



# National *RADIO* News

Vol. 6—No. 10

WASHINGTON, D. C.

Oct.-Nov. 1935

## IN THIS ISSUE

---

All-Wave Converters

---

The Cathode Ray Oscillograph

---

Metal Tubes

---

Reviewing the Industry

---

A Trip  
Through a Tube Factory

# How Strong is the Chain?



LET'S suppose you were running a construction job and needed a chain to carry a heavy and very valuable load—a load which if dropped, would mean great financial loss—delay—innumerable difficulties.

You order your blacksmith to forge a chain; you want it of the best steel—each section must be perfect because you realize the truth of the old saying, “No chain is stronger than its weakest link.”

The chain is completed, the load attached. The conveyor goes into action and its valuable cargo is deposited in safety. The chain held true. Had just one link parted—DISASTER!

Life is like that. It is like a chain composed of ambition, perseverance, character, etc.—and TRAINING. Most men are born with a certain amount of each of these—except Training. Until your link of Training has been forged there is nothing to tie the Success chain together. Until then it is in two parts—each too small to be valuable. But when properly united, these parts form a powerful combination, capable of carrying a priceless burden, *your future*, over the obstacles of life, over the

that results from incapability, on to the safety of Success.

You are building your link of Training into the chain which will carry you through life. Be sure it is a strong, permanent link. Had the blacksmith made one link of his chain out of twine, the load would not have been lifted. Serious enough, this would have been, but even so, the mistake would have been discovered, a new link forged—the load lifted without damage.

But if it had been made, apparently of good, strong material, which, under stress developed a flaw, and broke, the damage would most likely have been beyond repair. To repeat, *you are building your link of Training*. You are using good, strong, ~~time~~-tested material, for N. R. I. Training has been proved over a period of twenty years. But don't skimp on material. Put every bit of your N. R. I. Course into this chain—and it will carry you through.

Don't think you know a subject—KNOW THAT YOU KNOW IT! Don't try to cover a subject or a lesson in a day when common sense tells you it should require a week. Don't ruin your steel by allowing flaws to creep in which may eventually weaken your chain.

Put all of your N. R. I. Training into your success chain—make it as big and as powerful as possible. The time will come when you need a strong chain to support you—to help you over difficulties—to carry you through competition—to carry you onward, forward, and upward to the success goal which you have set for yourself.

J. E. SMITH, *President*.

# All-Wave

## Converters

THE increasing interest in all-wave converters together with the fact that they can now be obtained in kit form prompts me to write this article so our readers may have the whole story.

Not long ago, we received at the N. R. I. Laboratory a unit which looked very much like a midget Radio set but which was really an all-wave converter. The device was housed in a beautiful, black, "wrinkle" baked enamel cabinet, and equipped with an airplane type dial. The manufacturer was J. W. Miller Company of 5917 South Main Street, Los Angeles, California. It was a professional looking unit which, as I have mentioned previously, can be purchased in kit form.

During the next hour or so, I delved into this apparatus and found many interesting features. I'll tell you about them.

*This is another of the "Laboratory" articles which have become so popular with readers of NATIONAL RADIO NEWS. Mr. Thomsen, due to his wide experience with material of this type is in an extremely good position to bring you very worthwhile information.*

EDITOR

### *Advantages of an All-Wave Converter*

First, remember that this is an all-wave converter. Just what does this mean? Well, it makes any broadcast receiver an all-wave set. It is an economical means of converting a standard broadcast Radio into an efficient all-wave receiver. Thus, it is no longer necessary for the owner of an older broadcast receiver to feel that he *must* junk his Radio and purchase an all-wave set, in order to hear short-wave stations all over the world. With the all-wave converter, he can enjoy the thrill of hearing foreign stations, aircraft, police broadcasts and amateurs with the same ease and convenience as that offered by the latest types of all-wave receivers, and with only a nominal investment. If the set is a dual wave or skip band affair, as they are sometimes called, all-wave reception is also available. Then, too, if the receiver has automatic volume control, better selectivity and stability may be had than heretofore as additional stages of R.F. ampli-

PAUL H. THOMSEN

R.N.I. Staff



fication will be added. (Don't get me wrong, broadcast receivers without automatic volume control and similar features may be used effectively in bringing in short-wave broadcasts as well.)

Under normal receiving conditions, the converter was tried on tuned R.F. and superhet receivers, made years before anyone thought of multi-wave reception. The results—well, they were surprisingly good. Berlin, Germany, and Madrid, Spain, were heard with remarkable clearness and consistency. We were somewhat impressed by the stability of these signals. It seemed so extremely easy to tune back to the settings where the foreign stations came in. It was almost unbelievable to hear the old set produce so many foreign signals. South American and Cuban stations were plentiful, too.

### *The Circuit and Associated Units*

Now getting back to the circuit and electrical constants of the converter, we find that it employs a type 2A7 modulator oscillator and a type 58 tube as an intermediate frequency amplifier stage peaked at 545 kc., and a type 80 rectifier, which supplies all voltages necessary for the converter. Since the unit is self-powered, it can be placed across the room from the receiver or near your favorite armchair, within easy reach, as very few connecting leads will be necessary.

It is only necessary to plug into the 110 volt A.C. line, connect the antenna and ground leads to the converter and one other lead to the antenna terminal of the receiver. The frequency range is from 12 to 200 meters and divided into three steps, which are selected by a rotary switch controlled by the knob on the lower right of the panel. Two additional taps are available, one for operation over the 2,000 meter European broadcast band and another for the U. S. broadcast band in case the

(Page 10, please)

# The Cathode Ray Oscillograph

A Few Radio Servicing Applications

By Joseph Kaufman, N. R. I.

Supervisor of Education

The 3rd and concluding installment of the current series. Mr. Kaufman will have other articles on this subject at a later date.

IN this article on the cathode ray oscillograph, I want to suggest a number of practical applications of the device, uses which have helped the serviceman in rendering a better service to his customer. As there are many different types of cathode ray oscillograph units on the market, as there are various kinds of essential associated equipment, I must limit my discussion to the general procedure to take, and what to expect. When you feel the need for a cathode ray servicing instrument, the peculiarities of the instrument you purchase must be mastered.

## Alignment Procedure

Of all the jobs suggested for the cathode ray oscillograph, and there are hundreds of them, the alignment of radio frequency amplifier section of the receiver, I believe, is the most important. An alignment, using this device, leaves nothing to the imagination, you actually know whether the characteristic of the R.F. amplifier is peaked, flat topped, round or distorted. To be sure, many servicemen will ask: "What difference does it make? The customer does not know the difference," or he may say: "I can do well enough with a service oscillator and output meter."

My answer to these statements is merely an appeal to be scientific about your service work and to follow accepted technical methods whenever you can afford them. Simple and inexpensive receivers need only be peaked, hence the service oscillator and the output indicator will suffice. But with the gradual acceptance of receivers with good and high fidelity, more than aural and meter indications are required. When you use a cathode ray oscillograph several times for alignment purposes, you will never be without one, and it really takes very little extra time. When the oscillator-output meter method first came in vogue, practical men argued that they could do as well with an oscillator and determine the output by listening. When they actually tried the output meter several times, they made its use standard practice. Do not get me wrong, the oscillator-output method is good for peaking and alignment and I still feel it the wiser method for use in the customer's home. The cathode ray oscillograph is the ideal device for your work bench, and a complete revitalization job at the bench

should include scientific checks with this modern instrument. Now how is the cathode ray oscillograph adapted for taking the resonance curve of an R.F. system or an I.F. stage?

If you connect an unmodulated signal generator to the input of a radio receiver and a milliammeter in the second detector (we are concerned with a super type of receiver) you will observe that the current readings will vary as you adjust the frequency of the unmodulated oscillator. If the detector is of the C bias or diode rectifier type, exact resonance between the oscillator and receiver would cause maximum current to flow. Tuning the oscillator off the receiver frequency setting causes the current to drop. In fact, by plotting frequencies off resonance against current a resonance curve of the R.F. system results. But every time you make an adjustment the curve changes, and the only easy measurement to make with this set-up is the one for peak current deflection.

Instantaneous pictures of the entire resonance curve may be placed on the screen of a cathode ray oscillograph, provided the adjustment of the frequency variation cycle is regular and repeated more than 15 c.p.s. To modulate or wobble the frequency in this regular and repeated manner, the usual practice is to have a small synchronous or induction motor driven from the 60 c.p.s. power line, revolving a small trimmer condenser, which in turn is shunted across the main tuning condenser of the signal generator. Speeds of 900 to 2400 r.p.m. are used. As a rule the motor drives at least two trimmer condensers, so one or both may be connected across the oscillator, to give two ranges of frequency wobulation.

A simple wobulator circuit is shown in Fig. 17, following the ideas just presented. As the

(Page 6, please)

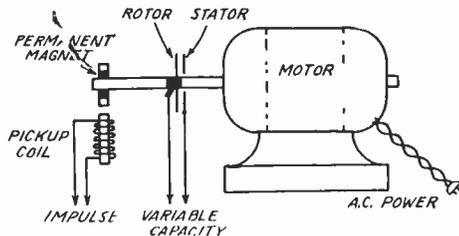


Figure 17

# The Service Forum

Conducted by

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



For a number of months now, Mr. Straughn has been conducting the Service Forum Department of NATIONAL RADIO NEWS. The number of favorable comments received by your Editor indicate the interest of our readers in this Department. In an effort to increase the value of "The Service Forum," Mr. Straughn solicits your comments and your help. He wants to know what you think of this section of NATIONAL RADIO NEWS; he wants you to send in to him, service notes which may be published for the benefit of our readers; and he will be glad to answer, in these columns, questions of general interest.

By "general interest," is meant problems which will not arise "just once," in isolated cases, but problems which occur and recur frequently in Radio servicing. Send in your problems—your name will not be mentioned, only your initials will be used.

— n r i —

## AIRLINE 40

## OSCILLATION

Changing the oscillator grid leak to one of 40,000 ohms will often eliminate this trouble which may occur at either end of the dial.

— n r i —

## APEX 10

## NOISY

A common cause of noise in this receiver is the electrolytic condenser by-passing the detector plate resistor. If the noise cannot be eliminated by other means try replacing this condenser with another electrolytic condenser having a capacity of 8 mfd.

— n r i —

## CLARION MODEL 51 INTERMITTENT RECEPTION AND OSCILLATION

The most common trouble with these receivers is a defective by-pass condenser in the Radio frequency circuit. A condenser may be leaky, open, or short-circuited and may cause either oscillations, noise or intermittent reception. It is sometimes difficult to locate such a noisy condenser if the antenna lead is disconnected. It is necessary for a Radio frequency signal to be picked up before the noise will be noticeable.

— n r i —

## CROSLEY 120

## STATIC, INTERMITTENT RECEPTION

The small .02 mfd. condenser located under the resistor strip between the 27 and 24 tubes will often cause intermittent reception and noise.

— n r i —

## BRUNSWICK FADING, INTERMITTENT SCREEN GRID MODELS RECEPTION

This trouble is quite often caused by a defective 1 mfd. condenser connected from the screen grid to the chassis. Try replacing this condenser making sure that the condenser is thoroughly grounded.

— n r i —

## FADA 761 INTERMITTENT RECEPTION FADING

The cathode by-pass condenser in the Radio frequency circuit quite often opens up causing fading or intermittent reception. The .5 mfd. screen by-pass condenser may also cause this same trouble.

— n r i —

## RCA VICTOR AND GENERAL POPPING ELECTRIC MODELS NOISE WHEN TUNED

These receivers which have automatic volume control occasionally have a defective screen grid tube which will cause this trouble. The defective tube will not show up in a tube tester and for this reason it is necessary to replace the screen grid tubes, one at a time until the defective one is found.

— (Page 7, please) —

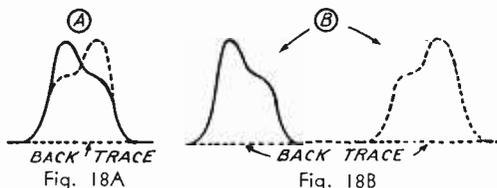
## RADIOLA 80, G.E. H-31 DISTORTION

Replacing the 10,000 ohm resistor between the cathode of the second detector and ground with a 8,000 ohm resistor some times clears up distortion which is difficult to eliminate. Making this change can also be used to increase the volume and sensitivity.

# The Cathode Ray Oscillograph (Continued from page 4)

trimmer rotates 360 degrees the rotor starts from zero capacity, goes to maximum in one-half turn; and then goes from maximum to zero capacity in the second half turn. If the main oscillator is adjusted so that exact resonance occurs when the trimmer rotor meshes half way with the stator, two resonance peaks will occur for each complete rotation. If for the first 180 degrees the frequency increases, then for the second 180 degrees the frequency will decrease; and for a complete 360 degrees two resonance peaks will be passed. At the same time two voltage impulses will be generated, usually at zero and maximum capacity, that is, the beginning of each resonance cycle. These impulses are produced by a bar magnet (pointed at the ends) sweeping past a pick-up coil, thus inducing in the coil twice each revolution of the condenser, a sharp impulse. The impulse is used, of course, to control the sweep voltage generator located in the cathode ray oscillograph. Bear this in mind.

By connecting the frequency modulated generator to the input of the receiver, and the vertical plates of the cathode ray oscillograph to the output of the second detector (preferably a resistive load), and synchronizing the sweep circuit to each wobbled impulse with the aid of the voltage impulses generated by the rotating bar magnet, two resonance curves will be observed superimposed on each other; or if synchronized to one impulse per trimmer rotation, two separated resonance curves will be seen. It is the analysis of these resonance curves that determines the characteristics of the receiver and what should be done to correct or align more perfectly the receiver under test.



Figures 18A and 18B show a typical resonance curve shown under both conditions. The superimposed patterns are preferred, as an adjustment can be made so both patterns blend into one image, indicating that a symmetrical characteristic is obtained. Figure 19 shows a number of unsymmetrical resonance curves, and considered desirable in receivers designed to have these characteristics.

The greatest difficulty will be in connecting the cathode ray oscillograph and the wobbulator to the receiver under test, and unless properly adapted will result in false resonance curves.

The connections must be made so as not to disturb the characteristics of the receiver.

First consider the connection of the frequency modulated generator. If the connection is at

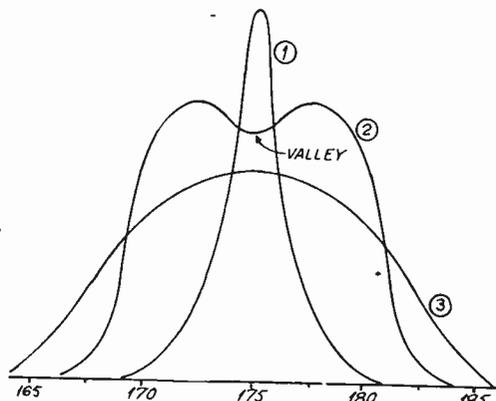


Figure 19

the input of the receiver, a direct connection may be made, although a dummy or phantom antenna could be included. If the input is to be to some stage, so as to adjust an R.F. or I.F. transformer, the connection should be to the grid input of the tube ahead of the transformer. Several recommended connections are shown in Figs. 20A, B and C. The first is the simplest and will generally suffice; the one shown in Fig. 20B is possible only if a C bias return (of a conductive path) exists through the output of the generator; and the one shown in Fig. 20C is best at high frequencies. Always connect the grid to the high R.F. terminal of the signal generator.

A little more thought should be required in making the connection to the vertical plates of the oscillograph. The low or ground terminal of the vertical plates is always connected to the chassis of the receiver, the high side so connected that only the varying audio potential with respect to ground exists. If a radio frequency filter system is employed it should be a point following the filter. In the case of diode rectifiers, the connection is made across the diode load; in the case of grid control detectors followed by a resistance coupling, the high potential connection is the plate after the R.F. choke or resistance R.F. filter. When an impedance or transformer load exists, a simple connection is to insert a 20,000 ohm resistor in the plate following the filter, connect the high side of the vertical plates to (Page 8, please)

# The Service Forum (Continued from page 5)

## GENERAL MOTORS IMPOSSIBLE TO AVC MODELS CONTROL VOLUME

If it is impossible to control the volume with the volume control the trouble is probably due to a defective 27 tube in the AVC socket. This tube may test good and in fact give satisfactory operation in other sockets. Try several 27 tubes using the one which gives the best results.

————— *n r i* —————

## ATWATER KENT 310 SCREEN OF OUTPUT TUBE RED HOT

If the screen grid of the 2A5 tubes glow brightly the trouble is probably due to an open in the primary winding of the output transformer located on the dynamic speaker. This breaks the plate voltage that is being applied to the tubes.

————— *n r i* —————

## CLARION 470 LOW SENSITIVITY, DISTORTION

Low sensitivity, intermittent reception and distortion can often be eliminated by decreasing the value of 2A6 bias resistor. Try various values between 5,000 and 10,000 ohms using the one which gives the best results.

————— *n r i* —————

## RADIOLA 82 OSCILLATION, DISTORTION

Oscillation and distortion is often due to a defective screen grid resistor. This resistor often changes in value, the original resistance of which is 14,300 ohms. The 18,000 ohm resistor connected from the screen grid to the cathode resistor may also change in value. The 14,300 resistor is a brown and pink resistor mounted on the resistor board, the third from the end. The other 18,000 ohm resistor is connected on the end of the resistor board and is black and red.

————— *n r i* —————

## APEX SUPERHETERODYNE CHANGE IN RECEIVERS VOLUME

A sudden change in volume in these receivers using AVC is generally due to the .5 mfd. condenser connected between the RF cathode and grid return of the RF and IF coils opening up. This is especially noticeable whenever a light or other electrical appliance is turned on in the house. Replacing the condenser with one known to be good will eliminate the trouble.

## BRUNSWICK 15 WEAK SIGNALS

With high plate voltage on the screen grid tubes together with low screen voltage will cause this trouble. In this case the 35,000 ohm orange resistor located in the front of the chassis will be found to be open or changed in value. Replacing this resistor will eliminate the trouble.

————— *n r i* —————

## ATWATER KENT 277 WEAK AND DISTORTED SIGNALS

The common trouble in this receiver is a defective resistor connected from the small Radio frequency choke coil near the oscillator tube to the chassis. This resistor is connected in series with the cathode pick-up coil of the first detector tube and its correct value should be 550 ohms. The 1 mfd. condenser by-passing this resistor may also be leaky or defective. It is well to replace both of these units.

————— *n r i* —————

## CROSLEY 40 SERIES WEAK SIGNALS

This is usually caused by a change in the resistance of the carbon resistor connected to the speaker field. This resistance should have a value of 6,000 ohms and a wattage reading of at least 5 watts.

————— *n r i* —————

## BRUNSWICK 83 MOTORBOATING

An open 1 mfd. tubular condenser which is connected to the .5 mfd. condenser in the Radio frequency section will cause oscillations or motorboating.

————— *n r i* —————

## AIRLINE 62-68 INTERMITTENT RECEPTION

This trouble is often caused by a defective 3200 ohm resistor supplying the cathode and suppressor grid bias in the 57 detector oscillator. The resistor may open up intermittently and for this reason should be replaced even though the resistance is correct at the time the resistor is tested.

————— *n r i* —————

## PHILCO MODEL 70 MODULATION HUM

This is generally caused by a defect in the two condensers shunting the primary of the power transformer. The installation of new .015 mfd. condensers should remedy the situation.

# The Cathode Ray Oscillograph (Continued from page 6)

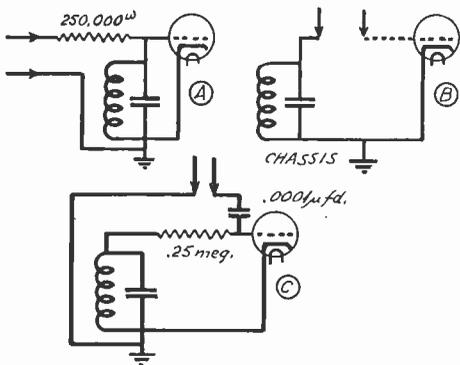


Figure 20

the plate side of the resistor, and short the choke or primary of the transformer with a 1 or 2 mfd. condenser. Several connections are shown in Fig. 21, *H* representing the high potential terminal of the oscillograph, *L* the low potential terminal.

It is highly important that the terminals of the vertical plate or the resistor it connects to have no appreciable capacitive or inductive effects, otherwise a resonance curve like the one shown in Fig. 22 will be obtained, which is not a true resonance curve. Removing the reactive components will eliminate this difficulty. Of course, anything you do should not affect the receiver characteristic. Figure 21E shows the most usual connection for a transformer load. When a distorted resonance curve is observed, reducing the resistor value eliminates enough of the phase distortion to give a symmetrical resonance curve.

The receiver should be operated below any overloading, unless you are interested in overloading. Receivers with A.V.C. should be fed with a low input so overloading does not occur. If it is impossible to reduce the wobbled input, remove the A.V.C. control and substitute a fixed bias in its place.

With the exception of this distortion factor, it is highly important that the R.F. input be as high as possible, so noise signals will not give a ragged resonance curve.

## Audio Distortion

A simple audio channel check is made by comparing the signal wave form of the audio generator before and after it has been sent through the audio system. The audio oscillator should preferably produce a sine wave, a single frequency of about 400 or 1000 c.p.s. will suffice. Its output should be controllable and where

there is no volume control, a potentiometer should be used. The audio signal generator is first connected to the vertical plates of the cathode ray oscillograph and the level controlled to give a reasonable size pattern. To be sure, adjustments are made to get a single cycle stationary pattern. The curve is traced on tissue paper temporarily placed over the screen. Now the audio signal generator is fed to the input of the audio system and the gain of the cathode ray oscillator amplifier reduced, as well as the output of the generator itself so the new pattern is of the original size. Compare the pattern on the tissue with what is observed. Second and third harmonic distortion is readily observed. Double humps or single central peaks indicate third harmonic distortion; a slight dip in one quarter of an alternation indicates second harmonic distortion. Two half waves with a gap between them indicates incorrect bias on a class B push-push amplifier. With experience many defects are observed, and knowing these defects correcting measures may be applied.

## Overall Response

When it is desired to have a simple overall aerial to loudspeaker distortion check, R.F. signals modulated with an audio sine wave are fed to the input of the receiver and the output voltage at the voice coil is reproduced on the cathode ray tube screen. Deviations from a sine wave are detected and by a stage by stage check the defect is located. Audio signals are fed to the audio system, audio modulated R.F. to the R.F. section, the R.F. value depending on which section (I.F. or preselector stage) you feed.

(Next page please)

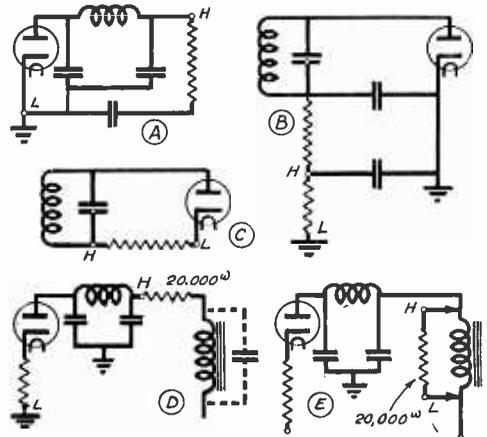


Figure 21

# The Cathode Ray Oscillograph (Continued from preceding page)

By using a signal generator of constant R.F. output, with fixed percentage of modulation for all of the various audio frequencies, an overall fidelity check is possible. By comparing the sine wave input patterns to the output patterns at each frequency, distortion can be spotted; by comparing output amplitudes (with constant input) of the various modulation frequencies, amplitude distortion is checked.

## General Line-Up Procedure

Suppose a receiver of good fidelity were brought in for R.F. alignment and audio adjustment. Let us take the case of a super with two I.F. stages (three I.F. transformers), one oscillator and a bandpass preselector. First the receiver is thoroughly tightened, connections checked, dust removed, every part put into good mechanical condition. Tubes are checked and all bad or doubtful tubes replaced. Next the audio system is checked for distortion and if necessary adjustments are made.

The I.F. stage is then peaked at manufacturer's recommended I.F. using the frequency wobulator signal generator connected to the input of the first detector and the cathode ray oscillograph connected to the second detector and to show the response curve. A curve like the one shown as 1 in Fig. 19 should be observed.

Now adjusting each transformer in the I.F. section, turn the primary trimmer up an eighth of a turn and the secondary trimmer out an eighth of a turn. Repeat for each transformer until the double hump, curve 2 of Fig. 19 is observed. Continue until the response curve width is of desired value, about 10 to 15 kc. if ordinary good audio quality is desired, and 15 to 20 kc. if higher fidelity is wanted. If the valley gets too deep, but the band width is satisfactory, load the intermediate transformer with a resistor across the secondary or primary, choosing a value that drops the humps to a satisfactory level. Or you may peak one of the I.F. transformers so as to get three humps. Unless the I.F. transformers have been designed to have optimum coupling the double hump may not appear, and a response like curve No. 3 of Fig. 19 will be obtained.

Having bandpassed the I.F. section connect the signal generator to the receiver input. Set the station selector dial at 1,400 kc. and adjust the high frequency receiver oscillator trimmer for maximum output. Repeat for 600, rocking the low frequency padder and signal generator for maximum output.

Go back to 1,400 k.c. and adjust the preselector trimmer (for a bandpass circuit two will exist), to get the desired double or flat top re-

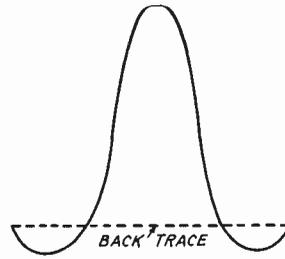


Figure 22

sponse curve. Repeat for each segment on the variable condenser, getting flat top by bending the rotor plates. Now the receiver has flat top response over the complete broadcast band. If selectivity is desired, introduce a variable high audio frequency cut-off, a tone control, in the output audio stage.

## KEEP ON KEEPIN' ON

If the day looks kinder gloomy  
And your chances kinder slim.  
If the situation's puzzlin'  
And the prospect's awful grim,  
If perplexities keep pressin'  
Till hope is nearly gone,  
Just bristle up and grit your teeth  
And keep on keepin' on.

Frettin' never wins a fight  
And fumin' never pays;  
There ain't no use in broodin'  
In these pessimistic ways:  
Smile just kinder cheerfully  
Though hope is nearly gone.  
And bristle up and grit your teeth  
And keep on keepin' on.

There ain't no use in growlin'  
And grumblin' all the time.  
When music's ringin' everywhere,  
And everything's a rhyme.  
Just keep on smilin' cheerfully  
If hope is nearly gone,  
And bristle up and grit your teeth  
And keep on keepin' on.

# All-Wave Converters (Continued from page 3)

device is to be used as a remote control unit. A cathode type volume control provides smooth positive control of sensitivity. The oscillator portion of the circuit employed is located below the sub-panel while the detector section is above, as can be seen in the photo. A complete schematic circuit diagram is supplied with the kit.

## Calibration of Dial and Tuning

An airplane dial reading in degrees from 0 to 100 is supplied with the unit. I have been informed that this is a more practical way of constructing converters supplied in kit form since variations in wiring by the individual assemblers would give inaccurate dial readings anyway and particularly on the high frequency bands. However, the assembler of the unit should supply the user with the important dial settings of the major short wave broadcast band positions, thus making it easier for the owner to locate the more powerful signals. Furthermore, the assembler should also adjust the I.F. transformer for maximum response on the particular receiver used. Two adjustments are provided on the type 301 I.F. transformer for this purpose. The tuning range is limited, however, tuning from 540 to 600 kcs.

I know some servicemen will take advantage of the possibilities of installing all-wave converters in Radio receivers designed only for broadcast operation. It is ~~removed from the upper part of receivers~~ ~~be removed from the upper part of receivers~~ and placed below the loudspeaker, with the power unit. This permits the

converter unit to be placed in the position originally used by the receiver. This arrangement eliminates the necessity of having a converter as a separate unit detached from the original receiver cabinet.

## A Suitable Antenna System Needed

For the successful operation of an all-wave converter, a suitable all-wave antenna system is necessary. The noise to signal ratio will be decreased and will therefore offer better reproduction of the programs transmitted. However, a good conventional antenna system is sufficient in locations where man-made interference is of a low value.

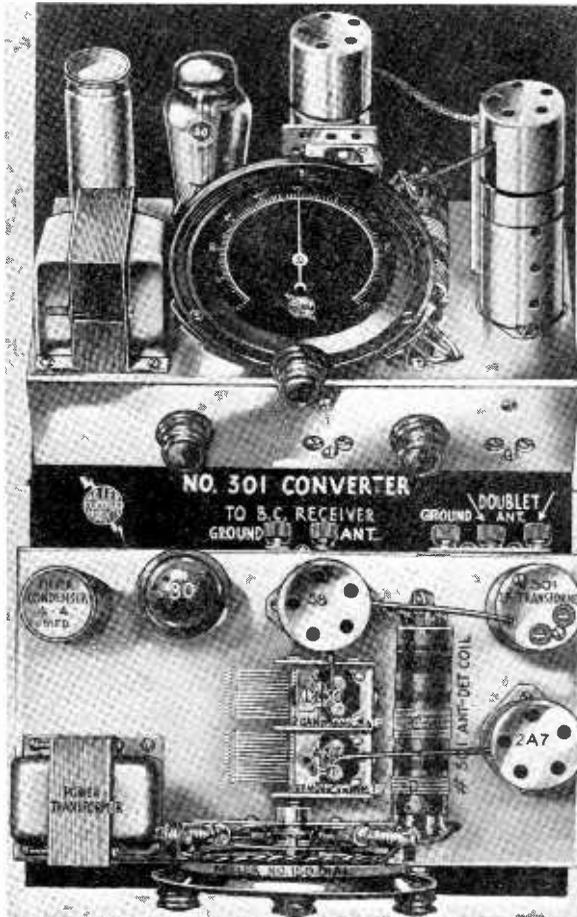
## Adjustment of Sensitivity Controls

It has been noted that it is best to use as much gain as possible in the converter section and to reduce the gain in the broadcast receiver to the desired level. Any variations in volume may then be made at the converter. This brings the signal level transmitted over the line to the broadcast set-up to a higher value and thus reduces local noise pickup on the I.F. frequency or 545 kcs.

## Characteristics of Short-Wave Signals

Only those familiar with the general characteristics of the transmission and reception of short-wave signals can obtain the best results from an all-wave converter. Therefore, the following data regarding the general nature and characteristics of short-wave signals will be

(Page 21, please)



# Metal Tubes

IN the June-July 1935 issue of NATIONAL RADIO NEWS, under the headline "Interesting Radio Tube News," we brought you our first story about the new metal Radio tubes.

At that time, many persons in the Radio Industry looked upon this innovation as more or less a novelty; as an attempt on the part of a manufacturer to bring out something new to help keep the production chart climbing, and to give advertising men something new to write about.

Those readers of NATIONAL RADIO NEWS who remember the article referred to above will recall that we made no comments one way or another as to the future of metal tubes.

We preferred to watch developments rather than make predictions.

And we still do not care to assume the role of prophet because prophetic tendencies quite frequently call for corrections, explanations, and alibis. We will merely place the facts before our readers and let them judge for themselves what the future will bring forth.

Sufficient to say that when concerns enjoying the prestige of General Electric and R. C. A., who designed and manufactured, respectively, the first of these tubes, make what is probably the most sensational change that has occurred in the tube industry since the advent of AC tubes, it behooves other manufacturers to fall in line very promptly, particularly if the change has merit or has a possibility of striking a popular fancy.

As a result, therefore, R. C. A., Sylvania, National Union, Tungsol, and Ken Rad, and possibly others are now making metal Radio tubes.

Some manufacturers, of which Arcturus is an outstanding example, have decided not to make metal tubes *at the present*, but are making the glass tube equivalent. By this we mean they are making tubes with bases and characteristics similar to those used in the metal tubes, except

that they have retained the conventional glass envelope.

National Union, on the other hand, is making the new metal tubes, and is also supplying a line of the glass equivalents.

A number of Radio servicemen with whom we have talked, looked upon the new metal tubes as "just another headache" to the serviceman. Well, possibly. If we are to accept some of the past experiences of the industry as a criterion, it will be some time before metal tubes can be obtained readily and with uniform characteristics—at the height of the Radio season. But maybe the tube manufacturers have prepared for all contingencies. Let's hope so! Some, at least, are not taking chances, and are building glass equivalents, which can be replaced with metal tubes at any time.

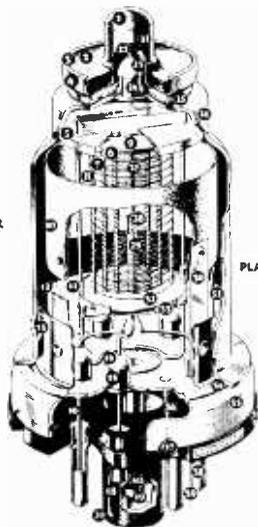
"What," ask several servicemen, "about the matter of using the all-metal tubes for replacement in existing receivers; those designed originally for the glass tubes? Will it not be a matter of stocking new adapters as well as all metal tubes for replacement in those sets?"

Of course, this could be done, but what would be the sense? With the exception of 6H6, a new double diode metal tube, the other metal

tubes have about the same electrical characteristics as the glass tubes that they could replace. A replacement would not improve the receiver, in fact, may destroy some desirable quality—so we advise you against such a procedure.

Anticipating the interest of NATIONAL RADIO NEWS readers in the new all-metal tubes, we have secured a cutaway illustration showing the internal structure of an all-metal Radio tube with the various parts numbered and captioned for your information. This illustration was obtained through the courtesy of the RCA Manufacturing Company. Readers of NATIONAL RADIO NEWS will be brought new developments in metal tubes as they transpire.

- ① SOLDER
- ② CAP INSULATOR
- ③ ROLLED LOCK
- ④ CAP SUPPORT
- ⑤ GRID LEAD SHIELD
- ⑥ CONTROL GRID
- ⑦ SCREEN
- ⑧ SUPPRESSOR
- ⑨ INSULATING SPACER
- ⑩ PLATE
- ⑪ MOUNT SUPPORT
- ⑫ SUPPORT COLLAR
- ⑬ GETTER TAB
- ⑭ GLASS BEAD SEAL
- ⑮ FERNICO EYELET
- ⑯ LEAD WIRE
- ⑰ CRIMPED LOCK
- ⑱ ALIGNING KEY
- ⑲ PINCHED SEAL
- ⑳ ALIGNING PLUG



- GRID CAP ⑪
- GRID LEAD WIRE ⑫
- GLASS BEAD SEAL ⑬
- FERNICO EYELET ⑭
- BRAZED WELD ⑮
- VACUUM-TIGHT STEEL SHELL ⑯
- CATHODE ⑰
- HELICAL HEATER ⑱
- CATHODE COATING ⑲
- PLATE INSULATING SUPPORT ⑳
- PLATE LEAD CONNECTION ㉑
- INSULATING SPACER ㉒
- SPACER SHIELD ㉓
- SHELL TO HEADER SEAL WELD ㉔
- HEADER ㉕
- SHELL CONNECTION ㉖
- OCTAL BASE ㉗
- BASE PIN ㉘
- SOLDER ㉙
- EXHAUST TUBE ㉚

Internal structure of an all-metal Radio tube.

(Courtesy RCA Manufacturing Company)

# Reviewing the Industry

By James G. Hollingsworth  
N.R.I. Vocational Advisor

*Previous articles written by Mr. Hollingsworth for NATIONAL RADIO NEWS have met with wide-spread approval. He will be remembered particularly for his "Auto Radio Opportunities," which appeared in the October-November 1934 issue, and "The Opportunities in the Field of Radio Servicing and Merchandising," which appeared in the June-July 1935 number of NATIONAL RADIO NEWS.—Editor.*

USUALLY, my articles are written around one particular branch of the Radio industry. In an effort to bring readers of NATIONAL RADIO NEWS vital statistics on that branch, and around these statistics build a story to show the opportunities in that particular field. This time, however, I am not going to adhere to this policy—I am not going to discuss any one branch of Radio, but will attempt to review the entire Radio industry and show a picture of how it stands today.

## *Broadcasting Stations*

Probably the best place to start with any analysis of the Radio industry is with the broadcasting stations. At the present time there are over 600 of these stations in the United States. Every year these 600 stations pay out about \$25,000,000 in salaries to their employees. (This does not include the salaries of artists and performers.) These broadcasting stations are located in every nook and corner of the country. They are in large cities—they are in little villages. While some of the stations employ only one or two men, there are those which employ as high as twenty or thirty men each, and operate in two or three shifts.

## *Ship Operating*

I have come to look upon ship operating as the "forgotten man" of the Radio industry. Ship operating, because it does not get the publicity that other branches of Radio do, is seldom heard of unless some marine disaster forces it into the public print, at which time we are reminded that it is probably the oldest commercial form of Radio; a great aid to shipping and navigation; and that there are over 2,000 vessels, from large ocean liners down to the hard-boiled little fishing ships and including palatial yachts, carrying from one to six Radio operators each.

## *Commercial Radio Stations*

While on the subject of the transmission end of Radio, it is well, also, to give some considera-



JAMES G. HOLLINGSWORTH

tion to another branch of this great industry which is almost as little known to the general public as ship operating. That is commercial Radio stations. The coastlines of the United States are dotted with commercial transmitting and receiving stations. These stations send Radio messages at so much per word, in a manner very similar to our large telegraph companies. Or it is possible now to pick up the telephone in your home and talk to a business associate on board ship in the middle of the ocean, or in a foreign land. Many Radio men find highly remunerative positions in commercial Radio.

## *Servicing and Merchandising*

Possibly the greatest branch of the Radio industry, when one considers the number of individual opportunities, is Radio servicing and merchandising. When we speak of Radio servicing we must, of necessity, talk in terms of millions. Since 1922—just thirteen years ago—20,000,000 Radio sets have been purchased in the United States. At some time or other each and every one of these Radio receivers needs servicing. It has been conservatively estimated that about 40%, or 8,000,000, of them need the attention of a capable, trained Radio serviceman each and every year. The Radio buying public has made an investment of between \$4,000,000,000 and \$6,000,000,000 in Radio sets, tubes, etc., in the past thirteen years.

There is a very close tie-in between Radio servicing and Radio merchandising. In fact, it is mighty hard to draw a definite line between the two. While there are some Radio service organizations which handle no sales of Radio receivers, every one of them does find it necessary to replace tubes, parts, etc., supply

(Page 15, please)

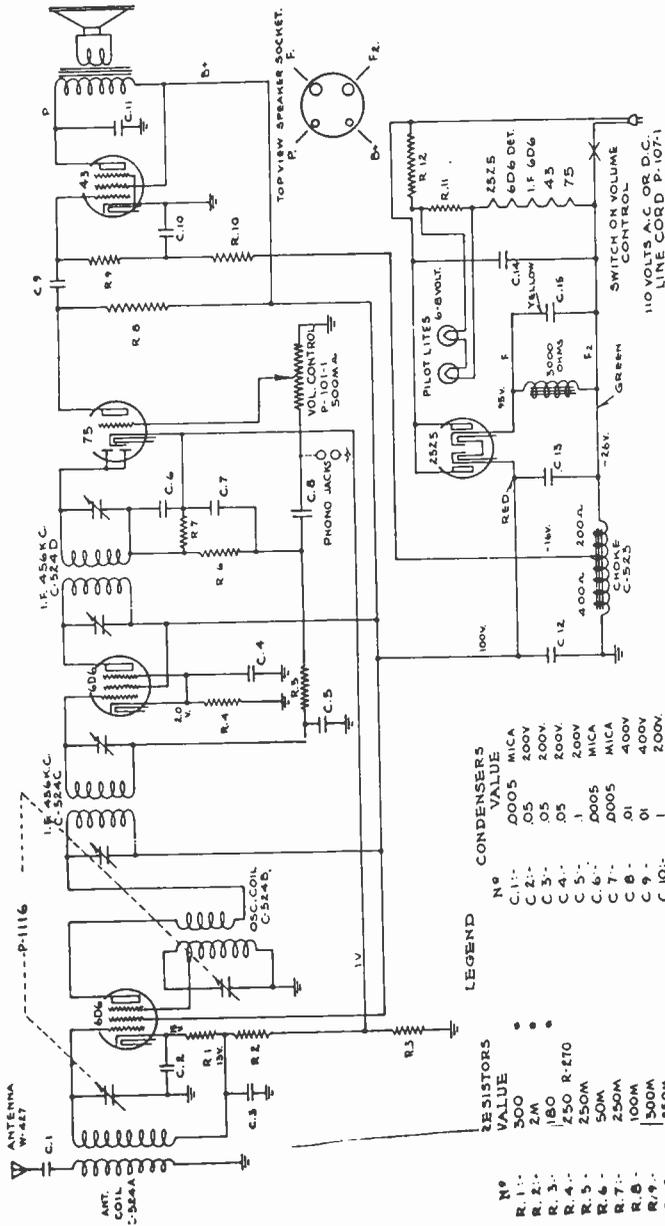
# RADIO-TRICIAN SERVICE SHEET

NO. 808 REV. OPA

COMPILED SOLELY FOR STUDENTS & GRADUATES



Zenith Model 801



**LEGEND**

RESISTORS		CONDENSERS	
No	VALUE	No	VALUE
R. 1	500	C. 1	.0005 MICA
R. 2	2M	C. 2	.05
R. 3	180	C. 3	.05
R. 4	250 R-270	C. 4	200V
R. 5	250M	C. 5	.1
R. 6	50M	C. 6	.0005 MICA
R. 7	250M	C. 7	.0005
R. 8	100M	C. 8	.01
R. 9	500M	C. 9	.01
R. 10	250M	C. 10	.1
R. 11	400-300M A. 0.54M P-106-1	C. 11	.025
R. 12	126 IN CORDMOP-1	C. 12	50MFD. C-525D
		C. 13	25.0MFD.
		C. 14	.1
		C. 15	5.0MFD

NOTE:  
 \* R. 1, R. 2 & R. 5 IN ONE UNIT PART NUMBER R-248  
 \* C. 15 AND C. 15 IN ONE UNIT PART NUMBER C-525-C  
 \* NUMBERS PREFIXED BY LETTERS ARE PARTS  
 VOLTAGES TAKEN FROM POINTS INDICATED TO CHASSIS  
 GROUND. VOLUME CONTROL ON FULL MEASURED ON  
 A. C. CURRENT.

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

## SERVICE NOTES

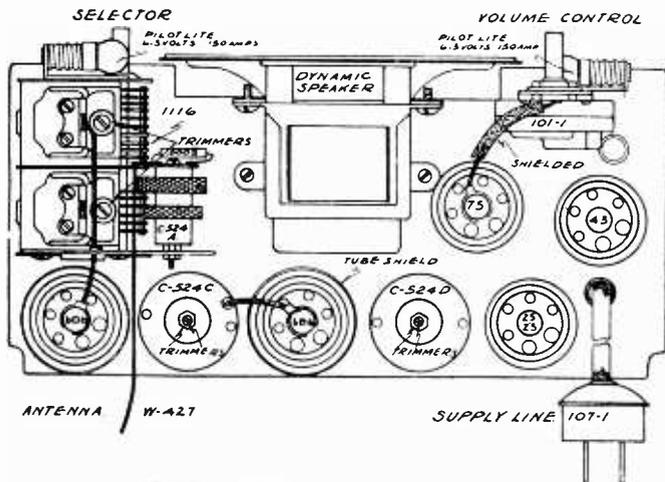
Should it be at any time necessary to rebalance this set, the correct procedure is as follows:

1. Volume control on full during all alignment.
2. Variable condenser in minimum capacity position, plates open, at start of all aligning.

### I.F. ALIGNMENT.

1. To peak I.F. transformers, connect oscillator set at 456 kilocycles to the grid of the 6D6 tube directly in back of the variable condenser and adjust the trimming condensers of the I.F. transformers to resonance (Maximum deflection on an output meter connected across the primary of the speaker input transformer).

Each I.F. trimmer has two adjustments, one nut and one screw, both of which are adjustable from the top.



INTERMEDIATE FREQUENCY 456 K. C.

### SERVICE

#### SUGGESTIONS:

**NOTE—CONNECTING CORD OF SET GETS WARM IN NORMAL OPERATION. DO NOT BECOME ALARMED.**

Make sure that all tubes are pushed firmly in their proper sockets and that the clips are securely fastened to the caps on the tops of the tubes.

That the aerial is stretched out and that the connections to an outdoor antenna (if used) are good.

If necessary to change tubes or service chassis, **UNDER NO CIRCUMSTANCES REMOVE BACK OR CHASSIS WITHOUT FIRST REMOVING PLUG FROM LIGHT SOCKET.**

To remove chassis from cabinet, pull off knobs from front, remove back (held with screws to case). Remove four mounting screws, then chassis can be slipped out of case.

### BROADCAST BAND ALIGNMENT.

1. Disconnect antenna wire and connect oscillator in series with a 75 mmfd. condenser to the antenna coil. With the variable condenser set at its minimum capacity position, at the extreme right of its rotation, and with an oscillator output adjusted to 1720 kilocycles, adjust trimmer of oscillator section of variable condenser (rear section) to resonance (maximum deflection on an output meter connected across the primary of the speaker input transformer). Next adjust the trimmer condenser of the front section of the variable condenser to resonance.
2. Check alignment at 1400-1200-1000-800-600-530 kilocycles, bending the slotted plates of the front section of the variable condenser only if absolutely necessary.

# Reviewing the Industry (Continued from page 12)

new speakers, which places them, more or less, in the category of Radio merchandisers. A great number of Radio organizations which handle service, also sell receivers as well as parts for the sets they repair, placing them more over the line into the Radio merchandising field.

These Radio merchandising organizations deal in the sale of new receivers to homes which have not been equipped with Radios, and also in the replacement of old receivers with new ones. Someone has estimated that out of the 20,000,000 Radio receivers in the American homes today, 10,000,000 of them are obsolete and need replacing. That field, in addition to supplying the 40% of the American homes which are not at the present time equipped with Radio receivers, represents the market of the Radio merchandiser.

## *The Wholesaler*

Of course the Radio service organizations and the tens of thousands of Radio dealers are not the only representatives in this Radio servicing and merchandising "set-up." There are the hundreds of wholesalers, who supply receivers to the dealers and who have their own organizations of servicemen, salesmen, etc., and the manufacturer.

## *The Manufacturer*

The Radio manufacturers offer a big market for the services of Radio men of various types. In the factory we find the Radio engineer, the buyer, the serviceman, the draftsman, the tester, the inspector, the assembly man, and many others.

It is not hard to understand the demand for man-power. Manufacturing figures for the year of 1934 have just become available, and we find that they hung up an all-time high record of 4,696,000 Radio receivers made and sold during the year. This represents an increase of 358,000

receivers over the former peak year of 1929, when 4,338,000 sets were sold.

## *Automobile Radio*

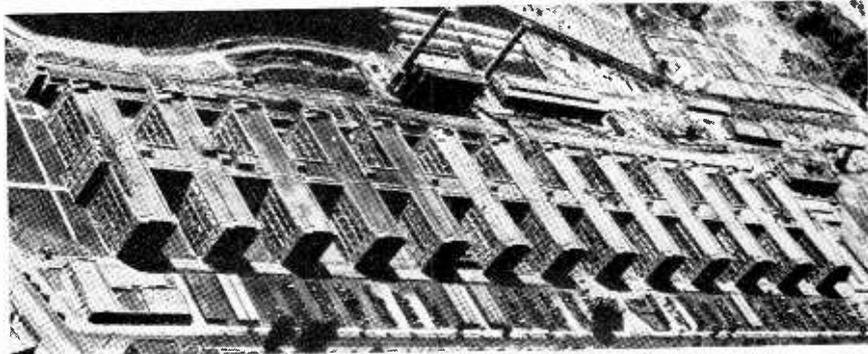
One of the infants of the Radio industry, automobile Radios, offers increased opportunity to the Radio manufacturer, the wholesaler, the retailer, the serviceman, and to Radio men all down the line through the servicing and merchandising branch of the Radio industry. Automobile Radios are only five years old, but let us look at their growth. In 1930, 34,000 of them were sold; in 1931, 108,000; in 1932, automobile owners purchased 143,000 automobile Radios, and then, in 1933, the sales jumped to 724,000, three times as many as had been sold in the previous three years. 1934 upheld the advance in the automobile Radio branch, when 780,000 of these sets were placed in the hands of automobile owners. So, with less than 2,000,000 automobile receivers sold to a motor-car-conscious nation which lists, at the beginning of 1935, 21,505,000 registered passenger cars, to say nothing of busses, trucks, etc., it is not hard to see what a market is still available. And this is a receptive market, when we consider that most of the automobile Radios sold thus far have been sold during depression years, and when we take into consideration the amount of money which is being spent for new cars nowadays. (1935, so far, has been one of the best years that the automobile manufacturers have ever known.)

## *Public Address Systems*

Recently I decided to make a note of everything I saw or heard that had to do with public address systems for a period of two weeks, to give me a better insight as to the opportunities, and the future in that field. During that time, and I made *no special effort* to get this informa-

(Page 24, please)

A typical Radio factory. The General Electric Company at Bridgeport, Conn., as seen from the air.



# A Trip Through a Tube Factory

*This article was written with the cooperation of the Hygrade Sylvania Corp. of Emporium, Pennsylvania.*

THE heart of a Radio receiver is the vacuum tube. It is responsible, to a great degree, for the proper functioning of the receiver. From the same point of reasoning, a poor tube can develop many a headache for the set owner. There is no economy from the listener's point of view, in using a cheap, poorly made tube. From the serviceman's point of view, it may sometimes appear that long profits are possible by the use of cheap tubes. The serviceman will, however, soon find out that it does not pay to use inferior Radio tubes. What original excess profit he may make, will soon be wiped out by "call backs," the loss of customer confidence, etc. Use good tubes, and be safe.



Figure 1

There are a number of manufacturers in the United States *who make good Radio tubes.*

Realizing that many readers of NATIONAL RADIO NEWS have never had the opportunity to visit a tube factory, and realizing further the interest which our readers must have in this subject, NATIONAL RADIO NEWS has selected one of the tube factories to illustrate this article; to take you for a little trip through the plant—to show you what is behind the scenes—what is involved in the manufacture of those little glass bulbs which are so vital to the Radio receiver.

Surrounded by the beautiful Allegheny Mountains, stands the modern day-light Emporium plant of the Hygrade Sylvania Corporation, employing about 1,800 skilled workers, who devote themselves exclusively to the production of

about 60,000 Radio tubes a day. (The Hygrade Sylvania Corporation has another plant at Salem, Massachusetts, with a production capacity of 40,000 tubes per day.)

In one wing of the Emporium plant there are produced more than 25,000,000 Radio tube parts per month, supplying both factories.

Let's go inside the plant now and see what's going on.

In a two-fold effort of making sure that only the finest materials are permitted to enter any manufacturing department of this plant, and the continual search for new and better methods, the chemistry, research, and development laboratories maintain a close coordination. Each of these departments is manned by a staff of highly trained engineers. Thousands of dollars worth of equipment is at the disposal of these departments in their never-ending vigil to make sure of the *best*.

In their fully shielded laboratories, filled with up-to-date testing equipment, receiver circuits are duplicated, enabling these engineers to analyze thoroughly the operation of all types of tubes. Careful measurements under these ideal conditions assist in solving vital problems and insure a high grade of efficiency for the tubes.

Figure No. 2 gives a partial view of one of the laboratories. As we walk through this interesting array of apparatus, we learn that

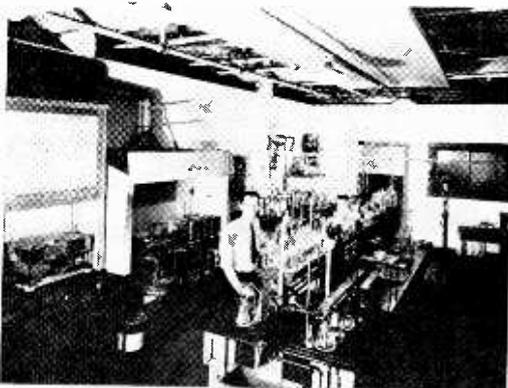


Figure 2

while it is complete, so far as such equipment is commercially available, the engineers frequently find it necessary to build especially sensitive and delicate testing apparatus for some particular experiment they have in mind. For

this reason, a machine shop has been set up in the laboratory, enabling the engineers to create special testing equipment to conform exactly with their own needs. In this machine shop we see several engineers at work, building queer looking mechanical and electrical devices, and combinations of both. We learn that they are doing this because they need some tube and circuit testing equipment which must have a flexibility and accuracy greater than that encountered in the ordinary instrument which the market has to offer.

As we progress on our trip through the plant, we come to the material control division. Here we come upon an engineer, his eye glued to a microscope, intently gazing at a small piece of material. We are surprised to learn the care with which all parts, wire, and other critical elements used in tubes, are measured and examined for structural fitness before they are accepted from the sources of supply.

Next we come upon a battery of strange looking contraptions that might well be some sort of pre-historic monsters. We are informed, however, that they are hydrogen furnaces in which materials used in vacuum tubes must be heated to extremely high temperatures—purged of oil, dust, and other contaminating substances. Heating is done in an atmosphere of hydrogen to prevent oxidation of parts.

We now enter the wing of the factory housing the Parts Manufacturing Department. Here we see skilled operators turning out some of the 25,000,000 Radio tube parts which are an average month's production. All of these parts are used in Sylvania tubes.

Accuracy, we are told, must be the keynote in the manufacture of parts which go into good vacuum tubes. Here we see a battery of machines with which very intricate operations are performed. It is on such machines as these, that

(Page 18, please)

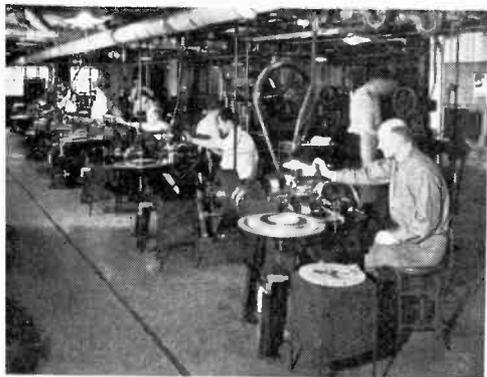


Figure 3

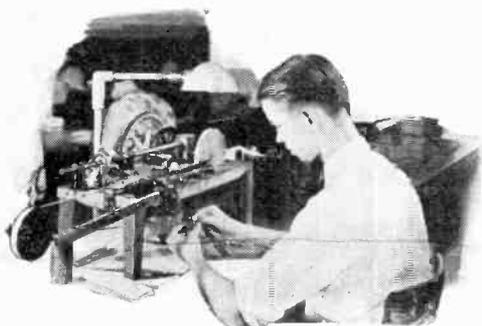


Fig. 4

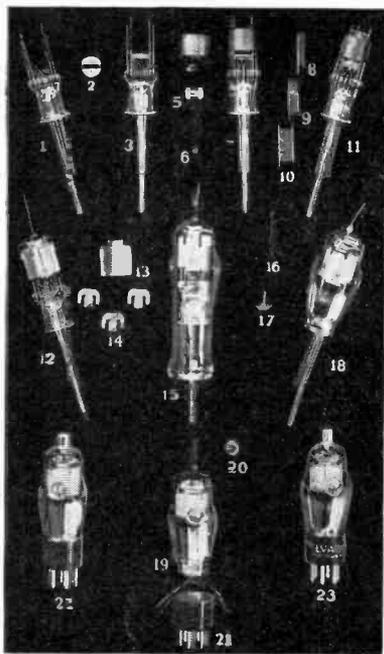
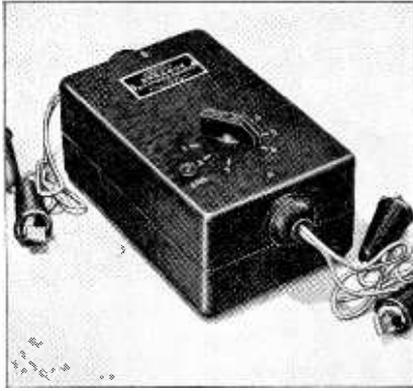


Fig. 5

Below  
Fig. 6

## Interference Analyzer

The Sprague Interference Analyzer has just been introduced by the Sprague Products Company of North Adams, Mass. It is designed to be of great assistance to Radio servicemen, electricians and laboratory experimenters. Not only does it make possible the prompt location and elimination of all types of Radio interference, but it affords an easy and inexpensive means of demonstrating to Radio set owners just where and how annoying interference originates.



The Sprague Products Company of North Adams, Mass., will be glad to send a descriptive circular to anyone who writes to them direct for this information.

— n r i —

## "Flying Radio Station" Aids Flood Region

When swirling flood-waters engulfed portions of Nebraska and isolated towns in the stricken area, the only communication with the outside was provided by the two-way voice Radio apparatus of the United Air Lines plane especially flown to the scene of the disaster by Pilot William Groen at the request of relief administrators.

Landing at McCook, Nebraska, Groen found that all routine forms of communication had been interrupted by the flood. He promptly put his plane's Radio equipment into emergency service and requested specific relief where needed, reported extent of the damage and progress of the flood.

## Tube Factory

Continued from preceding page)

plates, cages, screens, and other vacuum tube parts are made. See Figure No. 3.

Next we see the very interesting operation of grid-winding. Grid-winding for vacuum tubes was formerly done by hand, but in this plant it is done by automatic machinery. The turns of the grid are crimped in the support wires automatically. After the grid assembly is removed from the machine, it is cut into proper lengths by special apparatus. The battery of automatic grid-winding machines in the Sylvania plant can turn out 10,000 pieces per hour.

We next see filament wire passing from spools through alternate coating cups and baking ovens. Layer after layer is applied and baked, until the proper amount of coating, determined by weight, is secured. The coated wire is then wound on another spool, automatically. Here we see a little automatic machine which cuts the coated filament wire to the length required, and even scrapes the coating from each end prior to welding. See Figure No. 4.

We now pass through the department where cathodes are sprayed with coating material, weighed before and after the coating operation, to insure accuracy, then through the base filling department, where the bases are "loaded" with Bakelite cement; we see glass tubing hot cut, and formed automatically into flares; which are passed on to the interesting operations of stem manufacture, and then come to a battery of machines used for stem cutting and shaping. Here we see the trimming of nickel support leads to proper lengths, followed by forming operations, in which they are bent into the position required to support the tube elements.

Here we are in the mount assembly department, in the main factory where we see hundreds of employees whose deft and intelligent hands are performing astonishing feats of delicate precision as they lift the various parts and spotweld them into correctly spaced relationship.

Passing on, we watch the various operations of sealing, exhausting, basing, soldering and capping, in which human hands and almost humanly intelligent machines work together in perfect unison.

We have followed the tube from the selection of the raw material, to what appears to be the finished product, and here is a group photograph which shows the various operations performed, numbered in order. (Figure No. 5.)

But while the tube appears to be complete, it is not. It must pass a number of tests, for characteristics, for noise, and for length of life. There are more than 80 of these tests.

# RADIO-TRICIAN SERVICE SHEET

COMPILED SOLELY FOR STUDENTS & GRADUATES

## SOCKET VOLTAGE READINGS

TUBE	POSITION	E <sub>f</sub>	E <sub>k</sub>	E <sub>g1</sub>	E <sub>g2</sub>	E <sub>g3</sub>	E <sub>p</sub>
6D6	R.F.	5.8	3		98	3	98
	1st Det.				60	-	98
6A7	Osc.	5.8	2.5	-1	-	-	90
	I.F.	5.8	3		98	3	98
75	2nd Det.				-	-	30
	A.V.C	5.8	.5				
43	1st Aud.						
	PWR.	26	13.5	0	98	-	90
25Z5	Rect.	26	-30	-	-	-	-
			-28	-	-	-	-

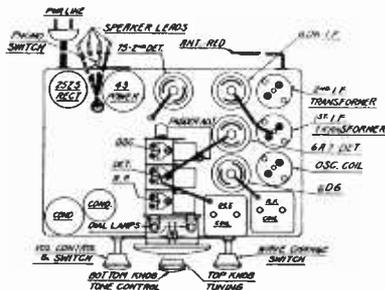
Line Voltage 112

Antenna and Ground Disconnected

F - Filament; K - Cathode; g1 - Control Grid; g2 - Screen Grid; g3 - Suppressor Grid; p - Plate

### Alignment

1. Balance intermediate transformers at 252.5 K.C. with service oscillator connected to grid of 6A7 and chassis ground.
2. Adjust wave trap padder (located underneath chassis at rear right side) for weakest signal with 252.5 K.C. service oscillator connected to antenna and ground.
3. Turn wave-band switch clockwise to the highest frequency band. Set service oscillator at 15 M.C. - still connected to serial and ground. Balance oscillator trimmer on gang condenser for correct dial reading at this frequency.
4. Turn wave-band switch counter clockwise to standard broadcast position. Adjust broadcast oscillator trimmer (located underneath chassis at right - center) for correct dial reading at 1400 K.C. and adjust R.F. and first detector trimmers on gang condenser for loudest signal.
5. Set service oscillator at 600 K.C. Adjust oscillator broadcast padder through hole in top of chassis. simultaneously rocking the dial back and forth for loudest signal.



Tube Position

Zenith Models 811-862-865-866-1162

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

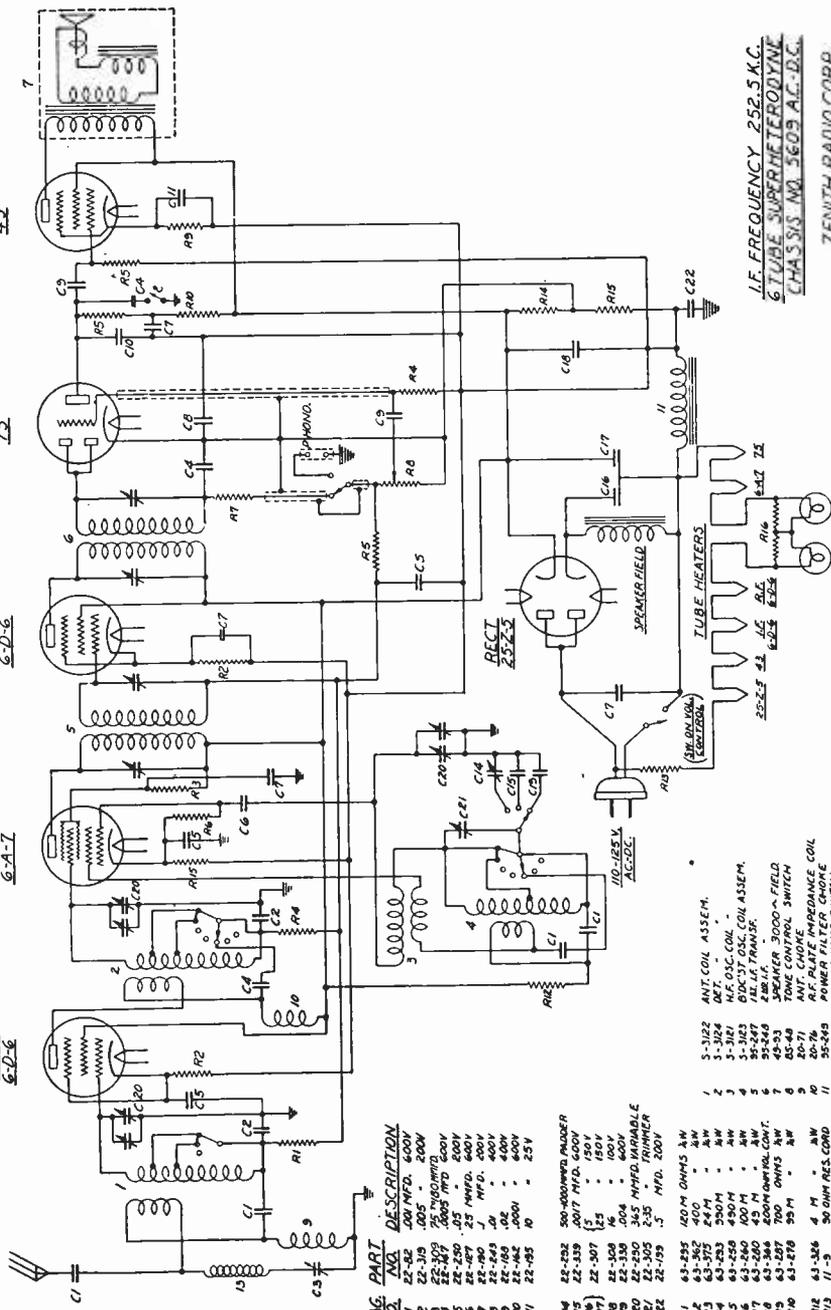
2ND DET.  
A.V.C.  
I.V.A.F.  
7.5

POWER  
4.3

I.F.  
6-D-6

1ST DET.  
OSC.  
6-A-7

R.F.  
6-D-6



I.F. FREQUENCY 252.5 K.C.  
6TUBE SUPERHETERODYNE  
CHASSIS NO. 3609 AC-DC.  
ZENITH RADIO CORP.  
CHICAGO, ILL.

MODELS 811-862-865-866-1162

DWG. NO.	PART NO.	DESCRIPTION
C1	22-232	500-4000MFD. PAPER
C2	22-339	100T MFD. 600V
C3	22-319	.005" . 200V
C4	22-309	250/100MFD. 200V
C5	22-250	100 MFD. 200V
C6	22-287	.25 MFD. 600V
C7	22-280	.1 MFD. 600V
C8	22-163	.1 MFD. 600V
C9	22-162	.02" . 400V
C10	22-162	.0001" . 600V
C11	22-185	.10" . 25V
C12	22-232	500-4000MFD. PAPER
C13	22-339	100T MFD. 600V
C14	22-319	.005" . 200V
C15	22-309	250/100MFD. 200V
C16	22-250	100 MFD. 200V
C17	22-287	.25 MFD. 600V
C18	22-280	.1 MFD. 600V
C19	22-163	.1 MFD. 600V
C20	22-162	.02" . 400V
C21	22-162	.0001" . 600V
C22	22-185	.10" . 25V
R1	63-285	100 M OHMS .5 W
R2	63-362	400" . .5 W
R3	63-375	2.4 M . .5 W
R4	63-283	500 M . .5 W
R5	63-283	500 M . .5 W
R6	63-280	100 M . .5 W
R7	63-280	45 M . .5 W
R8	63-366	500M OHMS .5 W
R9	63-276	50 M . .5 W
R10	63-366	4 M . .5 W
R11	63-372	50 M OHMS .5 W
R12	63-372	50 M OHMS .5 W
R13	63-364	500 M . .5 W
R14	63-374	. . . 2 W
R15	63-374	. . . 2 W
R16	63-374	. . . 2 W

- 1 3-3122
- 2 3-3124
- 3 3-3124
- 4 3-1023
- 5 35-2479
- 6 35-2513
- 7 85-44
- 8 80-71
- 9 80-74
- 10 80-74
- 11 85-377
- 12 85-377
- 13 20-75

- ANT. COIL ASSEM.
- I.F. OSC. COIL
- 60D37 OSC. COIL ASSEM.
- ILL. I.F. TRANS.
- SPEAKER 3000 OHM FIELD
- TONE CONTROL SWITCH
- ANT. CHOKE (PERFORMANCE COIL)
- POWER FILTER CHOKE
- BAND-CHANGE SWITCH
- WAVE TRAPP

## All-Wave Converters

(Continued from page 10)

helpful, especially to beginners interested in short-wave reception:

There are four major short-wave broadcast bands. Each band has its own characteristics. For instance, the 19 meter band is best adapted for reception during daylight hours and will be rarely useful after nightfall. Signals of distances over 1,500 miles are best heard on this frequency.

The 25 meter band furnishes good signals during both day and night, however, only at very distant points, those located over 2,000 miles away can be heard after darkness. During the day, only signals of approximately 1,000 miles or more will be heard best. Then near the 25 meter band will be found the 31 meter broadcast band. This band has the general characteristics of the 25 meter band, however, very good reception of distant stations is possible during both day and night.

Probably one of the best and most used of all short-wave bands, by short-wave broadcast listeners, is the good, old, reliable band of 49 meters. Very good daylight reception is obtained when the transmitter and receiver are but 300 miles apart, although very good distant reception is obtained when a large portion of the path taken by the signal lies in complete darkness.

A word or two regarding conditions affecting reception may also be helpful. Radio signals transmitted into the ether and on any wavelength are known to divide into two sections. They are known as the "ground" and the "sky" waves. The former remains close to the earth's surface, thus providing very reliable signals for short distances near the transmitter. The other wave, called the "sky" wave travels at higher levels and is reflected back to earth at greater distances from the transmitter. It is interesting to know that there is usually some difference between the two points where the waves cause cancellation making the signal fade out and fade in again, as you move away from the station. This is known as a dead spot region within which reception is extremely unsatisfactory. The area or length of the dead spot region is commonly termed "skip distance" which varies with seasonal changes and with weather conditions. The skip distance changes as the Heaviside layer, changes its height. These changes are also noticed between day and night.

Therefore, the general characteristics of any one of the waves received on the short-wave bands mentioned above must be considered in connection with the frequency band upon which reception is desired. Furthermore, a careful study of your time standards at various points must be included. For instance, 6 P.M. in the central states of the U.S.A. is usually midnight

## Non-Directional Dynamic Microphone

Here's a new kind of microphone, a development of the Bell Telephone Laboratories, the research laboratories of the American Telephone and Telegraph Company, and the Western Electric Company.

This new microphone has a frequency response independent of the angle of sound incidence and uniform over an extended frequency range. High grade pick-up throughout the range of from 40 to more than 10,000 cycles, without regard to the direction of sound approach, is entirely practicable with this new instrument.

Basically, the microphone is of the well-known dynamic or moving coil type. Among the many features that have made dynamic microphones so popular to users of high quality apparatus, and that are to be found to an even greater degree in the new instrument, are freedom from electrical interference and high signal to noise ratio, permitting its use far from the sound source.

Another dynamic microphone characteristic is the low electrical impedance which allows its use several hundred feet from amplifying equipment.



— n r i —

## Wins Trip to Jamaica

As one of the state of Iowa winners in the recent Philco Radio sales contest, N.R.I. Graduate Jack Kirk received a fine ten-day trip to Jamaica.

Eight hundred Philco dealers, distributors, and company officials were aboard the ship, "The Monarch of Bermuda" and a Philco convention was held during the journey.

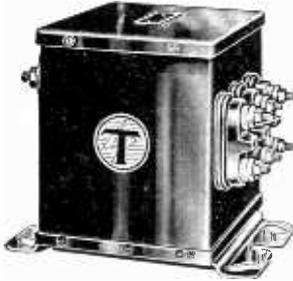
The ship "Monarch of Bermuda" will be remembered as very prominent during the "Morro Castle" disaster sometime ago.

---

in Europe. Therefore, the hours during which you can expect to receive foreign European stations will be in early afternoon or between 3 and 6 P.M. Australian and New Zealand stations will, however, come in best during the early morning hours between 4:30 and 8 A.M.

## Variable Impedance Modulation Transformer

The Thordarson Electric Manufacturing Company of 500 West Huron Street, Chicago, announces a new transformer for use in Radio transmitters which permits coupling the 500 ohm output of any audio amplifier to any R.F. plate circuit carrying not over 215 ma. of d.c. where 80 watts of A.F. power is required.



The primary is wound for a 500 ohm line. The secondary winding is tapped to match a 5, 6, 7, 8, 9 or 10 thousand ohm plate circuit. The transformer is known as T-7532, and is but  $6\frac{1}{2} \times 5\frac{3}{4} \times 8$ ", weighing  $16\frac{1}{2}$  lbs. Its A.F. characteristic is essentially flat up to 7000 cycles.

— n r i —

## Tube Factory

(Continued from page 18)

Tubes are even subjected, in a set testing laboratory, to tests in the very latest models of standard receivers.

Finally, the tubes go through the successive steps of base branding, code etching, and last, a check for plate current and mutual conductance efficiency. They are tested and packed on the same day they are shipped. Everything possible is done to make them perfect tubes.

As we are leaving the plant, we turn for a last glimpse of the imposing array of equipment used in the manufacture of Radio tubes. (See Figure No. 6.)

We hope you enjoyed your trip.

— n r i —

Does the world owe you a living?

It most certainly does and it's quite willing to pay—but you've got to go out and collect. No one can do that for you.

## You Told Us What You Want

In the last issue of NATIONAL RADIO NEWS, under the heading, "What Do You Like?" we supplied our readers with a questionnaire, giving them an opportunity to ballot on a number of questions concerning the content of NATIONAL RADIO NEWS.

The result of this ballot gave us a wealth of information as to the desires of our readers, which will act as the basis of our editorial policy in future issues.

The popularity of NATIONAL RADIO NEWS, as a whole, was evidenced by the enormous number of these questionnaires which were returned to us. This indicates the number of N.R.I. students and graduates who *really read NATIONAL RADIO NEWS from cover to cover*. It was also quite flattering to our editorial vanity to receive several hundred unsolicited communications, along with these questionnaires, praising NATIONAL RADIO NEWS as, "just the magazine that students and graduates of the National Radio Institute need."

Tabulation of the returns indicate that the "Service Forum," as conducted by Mr. J. B. Straughn, leads in popularity as one of the standard departments of NATIONAL RADIO NEWS. It is closely followed by the "Service Data Sheets," which are prepared by Mr. Don B. Looney, and the "Easy Measurement Charts," supplied by Chief Instructor J. A. Dowie.

The Editorials by Mr. J. E. Smith and Mr. E. R. Haas received a tremendous vote, but we learned a lesson here—that our readers think there is too much of this editorial content in each issue of "The News." Therefore, following our policy of *giving our readers what they want*, NATIONAL RADIO NEWS will, in the future, unless there is particular reason for changing our "set-up" in an individual issue, carry only one editorial page per issue by Mr. Smith and Mr. Haas, and their pages will be alternated. For instance, in this issue, we will carry an editorial page by President Smith, and in the next issue an editorial page by Vice-President Haas.

It was also very interesting to note the desire of our readers to be told more about "New Inventions," and the manufacturers' handling them, and we plan to bring you more of this information, whenever it is available.

While the majority of readers of NATIONAL RADIO NEWS are primarily interested in material which has to do with the "Servicing and Merchandising" branch of the Radio industry, the operating fraternity was not to be denied, and we consequently had a heavy vote in favor of continuing articles on such subjects as "Broadcasting Stations," "Police Radio," "Marine Radio," and other forms of Radio operating. Even our "Serviceman" readers are interested in these subjects, as well they should be.

(Next column, please)

## Police Radio News

Lynchburg, Virginia, and Augusta, Georgia, are two of the latest cities to join the fight on crime with police Radio equipment.

Because Mayor Lewis E. Lichford, of Lynchburg thinks, "An ounce of prevention is worth a pound of cure," that city has inaugurated a one-way, medium high frequency police Radio system, which also will be utilized by the State police, to assist in the apprehension of law breakers, both within and without the corporate limits. The Radio apparatus at Lynchburg consists of a 250 watt transmitter, a receiver at police headquarters, and Radio receivers in seven of the city's police patrol cars.

City fire alarms will be broadcast over the police Radio system, thus enabling patrol cars in the vicinity of the fire to hasten to the scene with fire extinguishers, which will form part of the emergency equipment to be carried in each police automobile. Each patrol car will be manned by two policemen, trained in first aid work.

At the time this article was written, it was expected that the Augusta, Georgia, Radio system would be in operating condition early in September. It will provide police Radio service to Richmond County, both city and county police dispatches to be broadcast from Augusta.

Ten of the city's patrol cars will be equipped with receivers. At headquarters, a 270 watt transmitter and a receiver will be installed. A 120 foot Radio antenna will be erected on a steel structure rising through and above the roof of the barracks garage. It will be possible for Augusta to have two-way police communication later on, if it is desired, by installing ultra-high frequency transmitters in the patrol cars, and an ultra-high frequency receiver at police headquarters.

— n r i —

## What You Want

(Continued from page 22)

The "Mail Bag," one of the oldest departments in NATIONAL RADIO NEWS, and one which has been the subject of heated controversy during the past years, still remains a great favorite. Due to the fact that our readers have been given numerous opportunities in the past to continue or discontinue this department, and since those advocating its retention have come off victorious in each case, no mention was made on our formal ballot form. Even so, any number of readers made notes on the questionnaires and even wrote letters to accompany them, stating that they wanted the Mail Bag continued.

(Next page, please)

## Conversion Resistor Plugs

Continental Carbon, Inc., of 13900 Lorain Ave., Cleveland, Ohio, announces seven special resistor plugs which may be substituted for ballast tubes in battery receivers which are converted from dry cell operation to air cell operation. The conversion resistor plugs fit the standard four-prong socket intended for the ballast tube and serve to reduce the 2.53 volt potential of the air cell to the correct operating



voltage of the tubes. Conversion resistors 1, 2, and 3 are for use with certain types of Sears' battery sets having two filament circuits. The remaining resistors may be used in any circuit of the designated current drain.

Plug Nos. 1, 620 M.A.; 2, 300 M.A.; 3, 500 M.A.; 4, 540 M.A.; 5, 520 M.A.; 6, 620 M.A.; 7, 720 M.A. Note: No. 7 is for use only with Air Cell SA600.

— n r i —

## Invents Automatic Train Control

Graduate Max Theo. Wintsch, of Lancaster, Pa., has recently invented an automatic train control which shows promise of sounding a new note of safety in railroading.

Graduate Wintsch, with the cooperation of the officials of the Philadelphia and Western Railway Company, has installed the device on trains of that company and tests have been up to their highest expectations.

Since powerful audio amplifiers may well be considered the brain of this automatic system, graduate Wintsch gives his N.R.I. Training much credit for the success of this invention.

— n r i —

Speaking of quantity production, man has, down through the years, made 32,647,389 laws, but up to the present time he has not succeeded in improving upon the Ten Commandments.

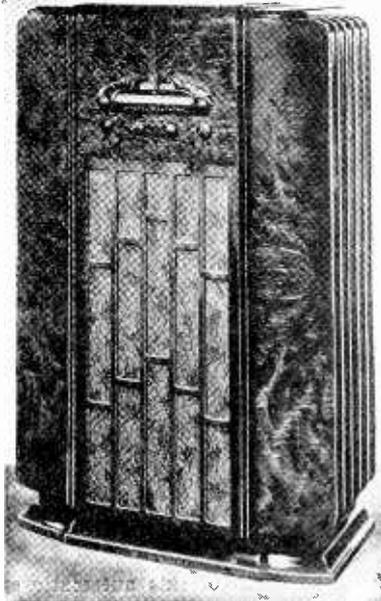
## Reviewing the Industry

(Continued from page 15)

tion—just taking it as it came to me. I heard of two churches whose boards of directors have recommended the installation of loudspeaker systems; I saw five carnivals using public address systems mounted on trucks; talked with one serviceman who operates such a truck, and found that he had rented it twice in the previous week; and saw one installation at a race track. I am convinced that loudspeaker systems are becoming increasingly popular, and that their installation and service at amusement parks, auditoriums, athletic fields, beaches, conventions, factories and fairs, will offer wide opportunity for Radio men, everywhere.

### Aviation Radio

The United States is among the first countries, if not THE FIRST COUNTRY, in commercial aviation. Radio is the eyes and ears of the aviation industry—it is the guiding hand



The type receiver the Serviceman is called upon to service today. Illustration shows a new General Electric Model. (Uses all metal tubes.)

and the safety valve of planes in the air. Aviation is growing, and as it grows, aviation-Radio will continue to grow, creating more jobs for

trained Radio men both in the air and at the numerous ground stations along the various airways.

### Miscellaneous

In addition to all of the Radio opportunities discussed previously in this article, we must take into consideration that there are additional opportunities in government Radio. The United States Government itself has done much to develop the Radio industry to its present high state. The use of Radio started years ago in the United States Army, Navy, Coast Guard, Department of Commerce, and other United States departments and agencies. And then we have police Radio, which creates additional jobs and opportunities for men in the manufacture, sale, installation, and service of police transmitters and receiving equipment.

### Television

By now, many of my readers will be wondering what I am going to say about Television. There have been so many predictions and so many contradictions that I will merely say that when power operated Radio receivers made their appearance, the Radio public soon got away from their battery operated receivers. I have every reason to believe that as soon as good Television reception is possible, and available, that there will be a similar change from the conventional Radio receiver of today to the Television receiver.

When will this take place? I can only quote from a recent interview with Mr. Philo Farnsworth, outstanding Television expert, who said: "I do not think that 1935 will see any commercial Television receivers on the market in this country, but—1936, well—quite possible."

In summing up my review of the Radio industry, I made a list, for my own information, and found that there are 103 different types of Radio jobs in the twelve main branches of Radio.

— n r i —

## What You Want

(Continued from page 23)

Stories about "What N.R.I. Graduates Are Doing," the "N.R.I. Alumni Association," "Automobile Radio," "Public Address Systems," etc., came in for their share of votes.

Such articles as "The Repair of Auto Radio Vibrators," "All-Wave Antenna Systems," and "The Cathode Ray Oscillograph," were particularly popular and will be continued.

We want to make NATIONAL RADIO NEWS just as interesting and as beneficial to you as possible, and your Editor desires to take this opportunity to thank you for the helpful suggestions made in the questionnaires you have sent in.

# Makes Gasoline Pumps Talk

**D**OWN in Nashville, Tennessee, there is an N.R.I. graduate who gets ideas for increasing his business, and then uses these ideas for the same purpose.

This graduate is E. H. Leftwich who operates a wholesale and retail Radio service business under the title of the E. H. Leftwich Company.

This young man takes a keen interest in public address systems and as a result, early last spring, one of the gasoline stations in Nashville installed a "talking gasoline pump," designed and built by Mr. Leftwich.

This is a standard Wayne Computing pump, and in addition to figuring the exact amount of money due for any amount of gas purchased, the pump actually "talks to the customer," passes the time of day, tells him about the gas it sells, entertains him with a harmonica solo, and then, as the customer is leaving, invites him to "hurry back."

The outfit consists of a three stage, high quality transformer coupled amplifier, a good double-button microphone, and an 8½ inch dynamic speaker installed inside the pump.

The wiring is all underground and in conduit. The operator is concealed from the customer and located 150 feet away from the pump.

So much interest has been created by the "talking pump" that Mr. Leftwich has already built twenty of these jobs for the local Wayne Pump distributor, who is now shipping them all over the State of Tennessee.

Working out an idea like this often represents the difference between "a big business," and "just a business."

In a letter, recently received at the National Radio Institute from Graduate Leftwich, he had the following to say:

"The N.R.I. Course is thorough and practical. With intelligent application the student gains a solid foundation of Radio principles that remains long after the Course is completed."

It is earnestly hoped that this little article will start a lot of NATIONAL RADIO NEWS readers to thinking about "IDEAS." We don't mean wild-cat schemes—plans for making a million dollars overnight or anything of that sort.

Just ideas about little things—something novel, something new, something that will gain the attention and the interest of the public. Such ideas pay dividends if they are properly thought out and then, properly put into use. What can you work out in the way of a new idea that will be useful?



E. H. Leftwich, who makes gasoline pumps talk.

— n r i —

## Insulated Metallized Resistors

IRC Type "B" Metallized Resistors have recently been announced by the International Resistance Company. These new units have complete high voltage insulation protection and are constructed without metal ends. They can con-



tact other parts without danger of shorting. They have an extremely low noise level.

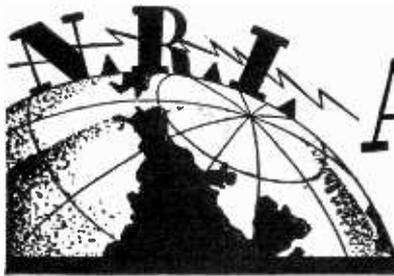
A new catalog containing full details will be sent on direct request to International Resistance Co., 2100 Arch St., Philadelphia, Pa.

## New Philco Manual

The Philco Radio and Television Corporation, of Philadelphia, Pennsylvania, through the Radio Manufacturers' Service, sponsored by that Company, are offering two new books which should be of value to Radio servicemen.

They are the Philco R.M.S. Wiring Diagram Manual containing complete service data including wiring diagrams, parts, layouts, and parts lists of all Philco models from the very first up to and including the latest 1936 receiver, and the transitone wiring diagram book which gives similar information on all of their transitone models.

The R.M.S. Manual sells for \$1 and the Transitone Wiring Diagram Book for 25c. They can be obtained from any Philco distributor.



# N. R. I. ALUMNI *News*

## Nominations for 1936

In a few short months the new officers of the Alumni Association will take office. There are seven offices of the Alumni Association to be filled—President, four Vice-Presidents, Secretary, and Executive Secretary.

On page 30 of this issue of NATIONAL RADIO NEWS, a NOMINATION BALLOT FORM HAS BEEN PROVIDED. It is arranged so you can remove it without injuring the magazine. Just tear it carefully on the dotted line.

The officers who served during the year 1935 are as follows:

President, P. J. Dunn, Baltimore, Md.

Vice-President, L. J. Vanek, Cincinnati, Ohio.

Vice-President, F. A. Nichols, Denver, Colo.

Vice-President, F. A. Parkins, Atlanta, Ga.

Vice-President, Earl Bennett, Chicago, Ill.

Secretary, E. A. Merryman, Wash., D. C.

\*Executive Secretary, P. J. Murray, Wash., D. C.

Asst. Executive Secretary, R. B. Murray, Wash., D. C.

You may nominate men who served as officers last year, or you can select others—just as long as they are Alumni Association members in good standing. You may nominate yourself if you desire.

When you have filled out and signed the blank it should be returned promptly to National Headquarters. The two men who have the highest number of votes for each of the offices will be selected as candidates, and in the next issue of the NEWS you will be given the opportunity of making a final selection of the officers who are going to serve during the coming year.

It is suggested that you return this form promptly as there is considerable work to counting the ballots. Send your selections just as soon as possible.

\*P. J. Murray has announced that he is not a candidate for re-election.

## Chapter Libraries

Alumni members living in cities which maintain Chapters of the Alumni Association are urged to make use of the Chapter library facilities.

Ever since the Local Chapter program was inaugurated, National Headquarters has advocated Local Chapter libraries and today every Chapter has a library. Recently, the Baltimore Chapter bought a special bookcase to house the books furnished by National Headquarters and the many publications secured locally.

Merely to have libraries is not enough. Alumni members should use them. Get the library habit.

National Headquarters will be glad to assist any Local Chapter in arranging a library system for members.

— n r i —

## Improvements

National Headquarters feels certain that any number of Alumni Association members have good ideas which, if secured and put into effect, would be advantageous to the Association.

We are, therefore, calling on all Alumni Association members to give us the benefit of any ideas and suggestions they may have for the conduct of the organization.

For example, here are a few of the problems which have come up recently:

1. Do members want more technical Radio material sent them through special mailings from National Headquarters?

2. A number of outside Radio men have written National Headquarters expressing their desire to become a part of this organization, although they are not graduates of N. R. I. Do members want to keep the Alumni Association a closed group and allow no outside Radio men to engage in its activities?

(Next column, please)

## Philadelphia-Camden Chapter

During the summer months we are having but one meeting per month, on the third Tuesday. A lot of the fellows feel they are entitled to a little vacation after arduous work during the fall and winter months.

There have been several discussions at our previous meetings regarding a plan we would like to put into operation. We believe it will be of direct benefit to all members of the Chapter. Details will be disclosed as soon as its effects are noted.

Mr. Raymond C. Seib was elected to the newly created office of Assistant Secretary. New members recently admitted are: N. Nicholson, 1225 S. Fourth St.; Carroll Temple, 1806 W. Albanus St.; William Trimble, 3034 N. Darren St.; William Meisener, 1825 E. Clementine St., all of Philadelphia. Let's all give these boys a big hand.

Starting in September meetings will be scheduled twice a month on the first Thursday and third Tuesday. Graduates or students desiring more information should write to Secretary Clarence Stokes, 2947 Rutledge St., or phone Chairman Charles Fehn at Nebraska 3557.

— n r i —

## Year Book

Suggestions have been received from various quarters that we issue a 1935 Year Book of the Alumni Association.

This book would review the activities of the year 1935, telling what has been accomplished by National Headquarters, the various Local Chapters, and the members at large.

We have not definitely decided upon the Year Book yet, but we are giving it some very careful study and definite action will be taken shortly. You'll hear more about this later.

— n r i —

## Improvements

(Continued from page 26)

3. Should the Association create a special membership for outside men giving the Alumni Association the opportunity to become a more powerful National organization?

4. Life membership has been considered—would members be interested?

Write up your answers to these problems. Give us suggestions, ideas. Tell us some of the things you would do if you suddenly found you had been elected president of this Association. Send your ideas to R. B. Murray, Assistant Executive Secretary, N. R. I. Alumni Association, 16th and U Sts., N. W., Washington, D. C.

## Chicago Chapter



Business is picking up—and so is our membership. Since starting our series of lectures by Mr. Kidd, our membership has grown by leaps and bounds. All you fellows in the Chicago Area who have not attended recent meetings are certainly missing something.

Mr. Kidd is an old-timer in the Radio profession (he was an instructor for a number of years) and certainly knows his business. What he is doing to fellows who attend these lectures is equivalent to what the doctor does with monkey glands. He is putting new life in this group, and that is something which is always welcome to keep the "boys" interested. His lectures are not too technical for the newer student, yet are practical enough for the most advanced and experienced serviceman. It is like going to school again. We are anticipating many more fine lectures from our friend Mr. Kidd. He is the kind of fellow you like to know.

This Chapter recently decided to have a genuine old-fashioned picnic. And was it a wow! Only one thing wrong—nothing was said about when the next one would come along. Anyway, the memory of this one will last for quite some time.

Preparations are under way for the next issue of our bulletin "Chicago Chapter's Chatter." All Chicago members are urgently requested to send personal items to the chairman so we can get them in the next issue.

We learn that National Headquarters is trying out new ideas to help our members. I suggest that you Chicago men cooperate and respond to the invitation National Headquarters has made on page 26 of this issue. They want suggestions on how to improve the Association for the benefit of you individually and the membership at large. This movement deserves your earnest support.

If any of you fellows know of any graduates in the Chicago Area who are not already members of the Association or acquainted with our activities here in Chicago get them lined up. You're always meeting fellows of the Radio Servicing Profession and you will find a number of them N. R. I. graduates. So keep this thought in mind when you come in contact with other Radio men.

## You Need the Alumni Association

By Wilmer Giese,  
Editor, Baltimore Chapter Bulletin

The N.R.I. Alumni Association has always impressed me as being similar in many respects to a college fraternity.

A fraternity may be represented as the association of many separate and distinct personages with many different ideas, joined together to advance the aims of the group, and ultimately to achieve the personal ambitions of the individuals.

Our Alumni Association members have joined together because they agree with the special aims of the group, and because they feel that they, individually, can profit to the extent of their personal ambitions through contact with the other members. Personal ambition always has, and I think, always will be the deciding factor in encouraging a man to become a member of the Alumni Association.

When National Headquarters announced the organization of a Local Chapter in the City of Baltimore, I decided at once to avail myself of the splendid opportunity I believed this Chapter could offer me. While I had no definite idea as to what the result of my association with this organization would be, my present Radio job was secured indirectly, through my association with the Baltimore Chapter. Is there any wonder that I feel indebted to the Association for what it has done for me? Is there any reason why I should not be enthusiastic about the Association when I see equally interesting results it has obtained for other members?

The N.R.I. Alumni Association gives a member a much better chance to go forward to his goal, success in Radio. It teaches him to associate with people, to get along with people, and what is more important than these things in any man's career?

The newcomer in the N.R.I. Alumni Association will soon find that he is fitting in with the ideals of this fine organization, and working individually, as well as a part of a group, toward a certain goal—along lines which produce leaders in the Radio profession. The unselfish spirit of the majority of men in the Association can only mean that it is going to continue to grow, continue to develop leaders, and continue to be a leader of thought and action in the Radio profession.

I have always been in hearty accord with the statement made by President J. E. Smith of the National Radio Institute, who said, while addressing a meeting of the Baltimore Chapter, "The power of the group is always stronger than the power of the individual."

## Directory of Officers

(To serve until January 1, 1936)

### *President*

P. J. DUNN,  
Baltimore, Md.

### *Vice-Presidents*

FRED A. NICHOLS,  
Evergreen, Colorado  
F. A. PARKINS,  
Atlanta, Ga.

LAWRENCE J. VANEK,  
Cincinnati, Ohio

EARL BENNETT,  
Evanston, Ill.

### *Secretary*

EARL MERRYMAN,  
Washington, D. C.

### *Executive Secretary*

P. J. MURRAY,  
National Headquarters,  
Washington, D. C.

### *Asst. Executive Secretary*

R. B. MURRAY,  
Washington, D. C.

— n r i —

## Directory of Chapters

Any students or Alumni members desiring further information regarding Local Chapter activities may obtain it by writing to the Chapters direct, addressing their letters according to the following list:

Baltimore—George Ruehl, Secretary, Charles-ton and Second Avenues, Lansdowne, Md.

Philadelphia — Clarence Stokes, Secretary, 2947 Rutledge St., Philadelphia, Pa.

New York—Allen Arndt, Membership Secretary, 68 Suffolk, New York City.

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

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

Cleveland — Charles Jesse, Chairman, 3369 West 129th St., Cleveland, Ohio.

Chicago — Samuel Juricek, Secretary, 4223 North Oakley Ave., Chicago, Ill.

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

Detroit—William R. Sewell, Secretary, 16039 Curwood St., Detroit, Mich.



We recently had the pleasure of reading the club magazines put out by the Philadelphia and Baltimore N. R. I. A. A. Chapters, and we extend our hearty congratulations to both cities on their work. We understand that soon every Chapter of the N. R. I. A. A. will have its own magazine, which, we think, is as it should be.

Many thanks to Mr. Dowie on Headquarters Staff for several interesting technical articles which we will pass on to our readers in future issues of the *Canadian Radio-Trician*.

Congratulations to our Chairman, Bill Forward. His wife presented him with a baby daughter three weeks ago. A few weeks previous he was appointed to the position of Senior Engineer with the Marvin Electric Co. This is what we call getting the "breaks."

Great plans are being made by our city members for the time when we move into our permanent meeting quarters. For one thing, a large cabinet will be available to keep our technical Radio material in, and then we won't be kept waiting for Ed Solman to arrive with the library under his arm. Who is going to keep the key to the cabinet?

Our Vice-Chairman, Bert Stollard, is building himself a two-story brick house and doing all the work from soup to nuts himself. To get it finished before winter he is even turning down service calls. Imagine that!

Radio manufacturers are cooperating with us in a big way with regard to supplying us with their circuit diagrams free. We have not been turned down yet and have gathered quite a collection. Incidentally, the Radio repair business is picking up in Toronto. Our men are busier now than they have been for quite a number of summers. It certainly looks as though business is on the way to recovery.

Mr. Irwin, of Philco Products, Ltd., has been more than helpful to us in supplying Radio information, and has brought before our members the aims of the Radio Manufacturing Service League. Arrangements have been made with the C. N. R. Telegraph to receive service calls for its members. Write for information to 1244 Duffrin Street, Toronto, Canada.

As many members have expressed the intention of visiting Toronto some time during the summer, and fall, we thought it might be a good idea to give the phone numbers of some of the boys they might want to get in touch with. Here they are:

"Bill" Forward—Melrose 5110; Ed Witherstone—Kenwood 4026.

(Page 32, please)

## Nomination Ballot

All Alumni Association Members are requested to fill in this Ballot and return it, immediately, to National Headquarters. It is your voice in the selection of candidates to run for the various offices of the National Radio Institute Alumni Association. Read the balance of this column, then turn the blank over. The entire other side is devoted to your selections and signature.

When the Ballots are checked at National Headquarters, *the two men having the highest number of votes for each office* will be considered as the candidates for the final run off and election. This election will be conducted in the next issue of NATIONAL RADIO NEWS.

All officers who served last year are candidates for re-election, with the exception of P. J. Murray, who has tendered his resignation. You may vote for them if you wish, or you may select other men. Select any men you wish just as long as they are MEMBERS OF THE N. R. I. ALUMNI ASSOCIATION IN GOOD STANDING. You may vote for yourself if you so desire. Be sure to give the city and state of your selections to prevent any misunderstanding. A complete directory of the officers who served last year are to be found on page 28 of this issue.

It is suggested that this slip be detached carefully from your NATIONAL RADIO NEWS so as not to damage the book. Tear off the slip at the dotted line, fill it out carefully, sign it and return it immediately to R. B. Murray, Assistant Executive Secretary, N. R. I. Alumni Association, 1536 U St., Washington, D. C.

(Over)

*This is a very important nomination. The Alumni Association is ready to go forward to bigger and better goals. We must select, very carefully, the men we desire to handle the reins of our organization for the coming year. Give this matter some thought and send in your ballot.*

# Nomination Ballot

R. B. MURRAY, Asst. Executive Secretary,  
N. R. I. Alumni Association,  
1536 U St., N. W.  
Washington, D. C.

I am submitting this Nomination Ballot for my choice of candidates for the coming election. The men below are those whom I would like to see elected as officers for the year 1936.

## MY CHOICE FOR PRESIDENT IS

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

## MY CHOICE FOR FOUR VICE-PRESIDENTS IS

1. ....  
City..... State.....

2. ....  
City..... State.....

3. ....  
City..... State.....

4. ....  
City..... State.....

## MY CHOICE FOR SECRETARY IS

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

## MY CHOICE FOR EXECUTIVE SECRETARY IS

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

# Baltimore

P. J. Dunn, Baltimore Chairman, and National President, has just returned from a tour of the West where he visited Chicago, Detroit, Cleveland and Traverse City, Michigan. We are glad to have him back with us and benefit by the information on Association activities in the West which he brought back with him. We understand there is a lot of talk about the boys in Traverse City wanting a Local Chapter. Pete's non-committal on this subject, but who knows?

The hot weather which we have experienced in Baltimore has not materially affected our meetings. We have been having them right along—and our membership is continuing to grow. With the fall season just around the corner our Publicity Division is again arranging with Radio set and tube manufacturers for engineers to speak at the fall and winter meetings of the Baltimore Chapter.

Following the lead taken by the Toronto Chapter in accepting out-of-town members, Baltimore is now extending an invitation to every N.R.I. student and graduate in the State of Maryland to become a member of the Baltimore Chapter. A letter to Secretary George Ruehl, Charleston and Second Ave., Lansdowne, Md., will bring full information.

The Pittsburgh Chapter really got our gang up in the air when they started in short wave work. Our members were so interested in getting into this field that we have organized our own Code instruction class and the boys are going forward in a big way. We are particularly lucky to have two old-time operators among our members who are conducting the classes.

The Baltimore Chapter does not want to appear to be doing any electioneering, but we can't help saying another word about Pete Dunn. Pete has done mighty fine work both as Chairman of the Baltimore Chapter and as National President. This issue of NATIONAL RADIO NEWS will probably call for nominations for National Officers for the year of 1936. We understand, unofficially, of course, that Pete is going to resign as Chairman of the Baltimore Chapter to give some of the other fellows a chance at that job—but he is still in the running for the Presidency of the National Association for the year 1936. Baltimore wants it known that it is behind Pete 100% in his campaign for reelection for the National Presidency. We figure that you can't find many Association Presidents who will make tours of the Local Chapters, at their own expense, just to benefit the Association.

*Well that's what Pete Dunn did—think it over when you are marking your ballot slips.*



# THE MAILBAG

## Ham List Growing

We were pleased to receive so many new hams for this issue. Eight of them since the last News went to press:

E. M. Carver, Jr.	W11EL	Bridgewater, Mass.
Harvey Gordon	W11VZ	Livermore Falls, Me.
Don Armstrong	W9UQP	Cedar Rapids, Iowa
M. W. Morris	W2FQA	Glen Cove, L. I., N. Y.
Lestef Strathem	W6JHW	Fresno, Calif.
J. P. Roberts	W5DMA	Trent, Texas
M. L. Pokress	W2IMW	Brooklyn, N. Y.
Warren Eckert	W9UJX	Parkville, Mo.

Let's hear from some hams outside the United States. Also, how about you Local Chapter Members of the Alumni Association? A lot of you have been working for Amateur Licenses.

— n r i —

## Likes "News"

"I wish to comment on your fine magazine you are putting out to your students. I found your article on 'All-Wave Antennas' a great help. Also, 'The Mailbag,' 'President's Page,' and 'Easy Measurement Charts,' are fine."

ERNEST KOPULOS, Three Hills, Alta., Can.

— n r i —

## Write to Him

"I would very much like to make 'pen friends' with some of your students or graduates."

P. C. THEUNISSEN.  
16 Murray St., Strand,  
Cape Province, So. Africa

*Mr. Theunissen has finished over eighty per cent of his Course, and will be graduating before long. He may be on the "underside" of the world, but he is on his way to the "top" in Radio in South Africa. Write him a letter if you would like to hear from a real live wire.*

— n r i —

## Praise From Utah

"Just a few lines to congratulate you on such a splendid magazine as the NATIONAL RADIO

NEWS. It is just full of useful and helpful hints; interesting from cover to cover. I have never before read such a fine Radio magazine."

L. E. SODERMAN, Michvale, Utah

— n r i —

## Radio is Musician's "Ace in the Hole"

"I am a musician by trade, and have been studying Radio on the side. I am a member of the International 100 Piece Marimba Symphony Orchestra, and have just returned from engagements in France and Belgium. I am not going into Radio just yet, as I want to continue with this orchestra. But my Radio knowledge will be very valuable to me if and when I need another means of livelihood."

MORRELL SHIELDS, Marietta, Pa.

— n r i —

## Here's Another One

As we are almost ready to go to press with this issue of NATIONAL RADIO NEWS, we receive a late flash from Winter Haven, Florida, telling us that N.R.I. Student R. E. Ford, has joined the ranks of N.R.I. Amateurs, with call letters W4DPM. Quoting from Mr. Ford's communication, "Here's a letter from another N.R.I. student who has gone Amateur. Please list my call letters as W4DPM. I want you to know that I have certainly enjoyed my study of Radio with the N.R.I., and think your Course is great stuff. I am doing Radio servicing in my spare time, and while my time is very limited, I have added quite a bit to my earnings. This fall I am going into Radio servicing as a full time proposition."

— n r i —

"My business has grown tremendously from the standpoint of service. In addition to my own work, I help do the work for two Radio dealers. Credit for all of this goes to the National Radio Institute. I have made enough from aligning receivers alone to buy a fine oscillator and tube tester. This latter work was done for other servicemen."

R. L. GRANT, Los Angeles, Calif.

We want to thank National Headquarters for their congratulations on the work we are doing here at Toronto. We are looking forward with confident hopes for a bright future. We are already showing "progress" towards our lofty goal, the finest Chapter in the National Association.

*National Headquarters may soon find it advisable to change the name of the Toronto Local to "The Canadian Chapter" if they keep on enrolling out-of-town members. Toronto has the distinction of operating over the widest territory of any of our Chapters.—EDITOR.*

— n r i —

### Chapter Magazines

During the past year there has been a distinct step forward in both the quantity and quality of Chapter magazines. Baltimore, Philadelphia, Chicago, and the Toronto Alumni have all issued numbers that presented a pleasing appearance, as well as having contained interesting news.

Here is what John F. Rider had to say in a recent issue of "Successful Servicing."

"We doff our battered 1929 chapeau in the direction of good old Baltimore—for the swell job the *N.R.I. Alumni Association* is doing with its publication, THE BALTIMORE BULLETIN, Vol. 2, No. 2, has just hit our desk, and to say that *Editor Geise* has turned out a workmanlike job is understating it."

There is a definite need for Chapter magazines. They can be published at small cost. Let the current year witness every Chapter striving to publish regularly such a paper or magazine.

— n r i —

### "Windmill" Radio

A new type of Radio power supply has been developed by E. S. McDonald, President of The Zenith Radio Corporation. It is intended for use particularly in areas where no power supply is available, and where it would be difficult to have batteries recharged.

The "Windmill" consists of an airplane type propeller attached to a generator. As little as a six mile wind will begin to charge the battery, and because the generator has a "cutout" mechanism, even the strongest gale cannot overcharge the battery.

# National Radio News

*"from the Pioneer Radio Home Study School"*

Vol. 6—No. 10                      October-November, 1935

Published every other month in the interest of the students and Alumni Association of the  
**NATIONAL RADIO INSTITUTE**  
 Washington, D. C.

The Official Organ of the N. R. I. Alumni Association  
 Editorial and Business Office, 16th & You Sts., N. W.,  
 Washington, D. C.

P. J. MURRAY, MANAGING EDITOR

Index	
Article	Page
How Strong is the Chain .....	2
All-Wave Converters .....	3
Cathode Ray Oscillograph .....	4
Service Forum .....	5
Metal Tubes .....	11
Reviewing the Industry .....	12
Data Sheet Zenith (various models) 13-14-19-20	
A Trip Through a Tube Factory .....	16-17
Makes Gasoline Pumps Talk .....	25
Alumni News .....	26 to 30
Mailbag .....	31