

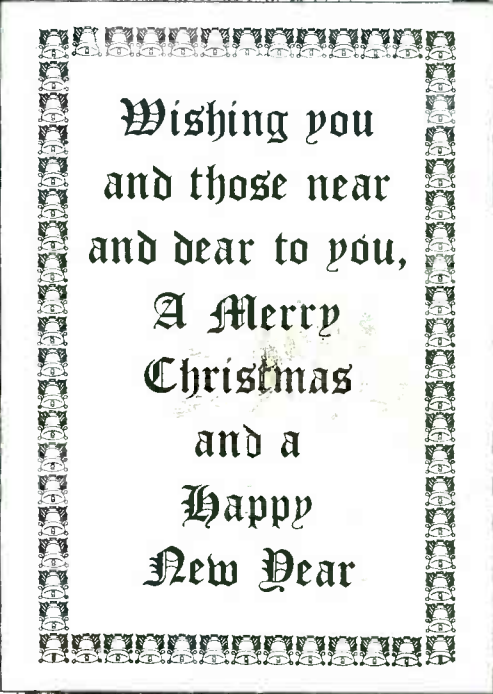


National *RADIO* News

Vol. 6—No. 5

WASHINGTON, D. C.

Dec., 1934-Jan., 1935



Wishing you
and those near
and dear to you,
A Merry
Christmas
and a
Happy
New Year



The President's Page



By J. E. Smith, President, N. R. I.

But as I pointed out before, Radio has had its "ups and downs." Its path has not always been the easy one. There have been slumps such as the one the Radio Industry went into in 1929 and which continued to a degree throughout the entire economic depression. There have been lawsuits over patent rights—there have been troubles between the broadcast stations over time and frequency, but these things must be expected in any major industry.

The interesting part of the whole thing is that these reverses seem to have helped rather than hurt the industry—because after each of these blasts the industry has emerged better and more popular than before.

Right now probably the biggest problem in the broadcasting end of Radio is between the forces who want to keep Radio as it is, on one side, and those who want to use many of the existing broadcasting channels, for educational, religious and other non-profit broadcasts.

There is much that can be said in favor of both plans—but those who desire to keep Radio broadcasting on its present basis have one very powerful argument in their favor. That is—"It was this plan on which American broadcasting has been built—it is the plan which has carried American broadcasting to leadership in the world—and is, therefore, the plan which should be followed if we are to go forward to continued success in Radio."

Looking back over the years we can see Radio starting as a plaything of experimenters—manufacturers making only parts and kits. We then see the trend to putting these crude, haywire hookups into cabinets. We see the tendency to build the speaker into the cabinet and the trend to make sets more compact and with less controls. We see numerous refinements in sets, speakers, tubes. We see the battery-operated receivers superseded by those powered from the ordinary house current.

The magnetic speaker gives way to the dynamic speaker. We see tone controls, automatic volume controls, remote controls take their places along with other improvements—also the rise of the midget as an economic necessity during the depression, and its fall when times got better. For several years automobile Radio marked time—then went forward with a rush. It too had its refinements and now it has taken its place alongside of the home receiver in the industry.

And now, we ask, what is ahead in Radio? Probably the most important things in Radio for

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AS we come to the end of another year, it is interesting to look back—to take stock of what has gone before and also give some thought to what we may expect to transpire in the Radio Industry in the future.

The growth of Radio reads very much like a story book. With the advent of broadcasting a dozen or so years ago began the real life of Radio. It started as a novelty—a toy in the hands of a few experimenters and in a short span of years, through which Radio had its serious "ups and downs," it has come to us in an ever-improving—ever-growing industry.

So insecure was the footing of this "plaything" industry a dozen years ago that manufacturers, rather than make complete Radio sets, manufactured only the parts—and then the Radio experimenter cut and twisted, drilled and mounted, swore quite frequently and then rejoiced in his ability to pick up signals with the "breadboard" outfit he had created.

Today, however, the Radio Industry presents an entirely different picture. There are 300 Radio manufacturers making Radio sets and tubes—there are about 3,500 wholesale distributors—there are about 30,000 Radio dealers. The investment in money in the Radio manufacturing business alone is estimated at close to \$250,000,000, and the Radio Industry of today gives employment to about 150,000 people. Quite a different picture—you will admit—than the one Radio presented in 1920.

Eighteen million Radio sets have been purchased since 1922. That gives some idea of the financial returns to the manufacturer, wholesaler, and dealer. It also gives some idea of the earnings of the Radio servicemen—because every one of these sets had to be installed—every one of them will at some time or other require the expert touch of a trained Radio-Tician.

Easy Measurement Charts

Applying Ohm's Law Using Charts Instead of Formulas

By J. A. Dowie

DR. GEORGE OHM, a German physicist, found in his experiments with electricity that an increase in the voltage applied to a conductor caused a directly proportional increase in the flow of current, now known as Ohm's Law. This is one of the most important principles of electricity and is expressed mathematically as

$$\text{Ohms (resistance)} = \frac{\text{Volts (pressure)}}{\text{Amperes (current)}}$$

This states that the *resistance* of a circuit is equal to the *voltage* acting in the circuit *divided* by the current in the circuit. This rule applies



J. A. Dowie
N. R. I.
Chief Instructor



to each separate portion of an electric circuit as well as to the circuit as a whole.

Since Ohms equals Volts divided by Amperes, then amperes must be equal to volts divided by ohms.

$$\text{Amperes} = \frac{\text{Volts}}{\text{Ohms}}$$

also Volts must be equal to Amperes multiplied by Ohms

$$\text{Volts} = \text{Amperes} \times \text{Ohms}$$

Thus Ohm's Law can be put in three different forms. Of the three quantities, Ohms, Amperes, and Volts, two must be known in order to find the third quantity, using these formulas or charts.

Radio-Tricians will find many uses for Ohm's Law; estimating resistor values, voltage drop across apparatus, battery drain through resistances or voltmeters, etc. are many uses to which this law may be applied. To avoid the mathematical calculations involved in using Ohm's Law, which are a little hard for some students, the two Ohm's Law charts shown in Figures 1 and 2 have been prepared.

By means of a ruler and a pencil, drawing a straight line between any two known values on these charts; the point at which this line intersects the third scale, marks the value of the unknown.

Working out a few examples will illustrate the usefulness of these charts and show how they eliminate the necessity to use any complicated mathematical formulas.

Examples. What value of resistance would you use in a circuit in order that 0.5 (which is the decimal expression for $\frac{1}{2}$) of an ampere of current flows through the circuit, when the voltage is 5 volts: By drawing a straight line between 5 volts and 0.5 of Figure 1, we find this line crosses the middle scale at 10 which

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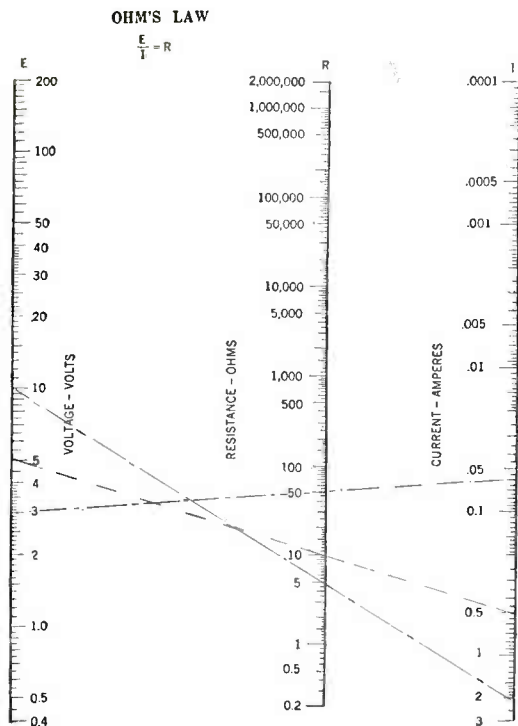


FIGURE 1



A Few Words With The N.B.C. Director



E. R. Haas
Vice-President
and Director

Radio Forges Ahead

The United States Department of Labor, reporting on Radio factory employment, states that June, 1934 showed an increase of 2.4% over May, while the factory payrolls of June were 4.5% over those of the preceding month. That would seem to indicate not only an increase of employment, but an increase in wage scale.



The Stewart-Warner Corporation and its subsidiaries made a net profit of \$540,360 for the first six months of 1934.



According to the records of the United States Department of Commerce, Radio exports during June of 1934 totaled 36,372 Radio sets valued at \$942,153, and 470,638 tubes valued at \$231,479.



During the first six months of 1934, Radio sales, according to very good authority, rose from 50% to 75% above the sales for the first six months of 1933. And the way things look as we go to press with this issue of NATIONAL RADIO NEWS, the second six months of 1934 will

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beat the second six months of 1933 by from 25% to 40%. In 1929, the peak year of Radio sales, there were 4,338,000 Radio sets sold. If the estimates above for the year 1934 hold true, there will be a Radio set sale during 1934 of 4,570,000 Radio sets, topping 1929 sales by over 200,000 sets. Who says the depression isn't past?



A Statement By The President Of The National Broadcasting Company

The outlook on Radio has been very ably pictured in the following statement made by Mr. M. H. Aylesworth, President of the N. B. C.

"When Senatore Marconi recently celebrated his sixtieth birthday he said that he hoped to surprise the world in a year or two as he did in 1901 when he thrilled the human race with the first transatlantic signal. Marconi was only twenty-seven on that historic day. And at sixty he is aware that the science of wireless, which he gave to the world, is comparatively but a day old.

"Radio's possibilities are unlimited. Owen D. Young's timely remark in 1920 applies to 1934, 'the principal asset in Radio is still the unknown.' The Radio discoverers are still sailing uncharted over that ocean of science which no man owns.

"Radio today is pulsing with the lifeblood of new industries that will rise within the years to come, giving employment to additional thousands of men and women.

"Facsimile Radio, that is, the sending of pictures and printed matter through the air, is looming on the horizon of science. It is uncanny to watch the Radio pens sketch drawings and words in the laboratories. But as we watch the activity of the tiny Radio pens as they dart across the paper, they seem to move with a businesslike sweep that means they are going some place. I believe the day will come when you will turn on the facsimile receiver when retiring and in the morning the paper tape will tell the story of what flashed through the sky while you slumbered. You will find road maps fashion designs, comic sketches for the children and no end of things, for whatever a pen can portray, facsimile Radio will handle."

PHILCO SUPERS USING 36 OSCILLATOR

A new 36 type tube will relieve the trouble temporarily. Lower the cathode resistor about 2,000 ohms. Clean the oscillator coil and connections and dry out if necessary. Completely disassemble the padding condenser and carefully clean the mica and brass plates of all corrosion due to sweating and moisture.

— n r i —

CLARION MODEL 52 & 53

Clean the wiping contact on the tuning condensers, or if the wipers are missing, install new ones or connect a pigtail between the shaft and chassis.

— n r i —

PHILCO MODEL 91

SHADOW OF TUNING INDICATOR GRADUALLY WIDENS

This indicates that the plate currents of the tubes going through the indicator are increasing. Generally this is caused by a gassy tube—therefore, replace the two 44 R.F. and I.P. tubes, even though they check O.K. in the tube tester. If allowed to stay in the set, the plate currents may reach proportions great enough to burn out the indicator meter movement.

— n r i —

ATWATER-KENT MODELS 448, 188, 260, 469 and 489

POOR TONE

This is often caused by a defective volume control. The tone is usually worse at low volume levels than at high volume levels. The control should have a resistance of a half megohm. Often times the control will increase to 1 megohm. The cure is to replace the control with a new one.

— n r i —

INTERNATIONAL MODEL J

HUM

Check for a defective resistor connected to the type 24 second detector, placed in series with the 60,000 ohm resistor to the screen of the 35 R.F. tube. If defective, a 500,000 ohm unit should be used for replacement.

FADING OR INTERMITTENT RECEPTION

INTERNATIONAL MODEL JS

INTERMITTENT RECEPTION

This is generally caused by leaky by-pass condenser connected between the place of the 47 type tube and the tone control. If the volume increases on removal of the ground wire, replace the by-pass condenser with one having a value of .06 microfarad.

— n r i —

STROMBERG CARLSON MODELS 38, 39 AND 40

NOISY VOLUME CONTROL

If noise is observed when the volume control is moved, try replacing the 56 type tube in the first audio stage. If the tube is gassy it may draw grid current, and noise will result when the control is moved.

— n r i —

PHILCO MODEL 7 NOISE WHEN TUNING

This can usually be cleared up by tightening the volume control nut in the chassis. It should be well grounded.

— n r i —

PHILCO USING 44 AND 36 TYPE TUBES

INTERMITTENT AND REDUCED PILOT BRILLIANCY

This is generally caused by a filament to cathode short in some of the tubes. If new tubes clear up the trouble, the old ones were, of course, defective and should be permanently replaced.

— n r i —

MOTOROLA MODEL 55

ELKNODE DEFECTIVE

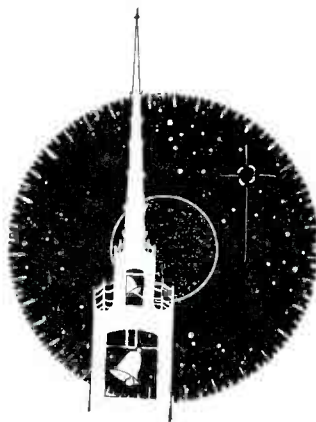
When installing a new Elknode, it is a good idea to place a 50,000 ohm resistor across its outfit wires. This gives a steady load and will lengthen the life of the unit.

— n r i —

MAJESTIC INTERMITTENT MODEL 363

Often times this is due to leakage across the plate or filament terminals of the 80 tube. Examine the tube socket, and if it seems to be charred replace the socket with a new one.

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WAR DECLARED!

Don't we, all too often, go into this world of strong competition inadequately armed to fight the battle of our very existence?

Is it not true that we attempt to compete with well armed troops—men with experience and training, without the proper background to warrant an even break at our zero hour?

Quite true, we are told that David slew Goliath with a stone—and consequently defeated the Philistines—but that was thousands of years ago. Battles today are fought with steel, lead, powder, and brains. You can't take a stronghold by hurling sponges at a concrete wall. You can't go out into the field of Radio and expect to make a big success if you are improperly or inadequately trained. You can't send yourself against well armed forces if you only have a bow and arrow.

Life is a battle. You are in it from the very time you set out to earn your own living. Whether you will be swept along with the tide—sooner or later defeated, or whether you will go forward to victory, depends solely upon yourself.

War is declared! Will you stand or fall? Will you succeed or fail? Your N. R. I. Training is your ammunition, your powder, your fortification. You have made the right start—you have mobilized your forces for the campaign—you have every right and reason to expect success. You have decided upon the plan which has carried hundreds of others to success, those thousands of N. R. I. graduates who have gone into the battle of life and conquered with their N. R. I. Training.

Arm yourself with your N. R. I. Training. Get everything you possibly can out of it, and you will go into the battle assured of emerging victorious.

THE Commander-in-Chief of the Armies and Navies of Ulvania has summoned his staff. High ranking officers of the Army, Navy, Marines are present. On a large table are maps, charts, plans and specifications, showing details of the Ulvanian fortifications, naval strength, etc.

Covering one whole wall is a large map of the entire enemy territory. On another table are bulky reports on enemy activities supplied by the Ulvanian Secret Service Division.

A major offensive is being planned.

The Commander-in-Chief speaking: "Battleship Division one will proceed at once to point 'Z' in company with 12 units of the Mine sweeper Fleet. Battleship Division TWO goes to point 'X' with Troop Ships carrying the Eleventh and Thirteenth Marines, the Seventh and Sixteenth Infantry and the Eighth Field Artillery. Third Battleship Division proceeds to point 'Y.' The Fifth Naval Division will sail for point 'W' to keep the enemy Naval Forces, which are on the South Coast, out of this action.

"Zero hour is 6 a.m. Thursday. Simultaneously our three fleets will open fire on fortresses 'A,' 'B' and 'C' proceeding thereafter to bombard enemy infantry at position 'D' while our land troops attack from the front having been landed at Fort 'B.' Is that all clear, gentlemen? Don't forget, your Zero Hour is 6 a.m. Thursday. Be ready.

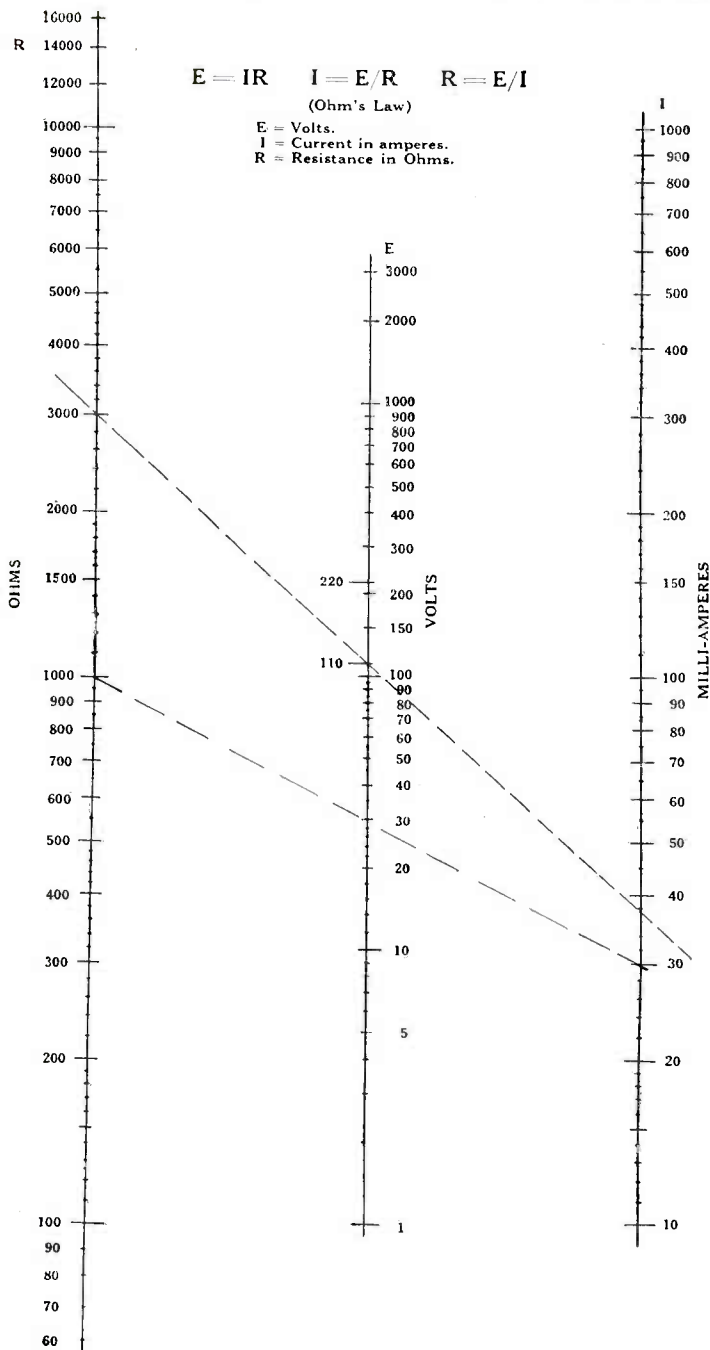
"And, gentlemen . . . recall all arms and ammunition. Equip your Infantry with bows and arrows and your Marines and Sailors with sling shots."

HAD THE C.I.C. SUDDENLY GONE MAD? YOU'D SAY "YES." SO WOULD I. SO WOULD THIS STAFF.

But—don't we, as units of our Nation's industrial army, as commanders-in-chief of our own personal success, frequently go mad likewise?



Easy Measurement Charts—Continued from page 3



is the resistance in ohms. If the current was to be .06 (6/100) of an ampere and the voltage 3 volts; the line crosses the middle scale at 50 ohms.

Now suppose 30 volts are applied across a 1000 ohm resistor. What would be the value of current flow in milli-amperes? By drawing a straight line between the two known values (30 volts and 1000 ohms) on Chart Figure 2, the value of current is found to be 30 milliampères.

If the voltage was 110 and the resistance 3,000 ohms then the value of current would be 37 milliampères.

Suppose we know the current in amperes and the value of the resistance in a circuit, for example, the current is 2 amperes and the resistance is 5 ohms then Chart Figure 1 shows that the unknown voltage across this resistance would be 10 volts.

Charts like Figures 1 and 2 therefore enable any one to easily calculate the voltage-current or resistance of Radio and electrical circuits which makes them come in very useful. So while you think of it—make a note of this issue of NATIONAL RADIO NEWS so you'll know just where these charts are when you need them.

*NOTE: A milliamperè is .001, $\frac{1}{1000}$, of an ampère. Therefore

all we have to do to change milliampères to ampères is to multiply milliampères by .001—for example, 30 milliampères multiplied by .001 equals .03 of an ampère.

To change ampères to milli-ampères multiply ampères by 1000—for example, .037 of an ampère multiplied by 1000 equals 37 milliampères.

← FIGURE 2

New Type 80 Tube With Corrugated Plate

SINCE the days of A.C. operated Radio sets the type 80 has been a very important tube. Its function is to convert alternating current to a form suitable for use by the receiver; namely, to direct current at higher voltage. The more tubes a receiver used obviously the more current the type 80 had to convert until, with modern multitube sets, the critical point had been reached where the useful life of the 80 had been seriously curtailed.

This problem of useful life and necessary output became further intensified with the introduction of the smaller dome-shape bulb used to enclose the 80.

In the studies made by National Union engineers to improve the No. 80, it became apparent that the direct limitation of performance was determined by the degree of back (secondary) emission existing at the plate. Furthermore, back emission was found to be closely associated with the operating temperature. Hence the problem became one of lowering the operating temperature of the plate.

STEPS TAKEN IN WORKING OUT PROBLEM

Carbonized plates were studied in hundreds of cases—special carbonization was employed, but this resulted in only slight improvements. Spacing of elements was studied, but even with the ideal arrangement, it was obvious that the temperature was still excessive. It was quickly discovered that an improvement could be obtained by increasing the operating voltage, but this would increase the strain on the transformers and filter condensers already standardized, or would entail increased cost of substitute parts. So this was discarded as undesirable.

The only method of lowering temperature without objectionable drawbacks was to increase the area of the plates—but the limitation seemed to be the size of the No. 80 bulb as the elements of the No. 80 had to be inserted from the bottom and were limited in size by the neck of the bulb.

And then the idea of folding or corrugating the plates was hit upon. This gave the increased

area and still went through the neck of the bulb—it worked (but not until after heart-breaking efforts with plate dies).

RESULTS

Longer Life—The new National Union No. 80 is a radically different tube both in design and operation. The corrugated plates are noticeable. It will replace any No. 80 in any set. It combines the acme of desirability of higher drain with longer life.

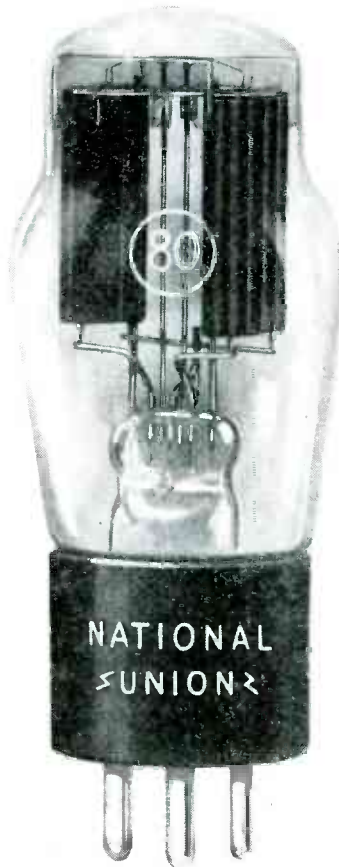
SAFETY

The National Union Company claims that because there is considerably less danger of their new corrugated plate No. 80 giving way because of shorter life or from line voltage fluctuation, there is less chance for burnt-out power packs, hence a safer tube in the Radio set.

COMPARISON

To give the Radio serviceman a comparison of performance, National Union states that the corrugated plate 80 will give equally as long life as 150 milliamperere drain as the old one at 125 milliamperes.

Marked improvement will be noticed in using these new No. 80's in multitube sets and for any other purpose where long life under exacting requirements is desirable.



Next Issue to Carry Valuable Auto Radio Chart

In the next issue of NATIONAL RADIO NEWS we will bring our readers a valuable Automobile Radio Chart which will be fine reference material for Radio-Tricians handling Auto Radio equipment. This chart gives data on 26 makes of cars including over 60 models, showing location of antenna lead in, battery information and other pertinent data.

LET'S HAVE A SALE

By P. J. Murray, Executive Secretary, N. R. I. Alumni Association;
Managing Editor, National Radio News

EVER so often—in nearly every business—the managers decide to step up their sales with a spurt.

You've noticed Department Stores—how one company has a "clearance sale," another has a "clean sweep sale." They have "fur sales" in August and "linen sales" in January. This is done for several reasons, among which are: to gain new customers; to clear out slow selling or "off-season" merchandise; to put more business on the books.

Now you, as a Radio man, have something to sell—YOUR SERVICES. No doubt there are times when your regular service business drops off—certain months when you could handle more business. Those are the times to "have a sale."

Then, there are seasons when the Radio business is real good—you're getting plenty, but you would like to handle a bigger share—even if you have to get another Radio man to help you handle it. The peak Radio months in the fall and winter are examples. Then, "have a sale."

How to go about it? It's not hard. Here are a few suggestions that will help you. First off, you need a list of set owners. Most likely you already have such a list of persons for whom you have done Radio work, your customers. It is easy to add to this list by checking up on homes where you see aerials. If they are apartment homes, the names can be obtained from the mail boxes in the lobby of the apartment house, in most cases. If they are in regular residences, and the names are not on the doors or the mail boxes—

just take down the number of the house and reference to the city directory will give you the information you desire.

A number of successful Radio servicemen have gotten lists—even in very exclusive apartment houses where the residents' names were carefully guarded, by the simple procedure of repairing the receiver of the janitor or the manager in exchange for a list of the set owners. Or, another way, is to talk to a boy, 13 years old or thereabouts, who lives in the building. Offer him a half a dollar to find out all the people who live there and have Radios. You'll be surprised how many he'll get for you for a half a dollar.

By these methods, and others you may think of, you can build this list just as large as you want it to be—just as large as you feel you can handle. By preparing some special "Bargain Sale" offer and mailing it to this list you have a good chance of picking up quite a bit of business—and incidentally building up your list of *regular* customers.

People nowadays are looking for bargains. You can prove this to your own satisfaction by picking up the newspapers and noticing how many of the large department stores advertise "bargains." They crowd their places of business when they have "sales" because people think they are getting "bargains." The experience of advertisers every-

where proves conclusively, that one of the best selling appeals is to show the prospect how he can save money—which is in effect a "bargain."

Therefore, the thing for us to do in the sale

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I don't sell Radios!

I'm not like the barber who gets you in his chair and then tries to sell you something out of every bottle on his shelf. My business is servicing Radio equipment. It is my job to make your Radio work—not to tell you how bad it is—or how obsolete it has become, with the idea of selling you a new set.

I'd rather make a Radio set work—and work properly, just the way it did when you first bought it, than anything else I know.

So when you call on me to repair your set, feel confident that I'm going to make it like you want it—like the manufacturer of that set intended it to be. I couldn't sell you a Radio if I wanted to—because I am a Radio serviceman, first, last and always—and *I don't sell Radios.*

Don't put up with improper Radio reception—what sounds like a big trouble in your set may only require a few minutes of an expert's time to correct. Note our special conditioning offer which is fully explained on the enclosed card. If your Radio is not just the way you want it to be—this conditioning service will probably make it right. Drop the card in the mail, and our expert will call immediately—or, phone Main 1357.

An unusual letter which was used with fine results by an N. R. I. man who wanted to stress "SERVICE."

General Service Hints

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

How To Cure Rattles In Dynamic Speakers

Rattles are often caused by the voice coil hitting against the magnetic structure of the speaker. Generally it is due to improper alignment of the voice coil resulting from an offset spider, or loose spider supports.

If the voice coil is caused to rub against the magnetic pole pieces, there is serious danger of the enamel on the voice coil wires scraping off and some of the turns being short-circuited. If such a condition exists, care must be taken to analyze the voice coil for shorted turns. This can be done by checking accurately the D.C. resistance and examining the voice coil wires under a magnifying glass. If the voice coil touches the pole pieces, because of improper alignment of the external or internal spider, this can be remedied by realignment. The gap between the center core and the inside of the voice coil form, generally ranges from .010 to .020 of an inch. Alignment can be made by inserting three cardboard or celluloid strips between the inside of the voice coil and the central iron core, as shown in the internal spider system in Fig. 1. Loosen the centering screw where the internal spider system is used, or loosen the external spider screws in the other types, let the moving coil align itself and tighten the holding screws. If the moving coil does not recentre itself, it will be necessary to loosen the retaining ring around the edge of the cone. Repeat the centering process and tighten all screws.

Iron filings and grit in the air gap may cause rattles. Blow out all foreign material with a

hand bellows or with a fine nozzle attached to an air pump.

In manufacture, the voice coil winding is carefully impregnated or lacquered, but in some cases the wires become loose under the continual strain of the voice coil vibration. The rattle thus caused is a distinctive buzz, and a little experience will enable you to detect loose wires in the voice coil readily by this particular sound.

Loose wires on voice coils can be remedied by impregnating the voice coil with some kind of good lacquer or household cement. A good dry Dupont clear lacquer or acetone solution such as "ambroid," can be used. Care must be taken in applying this lacquer that it is put on thin, otherwise it will interfere with the movement of the voice coil by rubbing or sticking against the pole pieces. Some voice coils have a number of layers of winding on the voice coil form, and a few wires in one of the inner layers may be loose, causing a buzz. This trouble is a little more difficult to remedy. This is best taken care of by several applications of the thinned-out impregnating solution over the spot on the voice coil under question, until the impregnation has had a chance to work through the other layers. A new cone with attached voice coil should be used in unreparable cases.

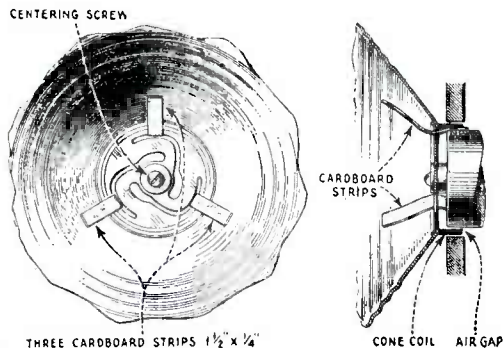


FIGURE 1

How To Remove The Compound From Sealed Containers

Service men in their repair work often find that a defective part is placed in a sealed container along with other good parts. The price of the entire piece may be more than the customer can afford or it may be impossible to obtain. Then the service man will find it a very good thing indeed to be able to remove the tar or wax so the defective part can be replaced.

There are two ways of removing wax and (Page 18, please)

The Service Forum—Continued from page 5

MAJESTIC MODEL 70 INTERMITTENT

The nuts from the power pack terminal strip should be tightened with a pair of pliers. The top strip should be removed and the nuts from the bottom mounting also tightened with pliers.

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PHILCO MODEL 10 RESETTING DIAL

To do this without loosening the dial shaft screws and resetting, insert a match stick in the hole of the back of the dial assembly. This will disengage the teeth of the dial wheel, and the condensers may then be turned without moving the dial.

— n r i —

GENERAL ELECTRIC MODEL M40 INTERMITTENT AND DISTORTED

Check the bakelite insulating strip on which the vibrator point rests. Sometimes metal particles will be found imbedded on the strip and these will cause the complaint. The strip may be cleaned with a file.

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SILVER MARSHALL MODEL 30B NOISY WHEN TUNING

Check the pilot light socket for an intermittent short to the chassis.

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SPARTON MODEL 931 INTERMITTENT, HUM OR LOW VOLUME

The .6 ohm hum balancing control on the power tube filament often increases in resistance. This will cut down the filament current. The control should be replaced, although the set will operate fairly well without it in the circuit. If the hum is not too great, it may be left out permanently.

— n r i —

PHILCO MODEL 19 WEAK AND DISTORTED

Try a new 75 type tube in the receiver, even though it tests O.K. in a tester. If a glow between the tube elements is noted when the tube is in the receiver, it is gassy and should be replaced. This condition generally will not be shown up by a tube tester.

— n r i —

PHILCO MODEL 65 INTERMITTENT AND WEAK

If you find that the plate voltages on all the tubes are low, the trouble is probably caused by a leaky or short circuited .001 microfarad bypass condenser in the detector plate circuit. Try a new condenser.

RCA VICTOR MODEL R-12 DISTORTED

This is often caused by a defective voltage divider system. Two resistors having a value of 16,000 and 8,000 ohms cause the trouble. They may easily be checked by substituting new units temporarily.

— n r i —

RCA VICTOR MODEL R-12 OSCILLATION AND NOISY WHEN TUNING

This trouble generally develops at the high frequency end of the dial, and is caused by poor connections between the rotors of the tuning condensers and the chassis. Sandpapering the contacts will clear up the trouble, and if you desire, you can make a permanent cure by connecting a pigtail between the rotors of the condensers and the chassis.

— n r i —

RCA VICTOR MODEL R-11 R A E POOR SENSITIVITY LOW VOLUME

Check the two .1 microfarad condensers in the grid return of the A V C tube for leakage. If you do not have a high range ohmmeter, try two new condensers. A symptom of this difficulty is an increase in volume when the A V C tube is withdrawn. This may, however, indicate a defective A V C tube.

— n r i —

FADA MODEL 18 INTERMITTENT, OSCILLATION OR HOWLING

This is generally caused by a defective bypass condenser. The substitution of new bypass condensers is the quickest way to check up on the one causing the trouble.

— n r i —

EVEREADY MODEL 52 HUM

This is caused by a poor contact between the common lead from the filter condenser block and its case, through which it is grounded. The wire will be found just inside the end of the can where the cover is soldered.

— n r i —

CROSLEY USING FRICTION DRIVE SLIPPING OF DIAL

This trouble occurs on the lower priced models employing a friction drive spring held up by a washer. The washer should be knocked off the shaft and the spring removed, together with the back piece of brass. If the brass piece has been worn, file or grind off the worn place and reassemble. If you cannot get the washer to stay on the shaft, push it down tight on the spring and solder it in place. If you experience difficulty in removing the spring and

(Page 28, please)

"Acorn" Tube For Radio Experimenters



A radically new type of Radio tube, resembling an acorn in size and shape, for use by amateurs and experimenters in ultra-high frequency, or micro-wave reception and transmission has been announced by the Amateur Radio Division of the RCA Radiotron Company.

Amateur radio experimenters, who have been credited with being the first to open up the practicable possibilities of short waves, are now exploring the possibilities of the extremely short micro-waves, which are similar in some ways to light rays, because they seem to reach out only as far as the eye can see. Comparatively little is yet known about the micro-waves, and they offer an attractive field for research and experimentation which the new acorn type tube should advance.

In announcing the new device, the RCA Radiotron Company emphasizes that it has been developed for amateur and experimental use, and is in no way to be considered as a substitute for use in conventional types of receivers. The tube, which has been designated by the number RCA-955, is a heater-cathode triode which may be used as an amplifier, detector, or oscillator at frequencies up to 600 megacycles, or about half a meter in wave-length. The new tube is the only triode capable of operating at ultra-high frequencies and it is therefore indispensable for use in the $2\frac{1}{2}$ meter and lower wave-length bands.

Although the "955" is not especially designed to be a transmitting tube, it may be used as such just as other receiving tubes are used in transmitters by amateurs. When used for this purpose, sufficient power output is usually obtainable to cover the line-of-sight transmission distances which are generally reached by micro-wave transmissions. Because of its extremely small size, the acorn type tube is especially suited for use in portable Radio equipment where conservation of space and weight is important.

The essential characteristics of the 955 acorn type tube are:

- Heater Voltage—6.3 volts
- Heater Current—0.16 amp.
- Maximum Plate Voltage—180 volts
- Grid Voltage—5 volts
- Maximum Plate Current—4.5 milliamps.
- Mutual Conductance—2000 micromhos
- Amplification Factor—25
- Plate Resistance—12,500 ohms

Auto Radio Vibrator Replaces Condenser



To take care of condenser replacements in auto-Radio vibrators, a line of tiny units specifically designed for the purpose is announced by the Aerovox Corporation, Brooklyn, N. Y. These replacement units comprise oil-impregnated, oil-filled, pure linen paper sections in hermetically sealed metal containers, with mounting lug and pigtail lead.

The units are designed to withstand heat, vibration, moisture and climatic conditions, as well as exceptional peak loads, without breakdown. They are available in several standard capacities.

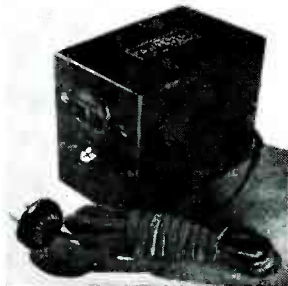
— n r i —

All-Wave Line Noise Filter

Keeping line noises out of present-day all-wave reception is the function of the new TACO 11-F All-Wave Line Filter just announced by Technical Appliance Corp., 27-26 Jackson Ave., Long Island City, New York.

Housed in attractive brown metal case with receptacle, ground binding post, attachment cord and non-breakable rubber plug, the all-wave line filter comprises separate filter circuits for broadcast and short-wave bands. The circuits have been worked out over a considerable period by Amy, Acevos and King, Inc., well-known engineers specializing in antenna problems and Radio noise elimination. The present device is made under license from them.

Filtering is thorough in both broadcast and short-wave bands. Only pure, noiseless AC or DC reaches the set. Device handles up to 250 watts. The installation is nothing more than plugging usual set plug in receptacle of filter, inserting filter plug in nearest electric outlet, and connecting binding post to convenient ground. If preferred, filter may be inserted between any electric appliance causing line noises, and its power supply, thus combating interference at source.



RADIO-TRICIAN SERVICE SHEET

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COMPILED SOLELY FOR

STUDENTS & GRADUATES

Stewart-Warner Model R-116 Chassis

CIRCUIT DESCRIPTION

The Stewart-Warner Model R-116 chassis uses a five-tube superheterodyne circuit. The incoming signal goes to the tuned first detector circuit and then beats with the oscillator output to produce a 456 K. C. intermediate frequency signal. This particular frequency is chosen to prevent image frequency interference.

The 456 K. C. signal is amplified by a high-gain I. F. stage and is then rectified by the diodes of the 75 tube which are connected in parallel. The audio component of the rectified signal is impressed across the 500,000 ohm potentiometer through condenser No. 15. The volume is controlled by selecting any desired portion of the A. F. voltage with the moving arm of the potentiometer which is connected to the grid of the 75 tube. The triode section of this tube acts as a high-mu audio amplifier, resistance-coupled to the type 42 output tube. This method of coupling produces excellent tone quality.

The necessary A. V. C. operating voltage is secured by smoothing out the modulated drop across resistor No. 8 by a resistance-capacity filter consisting of resistor No. 5 and condensers No. 3 and 6, and applying the voltage to the grids of the 6A7 and 78 tubes. Thus the bias of these tubes increases and drops in proportion to the strength of the received signal and tends to maintain the audio output at a practically constant value.

For the reception of short wave signals, portions of the antenna coil primary and the oscillator grid coil are shorted and a condenser is connected across part of the antenna coil secondary. This reduces the inductance of the coils and thus permits tuning to higher frequencies.

The R-116 A, H, and L are designed for operation on 115 volt 60 cycle power circuits while the R-116 X, XH, and XL are adaptable for use with voltages of 115, 125, 230, 240, or 250 at any frequency from 25 to 60 cycles. To permit this flexibility of operation, the power transformer has two separate tapped primaries. The connections for the various line voltages are shown on the tag attached to the transformer. All X models are also wired for operation with a high impedance phonograph pick-up. The R-116 AL and XL chassis are used in console cabinets with 8 inch speakers. The others are used in table models with 6 inch speakers.

ALIGNING THE R-116 CHASSIS

Before attempting to align a set, the service man should remove the chassis from the cabinet and become familiar with the general layout and with the function and location of the various alignment trimmers. The following discussion briefly explains how each circuit is affected during the various steps of alignment.

The first detector and oscillator circuits are aligned by the two trimmers located on the two-gang variable condenser and are kept in exact step by the special shape of the rotor plates of the oscillator section. This shaping of the plates makes it unnecessary to use a padding condenser for low frequency alignment.

The I. F. transformers, located on the top of the chassis in front of the 75 and 78 tubes, are the tuned-input, tuned-output type, with each winding tuned by a separate trimmer condenser. The four I. F. adjustments are reached through holes in the tops of the I. F. transformer shields.

PRELIMINARY STEPS

A high-grade modulated oscillator and a sensitive output meter are necessary for correct alignment of the Model R-116 receiver. It must be possible to reduce the oscillator output to a very low value or the signal will cause the A. V. C. circuit to function making it difficult to secure exact alignment. The output meter must be sufficiently sensitive to give a satisfactory reading with the low signal.

All aligning adjustments should be made with the volume control full on but with no broadcast signal being received. The output meter should be connected between the plate of the 42 and the chassis through a .25 mfd. condenser or across the speaker voice coil, depending upon the type used.

ALIGNING PROCEDURE

The step-by-step routine given below should be carefully followed after reading the preceding instructions.

1. The modulated oscillator should be tuned to a frequency of 152, 228, or 456 K. C. to align the 456 K. C. I. F. amplifier. Do not use the oscillator calibration curve to determine this frequency but check the oscillator harmonics against broadcast stations which are required to be on their assigned frequency. First check the accuracy of the broadcast dial by

noting whether stations come in at the correct setting. With the oscillator set at 152 K. C., the third harmonic is used for aligning while the fifth harmonic can be tuned in on the broadcast dial. It should be set at exactly 760 K. C.

To be sure that you have the harmonic of the 152 K. C. signal, tune in the other harmonics on the broadcast dial. These should come in 152 K. C. on either side of the original setting. With a 228 or 456 K. C. oscillator signal a similar procedure can be followed using 910 K. C. (The exact frequency to be used is 912 K. C. but 910 will be satisfactory.)

2. Connect the oscillator output from the grid cap of the 6A7 to chassis. Turn the tuning condenser of the set to some point where it has no effect upon the signal strength.

3. Adjust the oscillator output to give about one-half full scale deflection of the output meter.

ADJUSTING THE I. F. CIRCUIT

1. Adjust all four I. F. trimmer condensers, in each case tuning carefully to make sure that maximum deflection is obtained on the output meter. It is desirable to use an all-bakelite screw driver for this purpose although one with a small metal point may be used.

No inward or sideward pressure should be applied to the alignment tool, or the condenser may spring back to a different setting as soon as the tool is removed.

2. Go back and repeat all four adjustments, since the changing of each I. F. trimmer affects the others to a certain extent, thus necessitating readjustment.

ADJUSTING R. F. AND OSCILLATOR CIRCUITS

1. Connect a .0001 mfd. condenser from the blue aerial wire to the output of the oscillator, and ground both set and oscillator. Adjust the oscillator frequency to 1400 K. C. and carefully tune the receiver to give maximum output. Set the oscillator output to produce about half-scale deflection on the output meter.

2. Carefully adjust the 1st detector trimmer which is the front one on the gang, to give a maximum output meter reading. Retune the set and again adjust the trimmer. The rear section which tunes the oscillator, should not be touched unless the set is out of calibration at the high frequency end of the dial.

If the set is out of calibration it can be re-calibrated as follows: Disconnect the test oscillator, connect an aerial and set the tuning dial at the frequency reading of some broadcast station between 1000 and 1500 K. C., whose exact frequency is known and which can be picked up without any difficulty. Adjust the oscillator trimmer (rear) until this station is brought in with maximum volume. Re-connect the modulated oscillator and output meter and again adjust the front trimmer for maximum output meter reading. This is necessary because the first detector circuit is always affected by any change in the oscillator tuned circuit.

HUM AND NOISE ELIMINATION

Hum in early R-116 table model chassis may be reduced by reversing the two speaker field coil leads. This may be done underneath the chassis where these leads connect to the two electrolytic condensers. The green field coil lead should go to the front electrolytic condenser, and the white lead to the rear electrolytic. Later production chassis already have the connections made in this way. All console model chassis are already wired for least hum with the white lead connected to the front electrolytic and the green to the rear electrolytic.

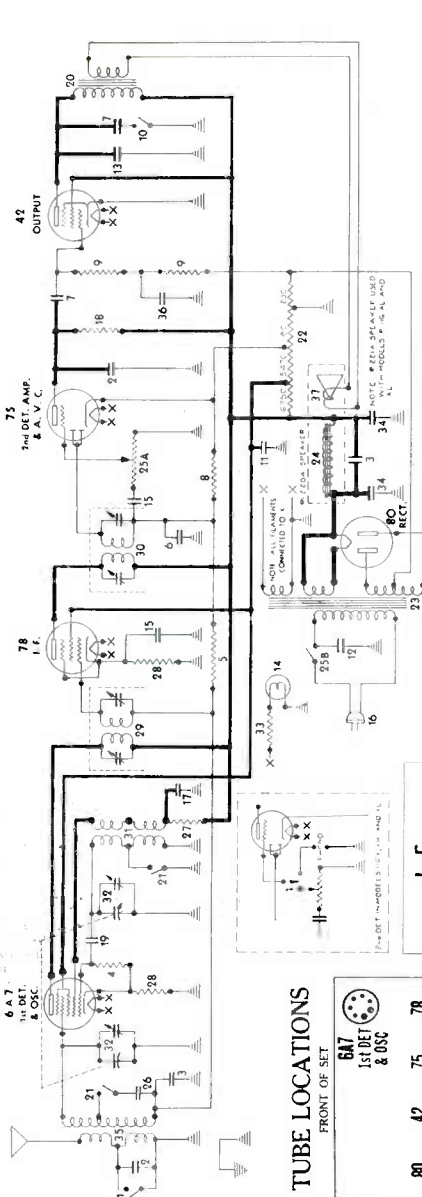
Excessive hum may also be due to the fact that the A. C. line lead is too close to the .05 mfd. 100 volt condenser No. 15 which is hooked in series with the volume control. The remedy is to separate the two as far as possible.

Another cause of hum is poor contact at the grounding lug of the voltage divider. This may be caused by the grounding screw being loose or may be at the point where the resistance wire is soldered to the terminal strap on the resistor. To eliminate hum from this cause, first tighten the grounding screw and solder to the chassis. If the hum continues, the 230 ohm negative end of the voltage divider should be replaced by a 230 ohm wire wound resistor. The two wires connected to the negative end of the voltage divider should be unsoldered and hooked to one end of the new resistor. The other end should be soldered to ground, preferably to the lug located just below the short wave switch.

Intermittent or noisy operation especially noticeable when the dial is turned or when the variable condenser is jarred, is frequently caused by metal particles shorting the variable condenser. This trouble can be eliminated by cleaning with a blast of air or by running a pipe cleaner between the plates.

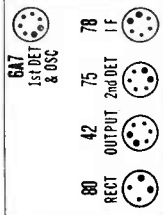
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Stewart-Warner Model R-116



TUBE LOCATIONS

FRONT OF SET



I. F. FREQUENCY
456 K. C.

Line Voltage	115 A. C.	Volume Control Full On	Screen Grid Voltage	Plate Voltage	Control Grid Voltage	Cathode Voltage
6A7*	1st Det. & Osc.	6.15	240	90	0	2.7
78	I. F.	6.15	240	90	0	2.4
75	2nd Det.	6.15	110	0	1.3	0
42	Output	6.15	927	240	-1.5†	0
80	Rect.	5.0	329	Volts D. C. From Filament to Ground		

* Oscillator plate voltage, 150v. Oscillator grid voltage, -7.5.
† Actual bias voltage on type 12 tube is 17.0v. volts measured across the volume control divider.
All D. C. voltages are to be measured with respect to ground, using a high resistance voltmeter of 1000 ohms per volt. Readings will vary, depending upon voltage range of meter used. Marked for second detector plate voltage. This variation is most marked for Readings taken with set analyzers will be different because such instruments generally measure voltages with respect to cathode instead of ground.

R-116 PARTS LIST

Diagram Part No.	Description	List Price	Diagram Part No.	Description
1	43889 Photograph Section (Used in R-116A, AL, and XL)		29	R3556 1/2 watt 100 ohm Resistor
2	R1138 .001 Mfd. Silver Fixed Condenser		30	R3538 2nd I. F. Transformer Complete
3	R1681 25,000 ohms, 1/2 watt Carbon Resistor		31	R3537 1st I. F. Transformer Complete
4	R1682 15,000 ohms, 1/2 watt Carbon Resistor		32	R3565 Variable Condenser
5	R1683 10,000 ohms, 1/2 watt Carbon Resistor		33	R3566 10 ohm Wire Wound Resistor
6	R3007 .02 Mfd. 600 volt Fixed Capacitor		34	R3620 Power Transformer (15-250-350-600 cycles) (Used in Models R-116A, XL, AL)
7	R3072 50,000 ohm, 1/2 watt Carbon Resistor		35	R3631 Antenna Coil (Used in Models R-116A, XL, AL)
8	R3073 20,000 ohm, 1/2 watt Carbon Resistor		36	R3632 25 mfd. 100 volt Fixed Condenser (Used in Models R-116A, XL, AL)
9	R3074 10,000 ohm, 1/2 watt Carbon Resistor		37	R3692 Diaphragm and Shield Assembly for R-220A (Used in Models R-116A, XL, AL)
10	R3214 .25 mfd. 250 volt Fixed Condenser (Used in Models R-116A, AL, and XL)			
11	R3215 .05 mfd. 250 volt Fixed Condenser (Used in Models R-116A, AL, and XL)			
12	R3216 .02 mfd. 1000 volt Fixed Condenser (Used in Models R-116A, AL, and XL)			
13	R3217 .01 mfd. 1000 volt Fixed Condenser (Used in Models R-116A, AL, and XL)			
14	R3276 6.3R332 for R-116A, AL, and XL only. See Note No. R3635 for R-116, AL, and XL			
15	R3352 6.3R332 for R-116A, AL, and XL only. See Note No. R3635 for R-116, AL, and XL			
16	R3353 6.3R332 for R-116A, AL, and XL only. See Note No. R3635 for R-116, AL, and XL			
17	R3354 6.3R332 for R-116A, AL, and XL only. See Note No. R3635 for R-116, AL, and XL			
18	R3355 6.3R332 for R-116A, AL, and XL only. See Note No. R3635 for R-116, AL, and XL			
19	R3356 6.3R332 for R-116A, AL, and XL only. See Note No. R3635 for R-116, AL, and XL			
20	R3357 6.3R332 for R-116A, AL, and XL only. See Note No. R3635 for R-116, AL, and XL			
21	R3358 6.3R332 for R-116A, AL, and XL only. See Note No. R3635 for R-116, AL, and XL			
22	R3359 6.3R332 for R-116A, AL, and XL only. See Note No. R3635 for R-116, AL, and XL			
23	R3360 6.3R332 for R-116A, AL, and XL only. See Note No. R3635 for R-116, AL, and XL			
24	R3361 6.3R332 for R-116A, AL, and XL only. See Note No. R3635 for R-116, AL, and XL			
25	R3362 6.3R332 for R-116A, AL, and XL only. See Note No. R3635 for R-116, AL, and XL			
26	R3363 6.3R332 for R-116A, AL, and XL only. See Note No. R3635 for R-116, AL, and XL			
27	R3364 6.3R332 for R-116A, AL, and XL only. See Note No. R3635 for R-116, AL, and XL			

MISCELLANEOUS PARTS NOT SHOWN ON DIAGRAM
 R3147 Range Switch Knob
 R3170 Speaker Cable (Used in R-116 AL and XL)
 R3560 Tube Shield (Used in R-116 AL and XL)
 R3571 Tube Shield (Used in R-116 AL and XL)
 R3572 Tube Shield (Used in R-116 AL and XL)
 R3573 Tube Shield (Used in R-116 AL and XL)
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 R3699 Tube Shield (Used in R-116 AL and XL)
 R3700 Tube Shield (Used in R-116 AL and XL)

The Value Of Instruction With Practical Experimental Apparatus

By T. E. Rose, N. R. I. Student Service Department

CAN you imagine learning Radio by a system of instruction that does not include a practical home laboratory of experimental apparatus? There are such courses offered to the public, but just how the student is expected to get anything practical from them has always been a mystery to me. If I were drowning, I'd certainly hate to have to depend for rescue on someone who had "learned to swim" without going near the water! Wouldn't you?

Right here lies perhaps the greatest value of N. R. I.'s Outfits of experimental apparatus: the fact that through performing the required experiments with each Outfit, the student obtains practical, actual experience with *real* Radio parts, acquires the "feel" of Radio apparatus. Many of the operations the student performs in doing an experiment called for in his Outfit Instruction Sheets, he will do in actual service work later on when he enters the industry as a fully trained Radio-Trician. So instead of having "learned to swim without going near the water," some of his jobs will be an old story to him to a certain extent. He will approach such jobs, not "green" and confused with "stage fright," but with confidence and *actual experience*. He'll say to himself: "This is simple. Nothing to it. I've already done this job several times," and he'll proceed to do it again with the utmost ease, almost automatically.

Thus the value of N. R. I.'s Home Laboratory Outfits is well established. Never was there a better application of the old saying "practice makes perfect."

However, there is another very important purpose that these Outfits serve. In addition to giving the student practical experience in the handling of actual Radio apparatus, they also, through the experiments the student is required to perform with them, serve to supplement and impress upon the student's mind the theory he learns from his text-books. It is one thing to read about a coil or a condenser, to be acquainted with its construction from the description or even from a photograph or diagram, and to know how it functions in operation. But it is quite a different thing actually to connect a coil or condenser in a circuit and witness it in operation. What you learn by the latter method is more easily grasped and remembered than simply reading about a coil or condenser and its function in a circuit.

N. R. I. is justly proud of its Home Laboratory. It has had to be revised several times since it became a part of the N. R. I. Training, in order to keep it up-to-date and in step with



the latest advances and discoveries in Radio. But, fundamentally, it has remained the same and has served its purposes more fully, experience has shown, than any other system of training yet devised.

It is said that imitation is the highest form of flattery. If this is so, we need only to reflect upon the number of Radio home training schools that have sprung into existence since N. R. I. was founded twenty years ago, and note how many of them have copied N. R. I.'s Home Laboratory method of training. But N. R. I. still remains the largest and foremost home study Radio school and still offers, we are convinced, the finest, result-getting Home Laboratory as an important part of its training.



Electric Eye At WLW

At the base of the giant 831-foot vertical radiator steel antenna tower of 500,000-watt WLW—the world's most powerful Radio broadcasting station—a tiny "electric eye" stands guard day and night protecting the Radio audience against interruption in their entertainment from the Nation's Station.

This photo-electric cell is the "brain" of a unique device recently developed by WLW engineers to protect valuable equipment against lightning, and to prevent loss of broadcasting power through troublesome "power follow-up arcs" across the safety gap that carries lightning discharges from the tower into the earth.

While WLW's new vertical radiator antenna increased the station's efficiency from 50 to 100 per cent, it was soon discovered that unfortunately the huge 450-ton steel tower also served admirably as a giant lightning rod. It became the problem of WLW engineers to ground the electrical energy thus collected from the atmosphere, while at the same time preventing the grounding of the stupendous 500,000 watts power generated by the transmitter.

The use of the photo-electric cell was re-

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RENTAL AND SALE OF PUBLIC ADDRESS EQUIPMENT

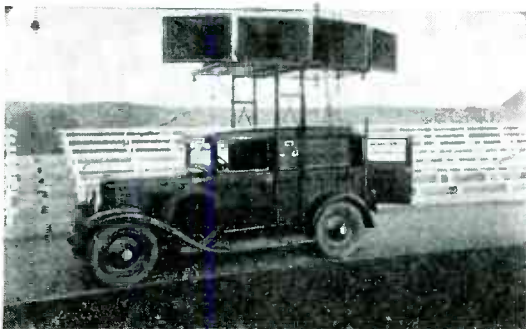
By Paul Thomsen, National Radio Institute

SUFFICIENT experience has now been had in the public address field to warrant the statement that most installations are of a rented or temporary character and these often lead to sale of permanent equipment. You can see the logic of this statement when you realize that good P. A. equipment is costly, requires a trained operator, and the installation must be made by a trained technician—you for example. Organizations and business men want demonstrations. Portable equipment is the answer, and a business-like rental set-up makes money for you and leads to sales of permanent systems.

As you know, P. A. systems fall into indoor and outdoor classes. The major differences are the audio power output required to cover the audience or space, the method of powering the equipment, the type of projectors (loudspeakers) used, and the construction of the exposed parts to withstand changing weather conditions. All other sections of the system may be identical equipment. A 20 watt amplifier is the same for indoor and outdoor needs: both may use a Radio tuner, phonograph pick-up with turn table; either system may use carbon, condenser, inductor or velocity microphones and the associated mike amplifiers to raise the output to the required level.

Your fellow Radio-Tricians have found it profitable to build portable sound systems into small delivery trucks rugged enough to withstand the unusual abuse that all outdoor P. A. systems receive. The equipment is so mounted in the truck that it can be rapidly taken down and installed indoors. They carry cable and mounting extension so all special conditions may quickly be solved.

Naturally the equipment is so designed that it may be powered from a source of power equally easy to obtain indoors and outdoors.

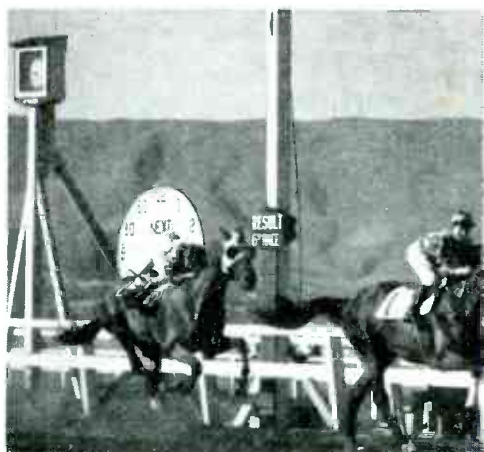


This Public Address System mounted in a truck makes real money for its owner, an N. R. I. graduate.

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The most usual indoor source of power is the 110 volt, 60 cycle power outlet. The truck installation, therefore, includes a 110 volt, 60 cycle, 250 watt generator, rotated by a small gasoline engine. Both are mounted on the same base. Attach four handles to the power system so that it may be carried indoors when suitable power indoors is not available.

The microphones, preamplifiers, power amplifiers, and loudspeakers are likewise mounted on the truck and on brackets so they are easily taken down. By having suitable brackets and pedestals for indoor use, these devices are quickly erected indoors. Let me make myself clear: buy good equipment, rugged enough to be used outdoors and have it so set up that



A permanent P. A. System at a race track. Many opportunities for installation.

a shift from outdoor to indoor use is accomplished in a minimum of time.

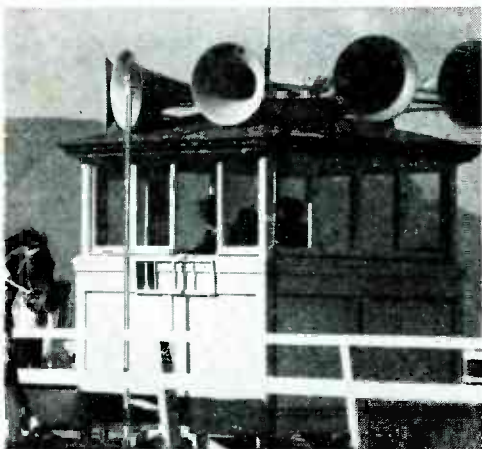
Although I hope to tell you more about P. A. equipment in future issues of NATIONAL RADIO NEWS, if you want me to, I want to mention here, that if I were in your place, I would seriously consider tying up with a good manufacturer or distributor of P. A. equipment and work out, together, a suitable installation. He wants to help you, as he knows that a good demonstration will lead to the sale of permanent equipment. Several mail order houses have a special department devoted to P. A. men, the trade magazines carry the advertisements of reliable makers of P. A. equipment. Write to several of them when you seriously con-

C ADDRESS SYSTEMS

stitute Staff

template going into the P. A. field and make your own choice.

In starting I would consider the purchase of a second hand delivery truck from a reliable automobile dealer, which should be reconditioned and lacquered to give it an acceptable finish. The truck should be painted in an attractive color and with sufficient space for advertisements. The P. A. equipment should include a 20 watt power amplifier, a good microphone and a voltage amplifier with controls, so that the mike and the power amplifier may be efficiently connected. Two 10 watt directional projectors, the horn type, should be considered as they are equally adaptable to indoor and outdoor use. All equipment should be powered



Outdoor and indoor places where people gather offer
opportunities for use of P. A. equipment.

from 110 volt A.C. source. Also get a gasoline driven generator. A 250 watt rating will take care of any future needs. Plan the mountings and cables so that they are quickly mounted or taken down in the truck or indoors.

Most P. A. men include in their equipment a phonograph pick-up; electric turn table; and several records, including a couple of brilliant marches, an organ selection, and a number of popular songs. These are used to attract attention to the truck while in transit, to interest the gathering before an address is made or to furnish entertainment at gatherings. Your local music store will gladly cooperate with you if you mention before each record that records were supplied through his cooperation. In this

case a "mixer" will be required to transfer from microphone to phono-pickup.

Getting Rental Contracts

The biggest problem the Radio-Trician encounters in establishing or increasing his public address business is in making the necessary contacts with prospective users of his equipment. In order to become established or known in his field it is very helpful to have folders printed available for distribution. The information given on the printed matter should describe in general, not in a technical way, just what apparatus you have to offer for rental.

It is always well to list, if possible, some of the jobs already handled as this will materially aid in selling your services to a new user. It is very desirable to include illustrations showing photos of your set-up and in operation, especially at some important job which the community will remember.

The printed matter may consist of a four page folder which may be distributed to the various business organizations in the locality either through the mail or other means. The literature should show your trade mark or trade name.

It is also well to advertise at regular intervals in the local newspapers, thereby keeping your name at all times in front of the active organizations which may use your services.

It is also suggested that you use calling cards which are not too small. Clearly display the name of your organization and the service you render. Emphasize the fact that free estimates will be given on any rental job. The calling cards should be distributed freely among business men at the place where the equipment is being used and while actually operating. This will help materially in making your services known to the prospective users of your equipment.

Another important factor which helps materially in the promotion of P. A. contracts is the painting and decorating of the loudspeakers and associated equipment which is in direct view of the audience. The color schemes most effective for all around use are a shiny alumi-



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How To Remove The Compound From Sealed Containers

(Continued from page 10)

tar. One is to remove the container from the set, get it cold and then strike the side of the container with a hammer. This will fracture the cold compound and it can be shaken out. To get the unit real cold you can place it in an ice box for an hour or so. When using this method you must be capable of deciding by reference to the set schematic diagram how any wires which may break should be connected. The method should only be employed on parts in a *sturdy* case. The power units of the early Atwater Kent A.C. sets are good examples. Parts such as chokes, iron core transformers and fixed condensers will not be damaged by this method of sealing compound removal. Carefully save all the tar or wax chips and, after installing the new part, melt them in a pan and pour back in the container.

When you have apparatus like an I.F. transformer in a "can," probably made of aluminum, never treat the container roughly. To remove the compound place the can in a pan partially filled with water. The can should be upside down—the wax side up and the water should not be deep enough to come to any holes in the can. Place the pan over any source of heat which could be used for cooking—a small electric stove is just the thing. Cook until the compound melts and carefully pour off into an old pan. Be sure and don't pour the part out with the wax. Gently roll it out on a piece of paper and do not break the leads unless the part is to be replaced.

The can should be handled with an old pair of pliers. When repairs have been made, melt up the compound and pour it back in, sealing the container.

There has just come to the attention of your Editor a very interesting publication entitled "Successful Servicing."

This is in the form of a house magazine published by John F. Rider, 1440 Broadway, New York City. There's a lot of good information in this publication and it will be sent to any reader of NATIONAL RADIO NEWS who writes to Mr. Rider, direct, and makes a request.



The world's largest theater is Radio City Music Hall. It is 121 feet high, seats 6,000, has the largest stage, the largest proscenium opening of any theater in America and one of the largest pipe organs ever built.

Page Eighteen

Our Poor Telephone Operator

The job of our switchboard operator here at N. R. I. isn't always an easy one. It is not at all unusual for persons to call up and ask us what kind of Radios we sell—or how soon could we fix a Radio—even asking for programs for various Radio Stations in this country and Europe.

But the prize came during the world series baseball games. St. Louis and Detroit were playing in St. Louis.

Came a phone call . . .

Operator: This is the National Radio Institute.

Party on wire: Yes, that's who I want.

Operator: What can I do for you?

P. O. W.: What the X?!*?! is the idea of letting all these Radio stations clutter up the air with *balls* and *strikes* and *runs* and what not? I want *music—not baseball*—get me music so I can enjoy my set.

Oh me! Such is the life of a telephone operator.



Electric Eye At WLW

(Continued from page 15)

sorted to after the ordinary method, that of providing a direct lightning path to the ground by means of a safety gap across the base of the tower, was found to be unsuccessful. In adjusting the gap it was discovered that one wider than two inches failed to provide complete protection, while with one less than two inches the normal peak voltages due to modulation on the 500,000-watt carrier would, on occasion, cause discharge across the gap.

An even more serious problem, according to Joseph A. Chambers, WLW Technical Supervisor, presented itself when it was found that once the arc was started across this gap, either by lightning discharge or by an abnormally high voltage, the arc could not be extinguished, as power from the 500,000-watt transmitter kept it "alive," draining practically all of the station's power from the antenna into the ground.

After various types of gaps, current transformers and rectifiers were tried unsuccessfully, WLW engineers resorted to the use of the photoelectric cell device. A Weston photronic cell, with its associated relays, was installed in a double shielded box on the brick wall sur-

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RADIO-TRICIAN SERVICE SHEET

REQ. U. S. PAT. OFF.



COMPILED SOLELY FOR

STUDENTS & GRADUATES

Stewart-Warner Model R-119 Chassis

CIRCUIT DESCRIPTION

The Stewart-Warner Model R-119 Chassis is a six-tube super-heterodyne. It will cover the broadcast and short wave ranges from 530 to 3750 K. C. The tuning dial is calibrated from 530 to 1740 K. C. and a short wave range is provided through a switch on the back of the chassis, for reception up to 3750 K. C. (80 meters).

The R-119A Chassis is designed for operation on 115 volt, 60 cycle power circuits while the R-119EF is adaptable for use with voltages of 115, 125, 230, 240, or 250 at any frequency from 25 to 60 cycles. To accomplish this, the power transformer has two separate tapped primaries. The method of connecting these primaries is shown on a tag attached to the chassis. The R-119EF chassis is wired for operation with a high impedance phonograph pick-up.

In the R-119A and EF chassis, the incoming signal is amplified by a stage of tuned radio frequency to improve selectivity and sensitivity, and to prevent image frequency interference; it then goes to the 6-A-7, first detector and oscillator, where its frequency is converted to 177.5 K. C.

The 177.5 K. C. intermediate frequency signal is amplified by the high gain I. F. stage, and is then rectified by the diodes of the 85 tube. Detection is accomplished by the diode connected directly to the I. F. transformer. A modulated D. C. voltage drop is produced across the 500,000 ohm potentiometer by the rectified current. The volume is controlled by selecting any desired portion of the A. F. voltage with the moving arm of the potentiometer, which is connected to the grid of the 85 tubes. The triode section of this tube acts as an audio amplifier and is resistance-coupled to the 42 output tube.

Delayed A. V. C. is obtained by using the voltage drop produced by the rectified current of the second diode of the 85 tube, for bias on the 7B and 6A7 tubes. This diode, which is coupled to the I. F. transformer by a .002 mfd. condenser, is 17.5 volts negative with respect to the cathode since it is biased by the cathode bias resistor. Consequently, no rectification and no A. V. C. action can take place in this circuit until the incoming signal is strong enough to exceed this value. This represents the minimum signal capable of giving full audio output. Through the use of the delayed A. V. C. any signal which cannot be amplified to this minimum value is not reduced in volume by the action of the A. V. C. circuit.

Short wave reception is accomplished by shorting a portion of the antenna coil, shunting the secondary of the broadcast r. f. coil so that only the short-wave r. f. coil is active, and by switching in a short wave oscillator coil. These operations are performed by a single two-position switch located on the back of the chassis.

ALIGNING THE R-119 CHASSIS

Before attempting to align a set, the service man should become familiar with the general layout of the chassis and with the function and location of the various trimmer condensers. The following discussion briefly explains the action of each alignment step.

R. F. alignment and calibration are accomplished by the three trimmer condensers located on the top of the variable condenser gang. The oscillator is kept in exact step with the other R. F. circuits by the special shape of the stator plates in the oscillator tuning section.

Both windings of the first I. F. transformer are tuned but only the plate coil (primary) of the second I. F. transformer is tuned. The three I. F. tuning trimmers are mounted on the rear of the chassis and may be reached through holes which are covered with flat metal buttons. The buttons may be pried out with a knife or screw-driver.

EQUIPMENT AND PRELIMINARY STEPS

A good modulated oscillator and an output meter are essential for proper alignment. The attenuator on the oscillator must be capable of reducing the signal to a low value because the A. V. C. will function if the signal is too strong and thus make correct alignment impossible. The output meter must be sensitive enough to give a satisfactory reading with this low signal.

The output meter should be connected from the plate of the 42 tube to ground through a .25 mfd. condenser or across the speaker voice coil, depending upon the type used.

All alignment adjustments should be made with the volume control full on but with no broadcast signal being received.

ALIGNING THE I. F. CIRCUITS

An insulated, 1/4 inch socket wrench is needed for I. F. alignment since two of the trimmers are connected to B plus. A Stewart-Warner phasing tool (No. T-79890, net price 75c) should be used although a Spintite wrench insulated with tape so that it will not short to the chassis, can be employed.

The step-by-step routine given below should be carefully followed after reading the preceding instructions:

1. The modulated oscillator must be tuned exactly to 177.5 K. C. This frequency can be accurately determined by checking the oscillator harmonics against broadcast stations. First check the accuracy of the broadcast dial, and then tune in either the fourth or eighth harmonic of the 177.5 K. C. signal. If they come in at exactly 710 or 1420 K. C. the oscillator frequency is correct. To be sure that you have the harmonic of a 177.5 K. C. signal instead of some other frequency, tune in the other 177.5 K. C. harmonics on the broadcast dial. These should come in 177.5 K. C. on either side of the original setting. Do not use the oscillator calibration curve to determine this intermediate frequency.

2. Connect the oscillator output across the 6-A-7 grid and ground.

3. Set the oscillator output to give about half scale deflection on the output meter.

4. Adjust all three I. F. trimmer condensers, in each case tuning carefully to get maximum deflection of the output meter. Reduce oscillator output if output meter goes off scale.

It is very important that no inward or sideward pressure be applied to the alignment tool or the condenser may spring back to a different setting as soon as the tool is removed.

5. Repeat all three adjustments since the adjustment of each I. F. trimmer may affect the others to a certain extent. Replace buttons covering trimmer holes to prevent tampering.

ADJUSTING R. F. AND OSCILLATOR CIRCUITS

1. Connect a .0001 mfd. condenser from the blue aerial wire to the output of the oscillator, and ground both set and oscillator. Adjust the oscillator frequency to 1400 K. C. and carefully tune the receiver to give maximum output. Set the oscillator output to produce about half scale deflection of the output meter.

2. Carefully tune the radio frequency, "A" trimmer, which is the back one on the condenser gang, until the output meter reading reaches a maximum.

3. Retune the set and adjust the first detector "B" trimmer, which is the middle one, for maximum output. The oscillator, or "O" trimmer should not be touched unless the set is badly out of calibration at the high frequency end of the dial.

CALIBRATION

Calibration can be checked by arranging a wire pointer above the condenser shaft center and then tuning in several stations of known frequency. With the condenser plates fully meshed, the lowest dial division (530 K. C.) should line up with the pointer.

If the set is out of calibration, it can be re-calibrated as follows: Disconnect the test oscillator, connect an aerial to the blue wire, and set the tuning dial at the frequency reading of some station between 1200 and 1300 kilocycles, whose exact frequency is known and which can be picked up without any difficulty. Adjust the oscillator trimmer "O" until this station is brought in with maximum volume. Then use the modulated oscillator and output meter to re-adjust the "A" and "B" trimmers, since these are always affected by any change in the oscillator tuned circuit, taking care to retune the set between adjustments.

No adjustment is provided for aligning the set for the short wave band.

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

Let's Have A Sale—Continued from page 9

we're going to run, is to give our customers and prospective customers a bargain. Let's show them what we will do on their receivers—how many items we will check, how many difficulties we will correct, all for a given small sum. You will recall that automobile service companies use this plan quite effectively.

Suppose, for instance, we were to have printed up, a little card stating that we will do the following service jobs on a receiver at the special price of \$1.00. The list could be something like the following:

1. Remove corrosion from aerial and ground connections.
2. Tighten aerial and ground connections.
3. Inspect for all loose connections.
4. Test tubes and attach labels showing condition.
5. Check tube sockets for poor connections.
6. Tighten tube shields.
7. Inspect loud speaker for rattles.

8. Clean exposed volume control.

9. Check volume control for noisy operation or dead spots.

10. Tighten dial knobs.

11. Check operation of set over entire frequency range.

12. Clean Chassis.

That would look like a bargain, wouldn't it? There would be any number of people who, having a Radio set that wasn't in perfect condition, wanting to get it in condition for the good Radio season ahead, but hesitating to have it checked up for fear of a large cost, would be influenced by the knowledge that they could have a twelve point check-up made, knowing that the bill would only be \$1.00.

And this bargain could be made particularly effective if you preceded it with a few lines of copy about having the Radio tuned up for the big season ahead—or reminding them that

some of their favorite programs are now back on the air and they want to get them with the greatest fidelity of tone—or reminding them of the big football games and sporting events—or the fact that the holiday season is coming on and they will have guests and will want their receivers in the very best of condition for the big entertaining season.

This bargain offer can be made into a very neat looking piece of literature if it is arranged in such a form that it is a return post card, and all the prospect has to do is sign it and drop it in the mail.

We know of several instances where Radio men have used this plan by sending their customers and prospects a letter telling them about the special offer and enclosing a stamped Government post card, which eliminated the necessity of the customer placing a stamp on it in order to mail it back, in other words, making

it easy for the customer to accept the offer.

One of the chief difficulties in getting unstamped post cards returned is in the fact that very few people have 1c stamps around the house, and consequently even if they are interested in your offer, it must be laid aside until they think to get a stamp. What you want is *action*—not at some future time—but immediately, while the customer or prospect is still "sold" on the idea. Penny post cards have been particularly effective for Radio men when running "special sales."

Is your Radio working like it was the day you bought it? It should be if all of its parts are clean, tight, and functioning properly.

But even the best Radio set will deteriorate. Dust accumulations and wear on certain parts often cause conditions which hinder the best possible reception and may cause no end of trouble if neglected. Your set should be inspected by an expert and corrected so that it will give you good reception—the type of reception the manufacturer of that set intended you to get from it.

Let us look over your set—put it in tip-top working condition. Get the full pleasure which your set can give—which it will give, if it is in good operating condition.

The special conditioning service as explained on the enclosed card costs you only \$1.00, and once your set has been conditioned by us, it will pay you back many times in the satisfaction you will get from it. Simply mail the post card, and our expert will call, at any time and hour you specify.

A letter which produced good results for the graduate who developed it.

Of course, there is the simpler expedient of having the offer printed up on cards or paper and dropping them in the mail boxes of prospective customers without any addresses. This method, however, does not pull nearly as good results as the other plan which has the advantage of more personal handling.

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Let's Have A Sale

(Continued from page 21)

We have also had experience with a number of cases where Radio men pulled in a lot of business on special sale offers by the use of good sales letters. A number of them are shown here—some of which have already appeared in NATIONAL RADIO NEWS at other times, but are being reproduced again because they have proved themselves to be good pullers and that's what you want.

If you try one sales idea and it doesn't work as well as you expect it to, that is no reason for you to become discouraged and think that the plan will not work in your case. Probably the idea used was wrong, or did not appeal to your particular customers and prospects. Try another version of the same idea.

Wherever possible, while you are putting on such a drive for new business, you should make it a point to follow-up the persons you have circularized with a personal call. You will find, in a number of such cases, that even though the prospect has no Radio work to be done at the present, he, or she, may be able to tell you of some friend whose Radio is not operating quite as it should and who might be interested in your proposition. Leads so obtained are very good, because you have the opportunity of going to this new prospect and saying that "Mrs. So and So suggested that I call."

A number of Radio men I know make it a practice to put on drives for new business at least twice a year, while others, with larger organizations, keep some such sort of "sales effort" going all the time. It must be good for business—all these fellows can't be wrong.



Electric Eye At WLW

(Continued from page 15)

rounding the antenna base insulator. A long tube containing light baffles was installed so that only light from a point directly in the safety gap could strike the photo-electric cell. The relay operated by the "electric eye" was connected in such a manner as to remove the station's plate voltage to the final amplifier whenever the photo-electric cell was excited, and to reapply it the instant the arc was extinguished. Due to the high speed of the control circuits, the interruption to service is so slight as to be barely perceptible to the ear.

Scientists and Radio engineers have evidenced a widespread interest in this most recent use of the photo-electric cell.

Page Twenty-two

Rental And Sale Of Public Address Systems

(Continued from page 17)

num, dark grey or black. Quite often the equipment is trimmed with other colors, so the entire installation follows some color scheme. This combination, if consistently used serves as a trade mark and helps materially in identifying you.

The trade name of your organization on a well planned placard should be displayed near the operator in charge of the volume control or amplifier. The placard or poster should not be too large to distract materially from the general surroundings. Print it in black and white.

Finally keep your eyes and ears alert. When conventions are planned, elections come around, sales meetings are being held, churches have outdoor festivals, factories and stores plan outdoor picnics, be "Johnny on the spot" and sell your services to the manager. Don't wait until someone comes to you. The chances are they won't.

Convincing The Prospect

Once you have become established in your locality, the buying public will naturally assume that you can render satisfactory service. At the start you will have to demonstrate your equipment. Although an outdoor demonstration is less likely to convince a prospective user of an indoor installation, you should try it first. Take the prospect to some place where people will not object and let him listen to record reproduction and voice amplification. He will be tremendously interested in the quality of the amplified voice or music. Emphasize the fact that your equipment has a tone control which will vary the quality or timbre of the sound emanating from the loudspeakers. This can be done very effectively during the playing of a phonograph recording, and especially an organ recital.

If the prospect still feels that an indoor demonstration is necessary, try to get him to go to some other job you may have to complete, show him written testimonials from satisfied customers. And in the final case make an installation to prove what you can do. Of course, the latter scheme would not pay if the job itself does not net you very much money. As a beginner, you have to do these things regardless of cost.

What To Charge

What you charge depends on many factors, important among which are whether you have competition or you are the first in your locality. Suppose as a start you have no one to compete with. Then you can estimate a job purely on a cost basis. Let us take a probable case. Assume that the entire system costs you

(Next page, please)

Rental And Sale Of Public Address Systems

(Continued from page 22)

\$900. (Yes, you must make up your mind that it takes cold cash to break into this profitable end of Radio and you must get your investment back and before the equipment must be replaced with a new and better system. Two years is a good estimate.)

Suppose we say that in two years you will average 100 rented contracts. Clearly you should charge \$9 for the use of the equipment. Let us again assume that a job takes 6 hours and you use a helper 3 hours of this time. If you figure your time at \$2 per hour and your helper at \$1 per hour: you must charge \$15. So far the cost is \$24. Now let us look a little deeper into this charge question. You have to pay for advertising, rent, telephone, and helper's time—overhead we call it. If you know what it is for a year you can divide it among the jobs. Let us say that it amounts to 40% of your labor costs, that is \$6. Total so far is \$30. Now how about profit. Do you want 10 or 20 per cent? Let us say 20%, as this is rather a risky game. Add \$6 to \$30 and your charge is \$36, a very usual price for an evening's work.

On the other hand suppose you have a competitor and his charge for a similar job is \$25, because he gets more contracts per year and has several trucks on the run. You've got to meet his price unless you can convince prospects that your equipment is much better. To meet his price, you have to work harder, close more contracts, cut down on your set up time, and in the beginning do more of your own work. "Tough sledding" but when you start a business don't expect to "turn the world on fire" right at the start. A little competition will make you hustle and you will eventually benefit.

Terms on Rental Contracts

Let me emphasize the importance of arranging terms of payment before an installation is made. The fact that sound emanating from a loudspeaker is an intangible service and valueless after the rental has expired; it is vital that you collect after each and every contract. Avoid exceptions from this rule. Have this thoroughly understood before you start.

Sale of Permanent Installations

There will be a number of rental contracts that will lead to the sale of permanent installations. Examples are rentals to churches, fraternal organizations, athletic clubs, department store demonstrations, etc. When organizations use your services several times a year, you can make up your mind that they would use a P. A. system more often if it were permanently installed. They are good prospects as they have had some experience. Go after them. There are

cases where you can sell equipment outright before rental. I will take this up shortly. What should you stress in a permanent installation sale? Possibly the most important factor is the simplicity of the controls used in operating the device. This point should be emphasized if the unit is to be operated by a non-technical group of people. Showing the simplicity and the neatness of a P. A. amplifier system is very effective in promoting the sale of equipment. Furthermore show that it is a fool proof unit which is easy to service, as even the simplest P. A. amplifier seems complicated to the average layman.

Another question they will ask is: How many hours or months of operation can be received without failure or additional expense? You should supply accurate figures on services rendered by your equipment. This is a very important sales point. Furthermore, it is usually a great help to assure the customer that he is protected from any delays due to faulty equipment or defective apparatus used in the unit. The use of standard parts and equipment throughout the P. A. system is another important feature to be emphasized. Furthermore you will service the equipment for 90 days free, and thereafter at a reasonable charge.

In order to obtain the sale and rental of public address equipment the Radio-Trician must be aware of the many fields in which there are prospective users of his equipment. The following is a list of the many users of P. A. equipment.

Airports; Amusement Parks; Athletic Fields; Auction Rooms; Auditoriums; Banquet Halls; Basketball Courts; Cabarets; Carnivals; Chain Stores; Civic Centers; Churches; Clubs; Colleges; Conventions; Dance Halls; Department Stores; Drug Stores; Exhibitions; Factories; Fairs; Gymnasiums; Hospitals; Hotels; Industrial Plants; Lecture Rooms; Lodges; Offices; Outdoor Entertainment; Paging Systems; Political Meetings; Retail Stores; Railroad Stations; Restaurants; Schools; Ships; Skating Rinks; Steamship Piers; Stockyards; Swimming Pools; Tennis Courts; Vaudeville Equipment; Weighing Stations; Window Demonstrating.

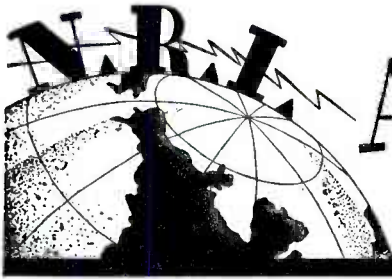
— n r i —

Thanks to Fred Altenbach, Jr. of St. Louis, Mo., for the Service Hints he sent in. We'll use them, Fred.

— n r i —

Shortly after boarding a San Francisco-bound plane of United Air Lines at Los Angeles, the buyer for a large department store discovered that she had left jewels valued at several thousand dollars in the airport rest-room.

She summoned the pilot, who Radioed back to the airport. An hour after the passenger reached San Francisco, her jewels arrived on another plane.



ALUMNI *News*

Baltimore Chairman Nominated To Run Against President Telaak

Election time is here again. The decks are cleared for action. The nomination returns are in and there now remains the final voting to select the National Officers of the N. R. I. Alumni Association for the year 1935.

While quite a number of candidates received a few votes from their personal friends, the presidential nominations assumed a more or less one-sided aspect. It boiled down to a landslide for the two favorites, the popular Ted Telaak, of Buffalo, N. Y., the present president of the Association, (who is also the Chairman of the Buffalo Local Chapter) and the equally popular Pete Dunn, the fellow who has done wonders in the development of the Baltimore Local.

Telaak, it will be remembered, was elected president last year, after having the experience of building up the first Local Chapter of the Association. He is a real old-timer in Radio, having served as factory representative for the old Federal Radio Co., (now out of business) also as Radio Editor on one of Buffalo's leading daily newspapers. He is now operating his own Radio Service business at which he is making quite a success.

Dunn, who has been in the Radio Service business so long that even he doesn't know just when he started in it, is also enjoying prosperity as a result of Radio. A hard worker for the Alumni and a fellow who has his heart and soul in helping the other fellow succeed. Many a young fellow, in and around Baltimore, owes his start in Radio to Dunn.

Buffalo, and the surrounding territory is backing Telaak almost to the last man. He's popular up there, is Ted, and from the trend of the nominations, he is being backed for reelection by the Canadian members, particularly those in the vicinity of the Toronto Local. He also polled a heavy vote from the Lake Shore Districts, including Cleveland and Detroit.

On the other hand, the east coast and south seem to be behind Pete Dunn. He showed strong in New York City, Philadelphia, Washington, Nor-

(Page 29, please)

Locals Backing Candidates

The good work Local Chapter officers have been doing for the Association has prompted their wholesale nomination for offices in the National Association Elections.

Eight of the fourteen nominees are officers of Locals. Buffalo has Telaak, Toronto has Ruse, Pittsburgh has Deschantz, Detroit has Mills. Chicago puts Earl Bennett in the running, and Baltimore leads with three candidates, Dunn, Ruehl, and Gralley.

Ruse was nominated to run against Vanek. Ruse is from Toronto. Vanek from Cincinnati. Looks like the Canadian boys have decided to have a Vice President of their own.

Nichols versus Mills presents an interesting race. Nichols is from the far west, Colorado, while Mills is the fellow who is making things hum in Detroit. Well, we'll have to wait and see which has the strongest following.

Parkins is from Georgia. His opponent, Gralley, is from Baltimore. This is an "all-south" race. An "all-midwest" battle is offered in the Deschantz-Bennett contest. Deschantz is a Pittsburgh boy, while Bennett is from Chicago.

The race for the Secretary's job will be right in N. R. I.'s back yard, so to speak. It is between Earl Merryman of Washington and George Ruehl of Lansdowne, Maryland (a suburb of Baltimore).

The job of Executive Secretary will be contested by P. J. Murray of Washington and A. H. Royce of Winton, Wyoming. Royce came into Alumni Association prominence some months ago when he came out in the columns of NATIONAL RADIO NEWS and demanded that the Alumni Association members express themselves on the question of "Whether to do service work in the home or in the shop." It seems that this question was in the minds of many of our members. The mails were literally flooded with letters from members who thanked Royce for starting this question.

The race for the Presidency should be interesting. Both Dunn and Telaak are Chairmen of strong Locals. Both are capable of handling the job.



Detroit

The following officers have been elected by the Detroit Local of the N. R. I. Alumni Association, to serve for the coming year:

C. H. Mills, Chairman
W. A. Fisher, Assistant Chairman
William R. Sewell, Secretary
William M. Webster, Assistant Secretary and Librarian
Percy E. Barlow, Finance Committeeman
F. E. Oliver, Finance Committeeman.

Mr. Fisher, the Assistant Chairman, has been appointed Chairman of the Publicity Committee to cooperate with National Headquarters on the Fifth Anniversary Campaign.

The Detroit Local Chapter has designed a Radio Service sign which will soon be displayed by all members of the Local in their laboratories in all sections of the city and surrounding suburban cities. The sign has been made so that it can be duplicated easily for use on tire covers, testing equipment and as stickers to be used on service.

All of the newly elected officers have taken up their respective duties and Detroit looks forward to a big year ahead—and a prosperous year for all members of the Local Chapter.

For the benefit of all graduates and students of N. R. I. who have not received special notice, and who desire to become associated with the Detroit Local, we extend a very cordial invitation to attend the meetings which are held on the 2nd and 4th Friday evenings of each month, at 17550 Marx Avenue. For any further information, drop a card to Secretary W. R. Sewell, at 16039 Curwood, or Chairman C. H. Mills, 5458 15th Street.



FLYING RADIO MAN

The popular Sergeant-at-Arms of the Baltimore Local Chapter of the N. R. I. Alumni Association is a "Flying Radio Man." He is

John W. Ganz, one of the men to whom a lot of the credit for putting the Baltimore Local across is due. Ganz' regular job is installing Radios in airplanes, maintaining and operating ground and airplane sets. Ganz likes Radio—in fact, he advises it as a career for any young man. He says that his *spare time Radio earnings*,

outside of his regular position, run anyplace from \$5 to \$20 a week.



K. W. Griffith, evangelist, Radio Expert, and past President of the N. R. I. Alumni Association, combines his two favorite occupations, Religion and Radio. Here is a recent photo of him using his public address system to assist in delivering an outdoor sermon.



Pittsburgh

In cooperation with National Headquarters, on the Fifth Anniversary Alumni Association Campaign, the Pittsburgh Chapter has opened its Charter for the acceptance of new Charter members. It is hoped by this plan to help build up a bigger and better membership for Pittsburgh. A number of prospective members will no doubt take advantage of this privilege. The Charter will remain open until the December 1934 meeting.

At our last meeting, Mr. O'Shea, who has been conducting a series of talks on the subject "Modern Vacuum Tubes," concluded his series. The information given by Mr. O'Shea has been very helpful—and our members certainly appreciated his cooperation.

Our "Shop Periods" which are conducted once a month, particularly for N. R. I. students who are members of the Local, are meeting with great favor. We have organized our own supply department, where parts and equipment may be obtained by members at wholesale prices.

— n r i —

We have just been informed by Mrs. Jesse Sindt of Carlstadt, New Jersey, of the death, on September 20th, of her son John A. Sindt, one of our Alumni Association members.

Mr. Sindt graduated from N. R. I. in January 1934. He showed great promise as a Radio man, and in his death we have lost a valued member.

Philadelphia-Camden

Philadelphia-Camden has completed its Constitution and By-Laws, which are patterned after those of the National Association but which were also made to cover the individual requirements of the Local.

We have elected the following officers to serve until January 1936:

Chairman—Charles Fehn

Vice-Chairman—S. M. Craven

Secretary—Clarence W. Stokes

Financial Committeemen } James Ludlum
 } Edward W. Little

Librarian—Allen Schiavoni

Sergeant-at-Arms—Roy Foreman

Meeting quarters are at 2744 Frankford Avenue. There is so much interest in the meetings that we are now holding two meetings a month instead of one. The meetings are on the first Thursday and the third Tuesday.

Funds have been voted to start building the All-Star short-wave and broadcast receiver, in line with our program to build a transmitter and receiver for general use of members.

The Local sponsored a trip to the lighting exhibit of the Electrical Association of Philadelphia.

Standing committees have been appointed as follows:

Membership Committee—Hugh F. Scott, H. M. O' Cain; Ways & Means Committee — Alfred Koch, Harry P. Esenwein; House Committee—William J. Stein, Harry P. Esenwein, John H. Weaver; Publicity Committee—Ronald Clarkson, Joseph Pretzn.

Secretary Stokes has personally brought in six new members to the Local. He simply can't be stopped once he gets started. He is also responsible for obtaining a guest speaker for one of our meetings, a very able one, too, Mr. George Devine, Radio Engineer connected with Philco in the capacity of designing new test equipment. Mr. Devine spoke on the subject of "Radio Troubles and How to Solve Them." We want to extend to all N. R. I. students and graduates in the Philadelphia-Camden area, a cordial invitation to attend our meeting. Just drop in at 2744 Frankford Avenue on the first Thursday or third Tuesday of the month. Or, get in touch with Mr. Clarence Stokes, Secretary, 2947 Rutledge St., Philadelphia, Pa.

Plans are being worked out now whereby Mr. P. J. Murray, Executive Secretary of the National Association, will be with us at one of our meetings, to give a talk on the subject of "Radio

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Page Twenty-six

Buffalo

Naturally, there is quite a bit of excitement over the outcome of the elections of National Officers. Ted Telaak, President of the Association, and chairman of the Buffalo Local, is up for re-election, and has the whole-hearted support of the Buffalo Local of which he is Chairman.

Reporting a meeting to be held shortly after this issue goes to press, the Buffalo Local states it has lined up, as guest speaker, Mr. Lew Hollands of the R. C. A. technical staff, who will talk on short wave.

Mr. Hollands was the engineer in charge of R. C. A. short wave station installations in England, Germany, Siberia, and other foreign countries. The meeting was to be held at the N. R. I. Alumni Association clubrooms, 657 Broadway, Buffalo, N. Y.



The President's Page

(Continued from page 2)

1935 are all-wave receivers and high fidelity receivers. The all-waves have been created to cater to the desires of those set owners who get a thrill from bringing in distant stations. The high fidelity, on the other hand, has particular appeal to those who desire tone quality which will be as near as possible to the actual musical rendition in the studio.

Our country is now definitely out of the depression—more and more people are going back to work every day—more money will be spent for Radio. The coming year should show a marked rise in Radio service business and an increase in the sale of home receivers and automobile Radio.



New York-Brooklyn

The New York-Brooklyn Local Chapter, so ably headed by J. L. Kearns and a very capable staff is cooperating with National Headquarters in the Fifth Anniversary Campaign by handling numerous details of the membership Extension Drive.

Your Editor wishes to report that Mr. Kearns recently submitted some valuable information for The Service Forum columns but they have been lost. Mr. Kearns has graciously agreed to send us duplicates and we hope to have the information available for the next issue of NATIONAL RADIO NEWS.

Association Activities Expand

It is interesting to note how the Alumni Association movement is spreading far and wide—how our students and graduates in other parts of the world are catching on to the idea of the benefits behind this Association.

To explain, we publish below a letter signed by three N. R. I. men half way around the world from National Headquarters in Washington. This letter comes from Bombay, India. It took twenty-seven days from the day it was dropped in the mails until it was laid on your Editor's desk in Washington. Here is the letter:

Dear Sir:

We, the members of the N. R. I. beg to address you as follows:

We congratulate the Institute on completing 20 years of useful technical service and wish the Institute and its able staff may continue their valuable work and ideal of service for many such twenty years to come.

We the students and graduates of your Institute in Bombay have formed an Association and have the following as our ends, our ideals:

I. To give each other advice and help in matters pertaining to advanced Radio work in general.

II. To start laboratory for practical demonstration and research.

III. To popularize Radio activities and canvass for more students for N. R. I.

IV. To open a Bureau for finding employment for the members.

These are some of our main aims and we are fully confident that N. R. I. will help us, as the students past and present, by offering us practical suggestions and service for better organization and success of this, our students' Association.

We shall mail you further details of Rules and Regulations shortly.

Wishing the Institute long life and brilliant success.

R. N. Kalle

S. E. Shroff

D. Major

Philadelphia-Camden

(Continued from page 26)

as a Business." This will be the first time Mr. Murray has been able to attend one of our meetings since last April. With him will be Mr. Joseph Kaufman, Supervisor of Education of the National Radio Institute in Washington, who will give a talk on the subject of "The Art and Science of Correct Servicing."

If you miss this meeting it will be your own fault and you'll regret it.

Baltimore Holds Rally Meeting

One of the biggest meetings of the N. R. I. Alumni Association which we have been privileged to see, up to this time, was held recently at the Baltimore Local Chapter.

There were several reasons for this meeting. First, the Local has moved to its new and larger quarters; second, there was a big drive on for new Local Chapter members; third, the boys were celebrating the Twentieth Anniversary of the N. R. I. and the Fifth Anniversary of the Alumni Association; and last but not least, they were celebrating the nomination of two of their members for offices of the National Association.

P. J. Dunn, their Chairman, has been nominated to run for the presidency of the Alumni Association while Geo. Ruehl, the Secretary-Treasurer of the Baltimore Local, has been nominated for Secretary of the National body.

The hall had been beautifully decorated in fall colors. Secretary Ruehl had donated the use of his P. A. system, a fifteen watt outfit with two loud speakers, desk and pedestal microphones, and with turntable and records for music.

The Baltimore City flag, the Maryland State flag, and numerous American flags were draped around the walls. A large blue and white N. R. I. flag was draped over the chairman's desk and N. R. I. pennants were in evidence everywhere. It was a very colorful affair.

Approximately one hundred and twenty-five persons were present. Alumni Association members from all over the State of Maryland and the District of Columbia were there, including a delegation from the National Radio Institute.

Among the guests of honor were The Mayor of Baltimore, the State's Attorney, and Judge Dickerson.

Judge Dickerson spoke at some length about Pete Dunn, Chairman of the Local, whom he has known since Pete was a little fellow in knee trousers. And said the judge . . . "I know nothing but good about him—he is almost like a son to me. There is nothing I wouldn't do for Pete. You fellows are lucky to have such a fine and able fellow directing the destinies of your Local Chapter."

One of the highlights of the meeting was when Alumni Member John Gough of Baltimore presented his friend Secretary Ruehl with a chromium desk plate which he hopes will bring George luck in the forthcoming elections.

And, as usual at Baltimore meetings, plenty of refreshments were served.

The Service Forum—Continued from page 11

brass piece, take the friction part and fit a piece of stove pipe wire into the slot into which the dial edge fits. It should be cut to such a length so it will fit snugly and be forced in tightly.

—————*n r i*—————
RCA MODEL 78

DEAD**GENERAL ELECTRIC MODEL 78**

This is sometimes caused by a defective detector filter choke located in the square can fastened to the side of the chassis. It can be replaced with an old audio transformer, connecting the primary and secondary windings in series if the secondary winding alone is insufficient, to give good results.

—————*n r i*—————
STEINITE MODEL 421

NO SCREEN GRID VOLTAGE

This is generally caused by a broken down screen grid by-pass condenser. Check each of the condensers and if any are defective replace them with .1 microfarad 600 volt units for a permanent job.

—————*n r i*—————
RCA & GENERAL ELECTRIC

SLIPPING DIAL

On models employing the rubber friction type dial the rubber may be taken off and turned around. Then loosen up slightly on the screw at the end of the condenser shaft. The job will now prove satisfactory and will last. If you do not loosen up on this screw, the tuning condenser gang will tend to bind and the rubber will wear out again in a few days. The application of oil to the condenser bearings will help.

—————*n r i*—————
SENTINEL MODEL 560

DEAD

Check for an open section in the condenser block. This block consists of two 8 and one 4 microfarad condensers. The black lead is the common negative. One 8 mike plus lead goes to one side of the filter choke while the other 8 mike plus lead goes to the other side of the choke. The 4 mike plus lead connects to the cathodes of the rectifier.

—————*n r i*—————
STEWART-WARNER MODEL 1171

PILOT LIGHT TOO BRIGHT

To overcome this replace the 15 ohm pilot light resistor with one having a value of 35 ohms.

—————*n r i*—————
WELLS-GARDNER MODEL 20

DEAD

If there is no plate voltage on the first A.F. tube the 40,000 ohm yellow resistor feeding the primary of the transformer connected to this tube is probably open. A 2 watt 40,000 ohm replacement resistor should be employed.

PEERLESS MODEL 20**INTERMITTENT RECEPTION**

This is most often caused by a defect in the condenser connected from the lower end of the detector grid coil to the chassis. Replace this condenser with another having a value of .1 microfarad. The condensers occupying a similar position in the grid returns of the R.F. tubes should also be suspected.

—————*n r i*—————
RCA VICTOR MODEL M-31

NO VOLUME CONTROL ACTION

This complaint accompanied by weak signals is usually caused by an open I.F. coil winding. Go over the soldered connections in the I. F. transformers with a hot iron as the joints may only be held together by rosin and may not be making electrical contact.

—————*n r i*—————
PHILCO LATE MODELS

WIRING COLOR CODE

Philco has adopted the standard R. M. A. color code as employed by various other Radio manufacturers. This coloring of wires is held to wherever possible and there are only a very few exceptions where the standard coloring is not used. The chart below indicates the various colors of wires and the types of circuits in which these wires are used:

Colors**Circuits**

- Red—Filaments and odd wires
- Brown—Cathodes and grounds
- White—B and screens of output pentodes.

—————*n r i*—————
STROMBERG CARLSON MODEL 38, 39 AND 40

WEAK SIGNALS

This complaint accompanied by a station hiss which seems to clear up when your finger is placed upon the control grid of the R.F. tubes, is caused by an open in the primary of the pre-selector coil. Carefully check the continuity of the R.F. tuning circuits and also check the antenna, making sure that it is not open. Be sure that the primary of the pre-selector coil is grounded to the metal braid of the antenna binding post lead.

—————*n r i*—————
STROMBERG CARLSON MODEL 38, 39 AND 40

DISTORTION

When this complaint can be cleared by placing your finger on the control grid of either the R.F. or first detector tubes, the trouble is probably due to grounding of the control grid return to the chassis. The shield over the coil may bite into the lead, shorting it to ground. This will prevent the A V C from acting on the stage in question and will therefore reduce the swing of the visual tuning meter on resonance.

Baltimore Chairman Nominated

(Continued from page 24)

folk, and on south. Of course, Baltimore turned out for him in great style. Pittsburgh showed a slight leaning toward Dunn, with Cincinnati, Columbus and other Ohio cities (except Cleveland) about equally divided among the two candidates.

In the southwest and on the west coast the honors seemed equally divided between the two.

So all we can say at this time is "What a Race This is Going to Be." The Buffalo Chairman against the Baltimore Chairman, with the National Association almost equally divided in their favoritism. Who's going to win? That is a toss-up. Your guess is as good as the next one. The thing to do is to make this a record vote. Back your favorite. Send in your ballot early and help us avoid that last minute rush of ballots.

The ballot forms are on page 30 of this issue. They have been arranged so that you can tear them out without injury to the book. Remove them carefully, fill in the ballot and mail it back immediately to: P. J. Murray, Executive Secretary, N. R. I. Alumni Association, 16th and You Sts., Washington, D. C. For those who do not wish to tear the page from NATIONAL RADIO NEWS, the ballot may be copied on a piece of plain paper, filled out and returned.

Let's have a ballot from every member of the Association. This is your organization, and it is up to you to say who are to be the officers for the coming year. VOTE!



There suddenly seems to be an unofficial race between the various Local Chapters to enroll new students for the N. R. I. Course of Training. Baltimore is leading; New York-Brooklyn is second and Pittsburgh third in the race.



LATE BULLETIN

P. J. Murray, Executive Secretary of the National Association, was invited to be present at the November 16 meeting of the New York-Brooklyn Local. It was impossible for him to do so, but it is understood that in all probability he will attend the December meeting of the "Big City" Local.

Final Ballot For Election Of National Officers For 1935

It now becomes the duty of every Alumni Association member to cast his vote to elect the officers who will serve the National Association of the N. R. I. Alumni for the year 1935.

On the other side of this page (page 30) a handy ballot form has been prepared for our members. Vote for one man for President, four men for Vice Presidents, one man for Secretary, and one man for Executive Secretary. Be sure to sign your name and address to the bottom of the ballot.

After this is done, the ballot can be removed by tearing it carefully along the dotted line. By using care in this operation you will not deface this issue of NATIONAL RADIO NEWS.

The ballot must be mailed immediately to P. J. Murray, Executive Secretary, National Radio Institute Alumni Association, 16th & U Streets, N. W., Washington, D. C. It is important that the ballot be returned promptly so that all returns may be counted and the names of the new officers published at an early date.

For those who do not wish to tear this form out of their NATIONAL RADIO NEWS, prepare your own ballot on a typewriter, or with pen and ink and sign and mail to the address given above. If you prepare your own ballot be sure to write on one side of the page only, confine your balloting to one sheet of paper, and mail to the Executive Secretary direct. Do not make your balloting a part of any other letter to the Alumni Association or to the Institute. Ballots must be kept separate to obtain the proper attention.

This balloting is important to you and to your Association. It is your right—it is your duty. The officers for 1935 will have a great bearing on the Association's activities and it is up to you to vote for the men you prefer to hold the reins of the Association for the coming year.

Mark this ballot carefully, following instructions given on page 29. It is important that this ballot be mailed to National Headquarters at the earliest possible moment.

FOR PRESIDENT

(vote for one man)

- T. J. Telaak
- P. J. Dunn

FOR VICE PRESIDENTS

(vote for four men)

- I. J. Vanek
- Fred Nichols
- F. A. Parkins
- T. A. Deschantz
- A. G. Ruse
- C. H. Mills
- E. O. E. Gralley
- Earl Bennett

FOR SECRETARY

(vote for one man)

- Earl Merryman
- Geo. H. Ruehl

FOR EXECUTIVE SECRETARY

(vote for one man)

- P. J. Murray
- A. H. Royce

Sign here:

Your name

Your address

City State

MAIL YOUR COMPLETED BALLOT TO:

P. J. Murray, Executive Secretary, N. R. I. Alumni Association, 16th & U Sts., N. W., Washington, D. C.

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- J. L. Kearns, N. Y. Brooklyn
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The Official Organ of the N. R. I. Alumni Association



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The Mailbag



N. R. I. Hams

F. A. Pritchard, Wethersfield, Conn., W1AQU.
C. E. de Silva, Antiqua, B. W. I., VP2CD.

— n r i —

A Letter From Arizona

I just received NATIONAL RADIO NEWS to which I always look forward with much interest. I always get at least one or two points which "soak in," thereby adding to my storehouse of knowledge.

My radio set is one which I built out of the parts you sent me for practical work while I was taking the course. Here's how it works for me. Last night, June 5th, I got WABC—WTAM—WHAS—WCCO—WENR — and old WLW is sure like local now—and many others, some Canadian and some Mexican.

Wm. H. Gray, Phoenix, Arizona

— n r i —

Home vs. Shop

Graduate Royce brought up a question some months back about servicing in the home. Well, I'm another Royce, and I want to express my opinion:

I class my work with that of doctors and dentists. Nobody ever heard of a doctor performing a major operation on the customer's living room table, nor a dentist filling a tooth in the privacy of the patient's home. Neither should a Radio serviceman be expected to tear a Radio all apart on the customer's best Persian rug.

It has always been my practice to test tubes and make a preliminary survey in the home, and if the job is small, repairs can be made on the spot. But on any jobs that call for more than a new tube or soldered connection, the set goes to the shop.

Good will is maintained by informing the customer of the repairs needed and the charges to be expected after a thorough check-up and before anything at all is actually done to the set.

The average Radio owner is quick to see that a serviceman cannot be expected to buy a truck to carry all the paraphernalia necessary to the completion of a first class repair job on the modern Radio receiver.

Dexter M. Royce

— n r i —

Stolen Property

Be on the lookout for the following described stolen property:

I model No. 85 Supreme tube checker, serial No. HJ1145; RCA Radiatron tube carrying case containing an assortment of National, Tung-

Sol, and RCA tubes, as well as RCA socket layout guide, a manual containing N. R. I. service sheets for the past several years, a Sylvania service hints book, Philco instruction books and service sheets. Reward for return.

Edward Pope, Rissville, Ga.

— n r i —

Floating Power

I had the unusual job of servicing a Radio set on a towboat. The vibration, bumps, etc., jarred the life right out of the tubes. I mounted the entire set on an old inner tube, and they haven't lost a tube since. The owner tells his friends that this idea has saved him \$50 in tubes.

R. E. Bourdreaux, Texas City, Texas

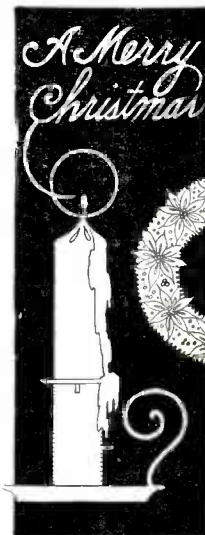
— n r i —

In reply to Mr. A. H. Royce, Winton, Wyoming, I have talked over this idea of "Service in the Home" with many of the fellows here in Denver. We have arrived at this conclusion. We charge \$2.00 for the complete inspection of a Radio receiver in the home, *and when it is found that an iron must be heated up* in order to check for leaking condensers and defective resistors, we always take the receiver to the shop. Soldering in a new resistor looks so easy to the customer that he may complain at the charge for this resistor and a further charge for labor. But show him, with a volt meter, that the resistor is defective, and he will let you take the set out for complete repairs.

— n r i —

People have more money to spend this Christmas than they have had in many years past. The Radio men who go after their customers with the idea of "fixing up the set for the holidays" are going to make some real money.

Most set owners will do quite a bit of entertaining at Christmas and New Year. Parties will be much more lively this year for various reasons. Music and entertainment will be much in demand. Sell that idea. Don't let a poorly operating receiver spoil the fun.



Build Yourself a Valuable Radio Library with these Helpful FREE MANUFACTURERS' BOOKLETS and CATALOGS

A FREE SERVICE DESIGNED TO SAVE YOU TIME AND MONEY

The cooperation of the manufacturers whose catalogs, literature and booklets are listed on this page, and the courtesy of the Calcaterra Catalog Service, has made it possible for the N. R. I. Alumni Association to offer to readers of National Radio News a unique and money-saving service in obtaining Radio manufacturers' literature.

All that is necessary for you to obtain the catalogs or other literature listed on this page is to write the

numbers of the items in which you are interested on the coupon, fill in the information asked for and MAIL IT TO THE CALCATERRA CATALOG SERVICE. DO NOT MAIL COUPONS TO THE NATIONAL RADIO INSTITUTE AS THAT WILL DELAY THE FILLING OF YOUR ORDER.

Stocks of the publications listed are kept on hand and they will be sent to you promptly, as long as the supply lasts.

2. HAMMARLUND 1935 PARTS CATALOG. 10 pages. Variable and adjustable condensers, sockets, coils, intermediate frequency transformers, chokes, etc., for broadcast and short wave work.

4. HAMMARLUND-ROBERTS 15 TO 200 METER COMET "PRO" SUPERHETERODYNE. Details of a receiver designed especially for laboratory, newspaper, police, airport and steamship use.

5. ELECTRAD 1935 CATALOG. 16 pages. Standard and replacement volume controls, Truvolt adjustable resistors, voltage dividers, vitreous enamelled fixed resistors, public address systems, etc.

6. AMPERITE REAL LINE VOLTAGE CONTROL. Characteristics, uses and chart showing the correct Ampelite recommended by set manufacturers for their sets.

25. LYNCH NOISE-REDUCING ANTENNA SYSTEMS. This folder describes in detail, and gives installing instructions for the various types of noise-reducing antenna systems developed by Arthur H. Lynch, Inc. Descriptions and prices cover the Lynch High Fidelity Antennas, the Lynch Marconi All-Wave System Antenna, the Lynch NoStat Broadcast Kit, the "Giant-Killer" Kit and many other Lynch Antenna specialties.

26. LYNCH AUTO RADIO ANTENNAS, FILTERS AND NOISE SUPPRESSORS. This folder describes a complete line of Lynch antennas, filters and ignition noise suppressors, especially designed for motor Radio installations. Complete data on how to eliminate motor Radio noise is included.

27. THE LYNCH AUTOSTAT CHARGING RATE BOOSTER. This folder describes the new Lynch Autostat designed to automatically increase the charging rate of the automobile car generator by five amperes every time the car radio is turned on so as to eliminate danger of running down the car batteries when the radio is in operation.

34. ELECTRAD SERVICEMEN'S REPLACEMENT VOLUME CONTROL GUIDE. A 44-page vest-pocket size booklet containing a revised, complete list, in alphabetical order, of over 2,000 different receiver models with the proper type of Electrad Control to use for replacements.

56. SUPREME SERVICING AND TESTING INSTRUMENTS. A catalog containing complete descriptions of a new line of Supreme low-price analyzers, set testers, tube testers, ohmmeters, capacity testers, oscillators and universal meters.

57. HOW TO BUILD A HIGH-QUALITY CONDENSER OR RIBBON MICROPHONE. This circular describes the Superior Microphone Kit and instruction sheets with which it is possible to build, quickly and easily, a high-quality condenser or ribbon microphone. The kit is made by the Ampelite Corporation.

60. AMERTRAN AUDIO AND POWER TRANSFORMERS AND CHOKE COILS FOR USE IN PUBLIC ADDRESS AMPLIFIERS AND RECEIVERS. A folder containing very complete information on the characteristics of a wide variety of AmerTran De Luxe and Silcor (popular priced line) audio and power transformers and chokes.

63. AMERTRAN MODERATE-PRICED, HIGH-QUALITY TRANSFORMERS AND CHOKES. This bulletin gives complete descriptions and prices on the new AmerTran Silcor line of moderate-priced audio and power transformers and chokes, designed for original and replacement use in radio receivers, amplifiers, public address systems and amateur transmitters. Many novel universal mounting features are incorporated in these units.

65. NEW SUPREME 1935 LINE OF TESTING INSTRUMENTS. This booklet gives complete information on the new 1935 line of Supreme testing instruments including the new 5" Supreme fan shape meter, the new Model 333 DeLuxe Analyzer, the low-priced Model 333 Standard Analyzer and the Improved Model 85 Tube Tester.

66. A SUPREME A.C.-D.C. TESTER WHICH CAN BE BUILT AT HOME AT LOW COST. This folder gives complete information about the Supreme 5" fan shape meter, rectifier and resistor kit for the home construction of an inexpensive A.C.-D.C. tester.

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