Earl Bennett, Evanston, Ill.

☐ E. J. Meyer, St. Louis, Mo.

☐ R. H. Rood, Los Angeles, Calif.

☐ F. E. Oliver, Detroit, Mich.

☐ H. R. Evans, Albion, Ind.

☐ Clarence Stokes, Philadelphia, Pa.

☐ Lloyd Eveland, Tonkawa, Okla.

☐ Ed. Witherstone, Toronto, Ont., Canada

FOR SECRETARY (Vote for one man)

☐ Earl Merryman, Washington, D. C.

☐ William Ward, East New York, N. J.

FOR EXECUTIVE SECRETARY
(Vote for one man)

☐ R. B. Murray, Washington, D. C.

☐ Allen McCluskey, Birmingham, Ala.

SIGN HERE:

Your Name.....

Your Address.....

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

Mail Your Completed Ballot to:

C. ALEXANDER, BOOKKEEPER

NATIONAL RADIO INSTITUTE

16th & U STREETS, N. W.

WASHINGTON, D. C.

TEAR CAREFULLY AND MAIL

Certification of Elections

In the past, individual votes for Alumni Officers were counted by the staff at National Headquarters. This year arrangements have been made for the Accounting Department to do this work. We want every member to know we are acting in the very best of faith.

Mr. B. Lavins, N.R.I. Comptroller and Mr. C. Alexander, Bookkeeper, will count all final ballots. The names of the men elected by a majority vote will have their names certified by a notary public, as being officially elected to fill their respective offices during 1937.

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Flash—Chapter Editors

The Editor of the *Chicago Chapter Chatter* would very much appreciate receiving other Local publications, and he will be more than glad to reciprocate. Please send them to C. B. Morehead, at 2743 Giddings St., Chicago, Ill., and enclose your own address for their mailing list. Thanks!

———*n r i*———

Alumni Member Van Allen Expires

It is with great regret that we announce the untimely death of Graduate D. T. Van Allen of the Detroit Chapter. The Chapter has suffered a distinct loss with the passing of our brother member. Our deepest sympathy is extended to his friends and loved ones.

———*n r i*———

Directory of Chapters

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

Philadelphia-Camden—Clarence Stokes, Secretary, 3347 N. Front St., Philadelphia, Pa.

New York—L. J. Kunert, 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—Samuel Juricek, Secretary, 4223 N. Oakley Ave., Chicago, Illinois.

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

Detroit—F. E. Oliver, Secretary, 218 Alter Rd., Detroit, Mich.

Student Kapes Gets an Answer

In reply to the S O S of A. Kapes in the August-September NEWS, I don't believe this question of service charges can ever be answered in a direct dollar-and-cents manner.

For instance, I've charged the owner of a Model 89A Spartan Equasonne eight dollars for replacing a section of the voltage divider. Anyone who has ever serviced that type of receiver knows what a job it is to get the chassis in and out of the cabinet. Besides, the price of that model ran around three hundred dollars.

But I wouldn't think of charging the owner of a small Philco job that much for the identical repair. People who own expensive Radios can well afford to pay more in order to give the poor fellow, who owns probably a second-hand midget, an equally good repair at less profit. The service man can get a pretty good impression of his customer's financial status upon entering his home. This observation and the type of receiver to be serviced is what I base my repair price on when asked for an estimate.

Of course, the service man should set a minimum charge below which a repair is impossible, although the amount of this minimum charge will vary with the individual service man because of the variation in service men's overhead expenses.

Consideration must be given to the time element, too, especially where you have to spend a lot of valuable time extracting the chassis which, in some sets, is in as many as five parts, and a job by itself. The repair involved may be a minor one, but time spent has to be paid for.

Many a time during my early student days I underestimated my services and had to stand a temporary loss. I emphasize "temporary" because it was well worth the experience gained, and I am sure that every beginner in Radio service work will have to go through this stage until through experience he develops an *instinct* of what, when, and how to charge.

To the beginner my advice is: Better lose a few dollars until you know how—and keep a satisfied customer, than make a high estimate and never get the job. Sooner or later you will have the chance to even out that loss on other jobs. That's the policy I've followed and still follow—and I haven't had a squawk yet.

Graduate J. NORMAN BECK,
Bethlehem, N. H.

Additions to N.R.I. Ham List

H. G. Hardham — VE4MW — Winnipeg, Man., Canada
Charles W. Cragle—W8QJK—Glen Lyon, Pa.
B. St. John—W6MG1—Greenwood, California
Edgar Lee— W5FXC—McLaurin, Mississippi
Arthur H. Muskett—VE5DO—Vancouver, B. C., Canada
Lewis Laury—W3DGU—Boyertown, Pa.
Billy James, Jr.—W5FSG—Ferris, Texas
Neil O. Garity—W9AGN—Harvey, Illinois
Arthur E. Sims—W4EKM—East Flat Rock, N. C.
Willis Blades, Jr.—W9NFS—Venice, Ill.
K. R. Sturdy—VE5SN—Port Alice, B. C., Canada

Do You Agree?

"Best wishes and good luck to NATIONAL RADIO NEWS, the best magazine of its kind in publication. Wish I could save all the valuable articles in it, but by cutting out the desirable Service Forums for filing, I lose them. Couldn't you put the Service Forums on the opposite pages of the Alumni News, which are usually valueless after they've been read once?

Graduate GUS SANKEY,
New York City.

How many are in favor of this plan?—EDITOR.

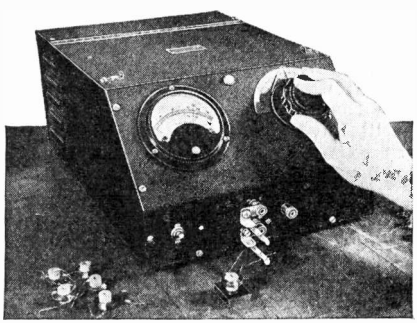
Q-Meter Becomes Standard Equipment

Research in coils used for R.F. transformers has shown the importance of a property called the "Q factor." This "Q factor" is the relation existing between the "inductance" and the "resistance" of the coil and the frequency used. If we know the inductance and resistance, we find the value for the Q factor as follows:

$$\text{Q factor} = \frac{6.28 \times \text{frequency} \times \text{inductance}}{\text{resistance}}$$

The largest number obtained for the answer when checking a set of coils identifies the best coil in the set. But instead of measuring the inductance, frequency and resistance, then working out the answer by arithmetic, it is now possible to measure the Q factor directly with a Q-meter. This is important to a designing engineer and it is well for Radio-Tricians to know that such meters exist.

The Q-meter's increasing use by Radio engineers, manufacturers, and government bureaus, reflects the rising standards in Radio. Says W. D. Loughlin, President of the Boonton Radio Corporation: "In addition to the many Q-meters found among American Radio workers, our instruments play a large part in the Radio industry abroad. Our records indicate that Q-meters are in use in most European countries, Australia, Japan, and South America. The popularity of this instrument in many laboratories and engineering departments has called for additional units to expedite important tests. All of which indicates that the Q-meter has become a standard test instrument in the industry, fully confirming our stressing the importance of direct-reading Q values, as well as of L and C.



The Q-meter

"We know that the Radio industry in the country is 'Q' conscious. Coils for Radio receivers are now specified in terms of Q. The Q-meter, by setting definite standards and simplifying the measurements, has definitely improved the quality of present-day Radio components."

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T. E. ROSE, EDITOR
S. M. ARMSTRONG, MANAGING EDITOR

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