

**NATIONAL  
RADIO NEWS**

Oct.-Nov., 1933

Volume 5

Number 10

**ANNIVERSARY NUMBER**

Celebrating the Fourth Anniversary

*of the*

**N. R. I. ALUMNI ASSOCIATION**

and Beginning the Twentieth Year

*of the*

**NATIONAL RADIO INSTITUTE**

# President Smith's Page

## SOMEBODY BELIEVES IN YOU

**N**O matter who you are or where you live—**SOMEBODY** believes in you.

That somebody may be your Mother, your Dad; it may be your Wife, or the girl you hope someday will be your Wife; or maybe its a little tot who calls you Dad and looks on you as the greatest fellow in the world. In that somebody's eyes kings, lawyers, presidents, merchants are just small change compared with you.

Somebody wants to point to you with pride and say "Sure, that's my boy"—"my husband"—"my Dad." When you live up to their expectations you're not only benefiting yourself—but you're making somebody very, very happy. When you fail—you hurt that somebody even more than you hurt yourself.

We hear plenty of young fellows say, "I'm making twenty-five dollars a week—I'm going to get married. Some day I'll get the breaks and then we can live better."

Then the tragedy begins. Before he was married nothing but the best was good enough for "his girl." Afterward she must wear made-over clothes, and worry about the grocer's bill. Little Billy can't understand why his Dad rides the street cars while the other boy's Father drives a Buick. Billy can't go to college because his Dad is still waiting for a "break."

You've got to make your own "breaks" these days. You've got to do something better than the other fellow to get in the class where they drive good cars and send the youngsters to college.

You've got to buckle down and study—make yourself more valuable—because that's what people are paid for—ability. The \$50 to \$75 a week jobs go—not to the fellow who dreams of success and waits for his "chance"—but to the fellow who can do things.

Radio offers fine opportunities for making money—for advancement—for building a real future for yourself and your loved ones. There is no limit to the financial rewards you can have, no limit to the pleasures and comforts you can provide for yourself and your family.

For the sake of those who are counting on you—for the sake of that somebody who be-

lieves in you—do a good job of it. Get out of the "bossed around" class—get away from the "small pay" job. Prepare—study—for the bigger job—the real pay—be the man somebody wants you to be—that somebody who believes in you.

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## MANY THANKS

**A**LTHOUGH the actual birthday of the National Radio Institute is not until November, we have already received many fine letters and telegrams of congratulation.

This is a year to celebrate progress. Out in Chicago the finest exposition that the world has ever known is celebrating 100 years of progress. At the National Radio Institute we are dedicating one whole year to the celebration of our twentieth year of progress. And at the same time the N. R. I. Alumni Association, the first and only known Association of its kind in the world is celebrating the fourth year of its successful existence.

We want to thank all of those who have so thoughtfully remembered N. R. I. with their congratulations at this time—the beginning of our twentieth year of progress.

The National Radio Institute pledges to its students—its graduates and to the Radio Industry continued progress in the training of Radio men for the industry—in supplying properly trained man power to do the work of the wonder-industry of the age—**RADIO**.

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## LARGEST PUBLIC ADDRESS SYSTEM

Visitors to the Century of Progress Exposition at Chicago had ample opportunity to hear in operation the largest Public Address System in the world.

One hundred and fourteen loud speakers, mounted on standards of modernistic design furnished music over the entire fair grounds.

Considering the size of the installation and the acoustical difficulties encountered, the tone quality was fine. About 70 per cent of the material over the public address system was Radio-fed.

# A "Rebuild Prosperity" campaign for the Radio Industry

THE tide has turned. The time has arrived at last for industry to lift itself out of the depression and rebuild its prosperity. Under the Industrial Recovery Act better wages and more spending are in sight and better prices and profits are going to follow. What is needed now in the Radio Industry is aggressiveness.

Public gloom is changing to confidence and optimism. Prices are rising. Re-employment is no longer a theory. It is taking place. People once again are talking about the things they want to buy. The six and three-quarter million families who need new Radio sets and the thirteen million households that have no Radios will soon be ready for the selling. The stage is set—the market is ready.

The Radio Manufacturers' Association is conducting a nation-wide "rebuild prosperity" campaign, which will extend to dealers, jobbers, manufacturers, in fact every type of organization that can help push forward this good movement. The National Radio Institute, National Radio News and the N. R. I. Alumni Association have pledged their assistance in this drive.

The important point to remember in this campaign—which can mean so much to every reader of National Radio News—is that as conditions begin to brighten—as real spending starts again, every industry will compete for the attention of the person holding the family purse strings. Competition in the Radio Industry will not be so much between Radio manufacturers or Radio distributors or dealers or servicemen—but it will be a competition against other industries that are after the same family dollars.

Naturally, the thing to do is to be on the ground first—be the first to contact the householder—be the first to sell that Radio—that service.

For four years people have denied themselves the good things of life until the hunger for a little luxury is beginning to hurt.

The greatest need today is for some sunshine in the home and Radio offers relaxation and pleasure—laughter, melody, romance, drama, knowledge, news. It is up to you—as a cog in this great Radio industry machine to step out and do something right now. You'll benefit—your customer will benefit—the Radio industry will benefit—and the country as a whole will be benefited.



The Insignia of the Radio Prosperity Campaign

The Radio service man will play a major part in this campaign in every locality in the country. It is up to the Radio service man to see every person in his particular town or district. Don't leave a single door unopened—get your message everywhere. Canvass for service work—canvass for the sale of new receivers, tubes, parts, accessories. Sell what you can immediately—and the result of your canvass should give you enough good prospects for future business to carry you through the best part of the fall and winter.

This campaign will be the biggest thing that Radio has ever done. It promotes the progress of its own prosperity. It's up to every man who has any part in Radio today to do his bit to bring Radio back to prosperous days again. Radio manufacturers, broadcasting stations, jobbers, dealers—Radio publications everywhere—all are devoting time and money to bring about the new era of prosperity. Tie in with this campaign merely by devoting your time and energy to it and it will pay good dividends.

While on the subject of prosperity campaigns, we must also say a word about the National Reconstruction plans now being pushed forward so successfully by President Roosevelt. The business houses displaying the eagle insignia of the N. R. A. are co-operating to make this plan a success—to help President Roosevelt—to help the country—to help us all. Every time you buy from a firm displaying the insignia you are helping in the drive to "DO OUR PART toward National Prosperity."

# A Few Words With the N. R. I. Director

E. R. HAAS, Vice President and Director, National Radio Institute



## TUNING UP THE MOTOR

Bernard P. Kennedy (better known as "Barney" Kennedy) drives racing cars. His cups and other trophies would fill several "five-foot shelves."

"Barney's" personal car is a small job—he prefers small cars, but it is always in perfect condition. In his own words, "It goes places—and comes back the same day." Maybe the paint isn't always like a mirror—but the motor sounds like the purr of a kitten after the second bowl of warm milk.

"A car," says "Barney," "only gets somewhere when every cylinder in the block is hitting. If the ignition or the cooling system is faulty your car heats up; loses power—loses speed. If the clutch is slipping, you have to use more energy—more power—and at the same time you're damaging the whole layout. Such damage will result in expensive repairs a little later on and definitely shorten the life of the car."

We hate to see anyone misuse a car. It's a fine piece of machinery—good for thousands of miles of transportation if given a little care. And the care is simple; plenty of oil—plenty of grease—the proper gasoline—and the eye and ear of a skilled mechanic occasionally.

The human system is, in a way, very similar to those cars that "Barney" drives. A wonderful piece of mechanism—good for several score of years of life, health and happiness. However, like a fine automobile, the body requires a certain amount of attention—call it service if you will—to keep it at the peak of its operating condition.

Just as a car cannot function properly if the carburetor is out of adjustment—neither can the human mechanism perform at highest efficiency if the lungs are not in condition. You would not expect an automobile to run smoothly if the distributor were worn, rusted, dirty; how then can we expect the body to be at its peak if the brain—the heart—or other important organs are not properly cared for?

You can only expect to get the most out of life in the way of happiness—in the way of business success—if you are healthy. Guard your health. Eat and sleep regularly. Make it a point to see your family physician at regular intervals. Care for your eyes—your teeth—steer clear of overweight or underweight. Give your body the little care that it requires and you will add many happy years to your life.

## RADIO SERVICE STANDARDS

Radio manufacturers realize that the up-to-date service man is a mighty factor in creating good will and public confidence in their products. Radio dealers and Radio service organizations have long known there is a definite relationship between the knowledge, theoretical as well as practical, possessed by a Radio service man and the percentage of unnecessary return service calls.

Radio dealers realize the dollar and cents value of giving the very best Radio service. These dealers are now discovering that many men who apply for Radio service positions are not capable of giving really satisfactory service on all types of sets, because of lack of adequate training for this work; especially the modern Radio sets.

Some service managers even pick their men *first* for their previous training; their ability to service all types of sets, and *second* for their ability to impress customers with the advisability of having the work done right.

From this it can be seen that any service man who desires to continue Radio servicing as a means of livelihood must realize that in order to learn thoroughly the subject of servicing sets it must be studied with the same diligence with which one would study any other highly specialized technical activity.

The National Radio Institute will continue to work for the elevation of Radio Service Standards and the N. R. I. Alumni Association is making fine strides in that direction.

# RADIO-TRICIAN

TUBE

REG. U. S.

PAT. OFF.

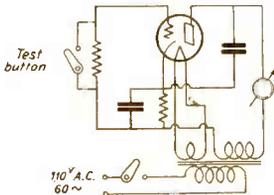
DATA

COMPILED SOLELY FOR



STUDENTS & GRADUATES

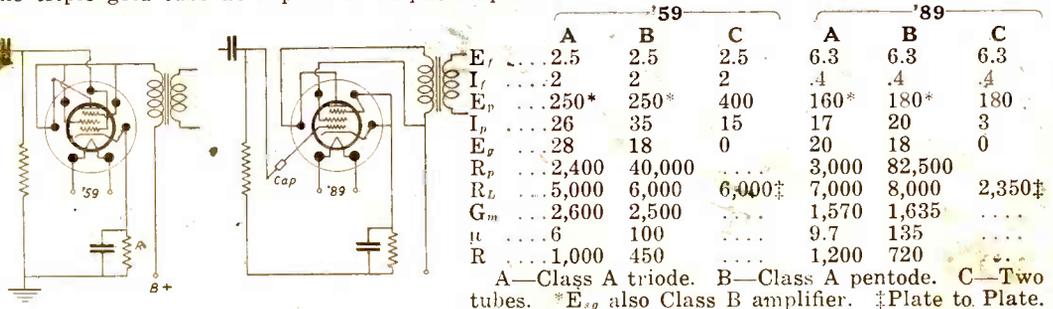
## 13— TUBE GAS TEST



A gassy triode tube is often the unexpected cause of considerable trouble for the presence of gas raises the plate current. The effect on reception is very marked in A.V.C. receivers. Gas in the controlled tubes will cause the volume to creep in intensity. Gas in the A.V.C. tube will hold the controlled tubes at maximum bias at all times. In power tubes with a grid leak sometimes a blue haze will disclose this trouble and in other cases there will be no visible manifestations of the trouble. A simple gas test may be made with the associated circuit by simply inserting the tube and alternately closing and opening the switch shorting the grid leak. If there is any appreciable change in plate current, the tube is gassy and should be discarded.

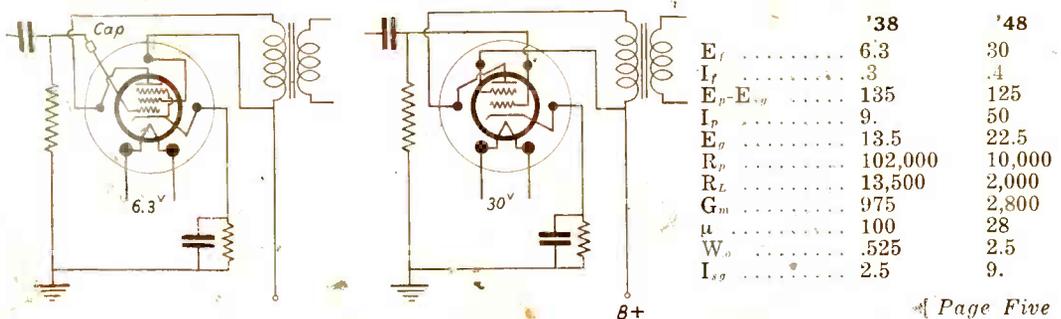
## 14— TRIPLE GRID AMPLIFIERS

These power amplifier tubes may be used for 3 modes of operation, ie: Class A triode, Class A pentode and Class B triode. The socket arrangements are different for these two tubes but they may be used for the same purpose. The '59 circuit shows its use as a Class A triode which may become a Class B triode by using 2 tubes in a back to back circuit with the proper input and output transformers and omitting R and C. The '89 circuit shows the use of the triple grid tube as a pentode output amplifier.



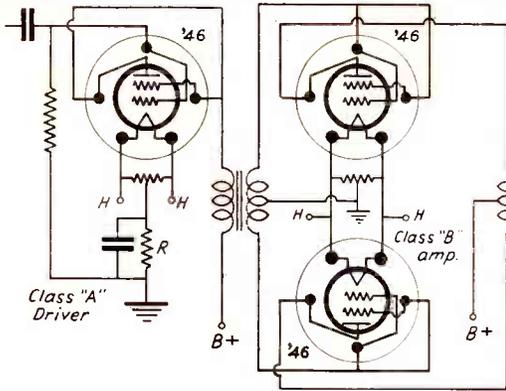
## 15— POWER PENTODES

The '48 tube is intended for use in universal A.C.—D.C. sets and thus has been designed to operate at a very low plate voltage. Ordinary 110 V.D.C. line voltage is sufficient. Its filament has a high voltage in order to operate in series with other filaments in such a set with minimum loss.



### DOUBLE GRID CLASS B AMPLIFIERS

In circuits using class "B" arrangements one of the same type tubes is used as a class "A" driver. Columns "A" indicate characteristics for class "A" operation and column B gives class "B" characteristics. The '49 tube is a battery operated tube having the same socket connection but the filament circuits are conventional battery connections.



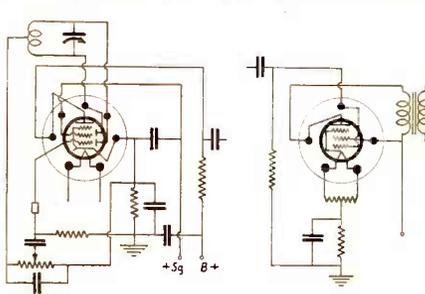
|                 | '46   |       | '49   |         |
|-----------------|-------|-------|-------|---------|
|                 | A     | B     | A     | B       |
| $E_f$ .....     | 2.5   | ..... | 2     | .....   |
| $I_f$ .....     | 1.75  | ..... | .12   | .....   |
| $E_p$ .....     | 250   | 400   | 135   | 180     |
| $I_p$ .....     | .22   | ..... | 5.7   | .....   |
| $E_{g_2}$ ..... | 33.   | 0     | 20    | 0       |
| $R_p$ .....     | 2,380 | ..... | 4,000 | .....   |
| $R_L$ .....     | 6,400 | 1450* | 6,000 | 12,000* |
| $G_m$ .....     | 2350  | ..... | 1,125 | .....   |
| $\mu$ .....     | 5.6   | ..... | 4.5   | .....   |
| $W_o$ .....     | 1.25  | 20    | .17   | 3.5     |

\* Plate to plate.

### FILAMENT PENTODES AND DUO-DIODE-PENTODES

The same socket connections are used for both the '33 and '47 tubes but the '33 has a D.C. filament and hence a battery bias requiring no bias resistor or filament c.t. resistor.

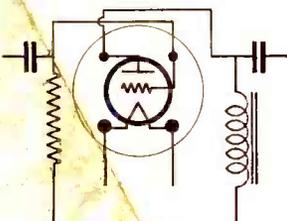
The characteristics of the 2B7 and 6B7 tubes differ somewhat according to their use as R. F. detector-amplifiers or R.F. detectors. Both sets of characteristics are given and the circuit shows the tubes used as an R.F. detector-audio-amplifier.



|               | 2B7   |        | 6B7   |         | '33    | LA    | '47      |
|---------------|-------|--------|-------|---------|--------|-------|----------|
|               | A.F.  | R.F.   | A.F.  | R.F.    |        |       |          |
| $E_f$ ...     | 2.5   | 2.5    | 6.3   | 2.5     | 2 D.C. | 6.3   | 2.5 A.C. |
| $I_f$ ...     | 0.8   | 0.8    | 0.3   | 0.3     | .26    | .3    | 1.75     |
| $E_p$ ...     | 250v  | 250v   | 250   | 250     | 13.5   | 135   | 250      |
| $I_p$ ...     | 0.65  | 9.     | 0.65  | 9.      | 14.5   | 12.   | 31.      |
| $E_{g_2}$ ... | 4.5   | 3      | 4.5   | 3       | 13.5   | 9     | 16.5     |
| $E_{sp}$ ...  | 50    | 125    | .50   | 125     | 135    | 135   | 250      |
| $R_p$ ...     | ..... | 650,00 | ..... | 650,000 | 50,000 | 5,260 | 60,000   |
| $R_L$ ...     | ..... | .....  | ..... | .....   | 7,000  | 9,500 | 7,000    |
| $G_m$ ...     | ..... | 1,125  | ..... | 1,125   | 1,450  | 1,900 | 2,500    |
| $\mu$ ...     | ..... | 730    | ..... | 730     | 70     | 100   | 150      |
| $W_o$ ...     | ..... | .....  | ..... | .....   | 7      | .7    | 2.5      |
| $I_{s.g}$ ... | 0.15  | 2.3    | .15   | 2.3     | 3      | ..... | 6        |

### FILAMENT TRIODES

The impedance coupled amplifier most generally applies to the battery operated triode. You are perhaps familiar with many of these tubes but all of them are given for completeness. The 864 is primarily used as a condenser microphone resistance coupled head amplifier. The WD11 socket connections are not shown.



|                 | '00A  |       | '01A  |       | 40    |       | 864   |       | 30    |       | 31    |       | 20    |       | 99    |       | WD11  |       |
|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| $E_f$ .....     | 5     | 5     | 5     | 1.1   | 2     | 2     | 3.3   | 3.3   | 3.3   | 3.3   | 3.3   | 3.3   | 3.3   | 3.3   | 3.3   | 3.3   | 3.3   | 1.1   |
| $I_f$ .....     | .25   | .25   | .24   | .25   | .06   | .13   | .132  | .063  | .25   | .25   | .25   | .25   | .25   | .25   | .25   | .25   | .25   | .25   |
| $E_p$ .....     | 45    | 135   | 180   | 135   | 180   | 180   | 135   | 90    | 135   | 135   | 135   | 135   | 135   | 135   | 135   | 135   | 135   | 135   |
| $I_p$ .....     | 1.5   | 3     | .2    | 3.5   | 2.1   | 12.3  | 6.5   | 2.5   | 3     | 3     | 3     | 3     | 3     | 3     | 3     | 3     | 3     | 3     |
| $E_{g_2}$ ..... | 0     | 9     | 3     | 9     | 13.5  | 30    | 22.5  | 4.5   | 10.5  | 10.5  | 10.5  | 10.5  | 10.5  | 10.5  | 10.5  | 10.5  | 10.5  | 10.5  |
| $R_p$ (meg.) .. | .03   | .01   | .15   | .013  | .0103 | .0036 | 6300* | .0155 | .015  | .015  | .015  | .015  | .015  | .015  | .015  | .015  | .015  | .015  |
| $R_L$ .....     | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| $G_m$ .....     | 666   | 800   | 440   | 645   | 900   | 1,050 | 525   | 425   | 440   | 440   | 440   | 440   | 440   | 440   | 440   | 440   | 440   | 440   |
| $\mu$ .....     | 20    | 8     | 30    | 8.2   | 9.3   | 3.8   | 3.3   | 6.6   | 6.6   | 6.6   | 6.6   | 6.6   | 6.6   | 6.6   | 6.6   | 6.6   | 6.6   | 6.6   |
| $W_o$ .....     | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

\* Ohms.

# RADIO-TRICIAN SERVICE SHEET

REG. U. S. PAT. OFF.

COMPILED SOLELY FOR STUDENTS & GRADUATES



## PHILCO TRANSITONE MODEL 5

### ADJUSTMENTS

Become thoroughly familiar with the adjustment procedure and the location of the padding condensers before starting to adjust a Model 5 receiver.

Furthermore, don't attempt to make the adjustments using a makeshift oscillator. The modern Radio depends on critically tuned circuits for its exceptional performance. It is nothing short of gross carelessness to try to adjust these delicately tuned circuits using unstable oscillators which are incapable of being calibrated accurately.

The intermediate frequency used is 460 kc. Set up the oscillator or signal generator for this frequency.

Disconnect the grid lead from the 6A7 tube. Then connect the test lead to the grid of this

padder for maximum signal in the loud speaker. Repeat this procedure in the next two adjustments.

**Padder 17.** This is the second I. F. primary condenser.

**Padder 20.** This is the second I. F. secondary condenser.

Remove the oscillator connections from the 6A7 tube and reconnect the receiver grid lead to this tube. The oscillator setting must now be changed to 1500 kc.

The receiver volume control must be turned on full, the oscillator lead connected to the antenna lead-in and the shield to the receiver housing. To obtain the correct setting of the tuning condenser, open the plates as wide as possible. Place a piece

### MODEL 5 PARTS LIST

| No. on Fig. 1 and 2 | Description                              | Part No. | No. on Fig. 1 and 2               | Description                | Part No. |
|---------------------|--|----------|-----------------------------------|----------------------------|----------|
| 1                   | Antenna Transformer                      | 32-1084  | 38                                | R. F. Choke (Low voltage)  | 32-1083  |
| 2                   | Tuning Condenser                         | 31-1019  | 39                                | Condenser (5 mfd.)         | 30-4015  |
| 3                   | Condenser (.05 mfd.)                     | 30-4020  | 40                                | Condenser (.05 mfd.)       | 30-4020  |
| 4                   | Filter Condenser (.25; .25; .5; 20 mfd.) | 30-4017  | 41                                | Resistor (200 ohms)        | 7217     |
| 5                   | Resistor (200 ohms)                      | 7217     | 42                                | Vibrator                   | 38-5036  |
| 6                   | Resistor (1300 ohms)                     | 8267     | 43                                | Resistor (200 ohms)        | 7217     |
| 7                   | Oscillator Coil                          | 32-1085  | 44                                | Transformer                | 32-7030  |
| 8                   | Condenser (.00025 mfd.)                  | 3082     | 45                                | Condenser (.006 mfd.)      | 30-1002  |
| 9                   | Resistor (15,000 ohms)                   | 6208     | 46                                | Condenser (4 mfd.; 8 mfd.) | 30-1010  |
| 10                  | Padder                                   | 04000-S  | 47                                | Filter Choke               | 32-7024  |
| 11                  | Padder                                   | 04000-J  | 48                                | R. F. Choke (High voltage) | 32-1078  |
| 12                  | First I. F. Transformer                  | 32-1086  | 49                                | Resistor (250,000 ohms)    | 4410     |
| 13                  | Padder                                   | 04000-Y  | 50                                | Control Shaft (Tuning)     | 28-8006  |
| 14                  | Condenser (5 mfd.)                       | 30-4018  | 51                                | Control Shaft (Volume)     | 28-8007  |
| 15                  | Resistor (1,000 ohms)                    | 33-3017  | 52                                | Tube Kit                   | 34-3006  |
| 16                  | Resistor (10,000 ohms)                   | 4412     | 75                                | Tube                       | 8002     |
| 17                  | Padder                                   | 04000-D  | 78                                | Tube                       | 8315     |
| 18                  | Second I. F. Transformer                 | 32-1087  | 41                                | Tube                       | 6446     |
| 19                  | Resistor (1,000,000 ohms)                | 4409     | 84                                | Tube                       | 34-2001  |
| 20                  | Padder                                   | 04000-M  | 6A7                               | Tube                       | 34-2002  |
| 21                  | Condenser (.05 mfd.)                     | 30-4020  | Dial                              |                            | 27-5006  |
| 22                  | Condenser (.00025 mfd.)                  | 3082     | Antenna Lead                      |                            | L-1594   |
| 23                  | Condenser (.0005 mfd.)                   | 5910     | Battery Cable (Bat. end)          |                            | 38-5124  |
| 24                  | Resistor (100,000 ohms)                  | 6099     | Battery Cable (Rec. end)          |                            | 38-5123  |
| 25                  | Volume Control and Switch                | 33-5009  | Fuse Housing                      |                            | 28-1269  |
| 26                  | Resistor (32,000 ohms)                   | 3525     | Male Cap (Fuse)                   |                            | 28-1270  |
| 27                  | Resistor (250,000 ohms)                  | 3768     | Contact (Fuse)                    |                            | 27-7133  |
| 28                  | Resistor (500,000 ohms)                  | 6097     | Washer                            |                            | 27-7132  |
| 29                  | Resistor (700 ohms)                      | 6443     | Spring                            |                            | 28-8009  |
| 30                  | Resistor (400 ohms)                      | 53-3016  | Fuse Insulator                    |                            | 27-7131  |
| 31                  | Condenser (.006 mfd.)                    | 30-1002  | Antenna Male Cap                  |                            | 28-1270  |
| 32                  | Output Transformer                       | 32-7005  | Contact (Antenna)                 |                            | 28-7133  |
| 33                  | Cone                                     | 37-3027  | Spark Plug Resistors              |                            | 4531     |
| 34                  | Field Coil                               | 7013     | Dial Resistors                    |                            | 4546     |
| 35                  | Pilot Lamp                               | 6408     | Screw Type                        |                            | 4851     |
| 36                  | Resistor (7 ohms)                        | 7153     | Interference Condenser (1 mfd.)   |                            | 4522     |
| 37                  | Fuse, 15 A.                              | 7227     | Interference Condenser (1/2 mfd.) |                            | 30-4007  |

tube and ground the shield on the receiver housing. Use a fibre adjusting wrench for all adjustments.

**Padder 10.** Turn the adjusting nut in until tight. Then back off one full turn. Leave this condenser in this position until the last step.

**Padder 11.** This is the first I. F. primary condenser. With the receiver and oscillator turned on and the oscillator set for 460 kc., turn the receiver volume control on full and adjust the oscillator attenuator. Then adjust the padder for maximum signal in the loud speaker.

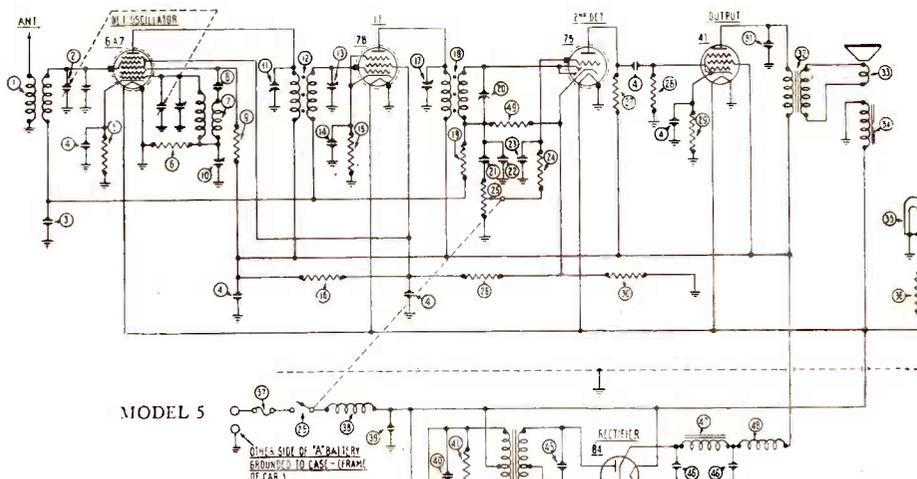
**Padder 13.** This is the first I. F. secondary condenser. Adjust the attenuator so that the signal is barely audible. This should be repeated with each adjustment if necessary. Adjust the

of paper on the stator plates and then rotor in until it strikes the paper.

**Oscillator Padder.** This is the padder on the second section of the tuning condenser (section nearest drive mechanism). Adjust for maximum signal.

**Antenna Padder.** This is the remaining padder on the tuning condenser. Remove the paper from the tuning condenser and set the condenser and oscillator for 1400 kc. Adjust the padder for maximum signal.

**Low Frequency Padder 10.** Set the oscillator for 600 kc. and tune the receiver to this frequency. Adjust the padder for maximum signal. After completing these operations, repad the antenna padder at 1400 kc.



### FILTER CONDENSER 30-4017

© on Figs. 1 and 2

There are five sections in this filter condenser, all terminated with wire leads. The two green leads connect to the .1 mfd. section, which is used for coupling the plate output of the 75 tube to the grid of the 41 tube.

The remaining four sections are all grounded to the can on one side. The white leads connect to two .25 mfd. sections. The first section is connected to the cathode of the 6A7 tube. The second section is connected to the screen of the 78 tube.

The red lead from the .5 mfd. section is connected to the B+ side of all the plate circuits. A 20 mfd. section terminates in a black lead, which in turn is connected to the cathode of the 41 tube.

### FILTER CONDENSER 30-4010

© on Figs. 1 and 2

This condenser consists of two sections, a 4 mfd. section and an 8 mfd. section, both of them grounded on one side.

The 4 mfd. section terminates in a red lead, which is connected to the cathode of the 84 tube. The 8 mfd. section terminates in a green lead, which is connected between the two chokes in the rectifier filter circuit.

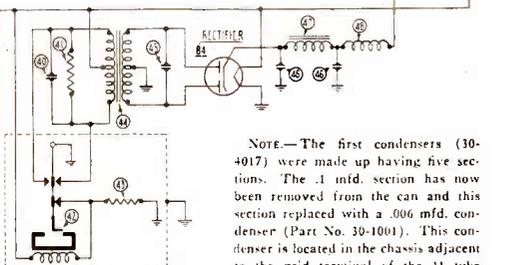


FIG. 1

Note.—The first condensers (30-4017) were made up having five sections. The .1 mfd. section has now been removed from the can and this section replaced with a .006 mfd. condenser (Part No. 30-1001). This condenser is located in the chassis adjacent to the grid terminal of the 41 tube socket.

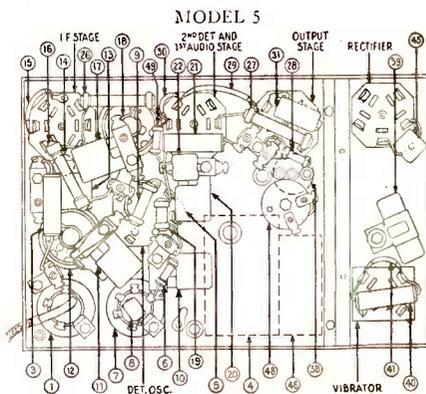


FIG. 2

# **QUERIES** ..... **AND** **ANSWERS**

???



*Question: I have a Superheterodyne which is slightly out of alignment. I don't know the I. F. frequency, can you tell me what it is?*

**Answer:** We cannot tell you the I. F. of that superheterodyne as you did not mention its make and model number. There is, however, an easy method of determining the approximate intermediate frequency.

Connect the output of your I. F. service oscillator to the first detector. Then vary the oscillator frequency until you obtain the strongest signal. Note the frequency setting of the oscillator. This will give you the approximate frequency of the I. F. amplifier. Assuming that you know the most commonly used I. F. frequencies, you can probably pick the exact one. For example, if you found the set to be aligned at 173 kc., the correct I. F. would probably be 175 kc.



*Question: I have a small midget universal receiver—how can I improve the tone quality? There is plenty of volume but the speaker overloads.*

**Answer:** The speakers used in the small universals are not large enough and do not have enough baffle to give high quality reproduction.

Many service men are improving these sets and making extra money by connecting their output to a large cabinet type self excited dynamic speaker.

If the new speaker is well baffled the reproduction will compare favorably with console receivers.

The original speaker may be disconnected and a proper coupling transformer used between the power tube and the new speaker. In a number of cases the primary of the coup-

ling transformer of the new speaker may be shunted across the primary of the output transformer in the receiver, preferably using a 2 mfd. isolating condenser.



*Question: What is meant by single signal reception?*

**Answer:** Single signal superheterodynes are used extensively by the amateur and for short wave c. w. reception in general where high selectivity cannot be satisfactorily obtained in the R. F. and I. F. circuits. Instead selectivity is obtained through a special adjustment of the I. F. and second oscillator circuits. This selectivity is far greater than could be obtained in the R. F. and I. F. circuits alone. Directly below you will find a table of frequencies which will be used in explaining the theory underlying single signal reception.

| No. | Sig. kc. | 1st Osc. | I.F. Peak | I.F. Sig. | c.w. Osc. | Beat |
|-----|----------|----------|-----------|-----------|-----------|------|
| 1   | 7098     | 7601     | 500       | 503       | 502       | 1    |
| 2   | 7099     | 7601     | 500       | 502       | 502       | 0    |
| 3   | 7100     | 7601     | 500       | 501       | 502       | 1    |
| 4   | 7101     | 7601     | 500       | 500       | 502       | 2    |
| 5   | 7102     | 7601     | 500       | 499       | 502       | 3    |

The table assumes that we have a superheterodyne with an intermediate frequency amplifier peaked at 500 kc. and the R. F. section of the receiver is tuned for the reception of a 7100 kc. signal. In the list this is signal No. 3.

When tuned to this signal, the first oscillator frequency is 7601 kc., causing a beat frequency of 501 kc., which passes through the 500 kc. intermediate frequency amplifier. We must consider the I. F. amplifier to have a selectivity a little better than 2 kc., so that 501 kc. can pass through without much trouble.

Now we set the c. w. beat oscillator, or audio beat oscillator, to a frequency of 502

(Page 10, please)

## QUERIES and ANSWERS

(Continued from page 9)

kc., which forms with the intermediate frequency signal of 501 kc., a beat note of 1 kc. or 1000 cycles.

Now if we consider the various signals between No. 2 and No. 3, varying from 7099 kc. to 7100 kc., with, of course, the same oscillator frequency, we will have I. F. signals varying from 501 to 502 kc. With the c. w. oscillator tuned constantly to 502 kc., the beat note will vary between 0 and 1 kc. As the beat approaches 0, the signal is somewhat attenuated because the intermediate amplifier peaked at 500 kc., will not very well carry 502 kc. If we consider signal No. 1 at 7098 kc., forming an intermediate frequency of 503 kc., we have a final beat note of 1 kc. combining with 502 kc. of the c. w. oscillator. because of the selectivity of the I. F. amplifier, signal No. 1 will be almost inaudible. Signal No. 2 will be fairly weak and signal No. 3 will be quite strong. Signal No. 4 will be fairly strong because the beat frequency produced in the R. F. section is equal to the intermediate frequency peak, but an audio signal of 2 kc. will be formed. With signal No. 5 we will have the same intensity as for signal No. 3, but a beat note of 3 kc. will be obtained.

The important point is this: For signals 1 and 3, which in the ordinary superheterodyne would come in at the same intensity and form the same beat note with the c. w. oscillator, in the case of the single signal superheterodyne, signal No. 1 is practically inaudible, whereas signal No. 3 is quite loud. In this way it is possible to cut down one audio side band and thus obtain so-called single signal reception.

Remember that for continuous waves at average keying speed, the intermediate frequency amplifier may be peaked within much closer limits than for phone reception. An intermediate frequency amplifier having a total band coverage of  $2\frac{1}{2}$  to 3 kc. should be used for single signal work.

It is with deep regret that National Radio News must report to its readers the death of Graduate William Boogaart of Jewell, Kansas.

Mr. Boogaart passed away on June 3, following an operation for appendicitis. He was particularly well thought of by the faculty and staff of the National Radio Institute for the diligence and conscientiousness with which he pursued his Radio studies. Mr. Boogaart was an excellent student and a fine Radio man.

## N. R. A. "BLANKET AGREEMENTS" AND N. R. A. "CODES"

by S. M. Armstrong, Director of Student Service.

**M**ANY fellows are quite naturally interested in knowing how the National Recovery Administration "Blanket Agreement" will affect different fields of the Radio Industry.

To put it briefly, the N. R. A. "blanket agreement" affects Radio Service Men, Radio Operators, and employees in other branches of the Radio Industry, just exactly the same as it affects employees in other lines of work. If the employer signs President Roosevelt's agreement, he must shorten hours of work and raise salaries so they will come within the limits prescribed by our President.

If you are an employee, or an employer, and are not certain where you stand under the N. R. A. program, the best way to get exact information is to go to your Postmaster. He can give you "the dope." Go to your local Chamber of Commerce, if you have special questions to ask—or if you have complaints to make. If you cannot get satisfaction at either of these sources, write Gen. Hugh S. Johnson, Administrator, National Recovery Administration, Dept. of Commerce Bldg., Washington, D. C.

Above all—support the N. R. A., and support the business concerns that are working under the N. R. A. Agreement. By working together—by cooperating—and by supporting our President and his program—we can *each one of us* do our part in pulling our nation out of this depression.

It is your patriotic duty to give President Roosevelt and the N. R. A. your enthusiastic, whole hearted support—and besides that, it's good common "horse sense" to do so. You and I can't end this depression by pulling *alone*, but we can make our efforts count by pulling along with the entire nation. *Support the N. R. A. by words and by ACTION!*

And now, a word about the "Codes" under which the Radio Industry will operate.

It is doubtful if a Code can be set up for Service Men, because Service Men are not well organized nationally. Also Service Work is *not* essentially INTER-STATE business, and Codes will deal principally with inter-state organizations, and with industries that do business in states outside the state where the "home office" is located.

(Page 11, please)



# A Practical Photoelectric Relay

By H. K. BRADFORD, N. R. I. Communications Consultant

THE development of simple photoelectric equipment which the service man or experimenter can easily build has opened up for him a wide variety of opportunities. The refinement of rectifying and amplifying tubes and other accessories making for simplicity of circuit design and higher application of apparatus easily brings this work to the service man with limited apparatus. Any one who desires to do so can build a photoelectric relay, usually with a greater degree of success than the average person can build a two-tube short wave receiver.

There are, of course, many occasions when the experimenter has spare time and he can make this spare time show considerable profit by building and selling photoelectric relay equipment. Such equipment will be found useful by store owners, banks, restaurants, etc.

A complete relay of this kind is given diagrammatically in Fig. 1.

1. Such a relay will furnish all practical purposes and it is indeed surprising how many pieces of electrical apparatus and mechanical apparatus can be operated directly or indirectly by this device.

The parts necessary for the construction of the apparatus are: A power transformer having a 110 volt primary, a high voltage secondary approximately 500 volts center tapped and a 6.3-filament winding, capable of supplying approximately 1 ampere of current. An '84 rectifier tube with socket will be necessary, a type '37 tube, a type '89 tube, their sockets, and a type 868 photo tube. Resistors necessary are as follows:  $R_1$ , 5 meg.;  $R_2$ , 2,500 ohms;  $R_3$  (potentiometer), 5,000 ohms;  $R_4$ , 2,500 ohms;  $R_5$ , 250,000 ohms, and  $R_6$ , 5,500 ohms. Condensers necessary for the circuit are  $C_1$  and  $C_2$ , which may be electrolytic or paper and should have values ranging between 1 and 8 mfd. Other condensers are  $C_3$ ,  $C_4$  and  $C_5$ —5 mfd.

It is suggested that this apparatus be mounted in a small metal or wooden box, or on a suitably sized board if desired. All of the apparatus can easily be mounted on a board 6" x 9". Mechanical mounting details are given in Fig. 2. Shielding of the phototube is essential and can be done with a regular tube shield with an aperture of about 1 square inch to admit the light. Shielding of the entire equipment is recommended but not essential.

The most convenient light source to use would be a 110 volt lamp of 25 or 40 watts, placed in a box with a suitable lens to produce parallel rays. This will operate the cell from a distance of 15 or 20 feet. Another convenient light source can be obtained with an automobile headlight bulb and reflector. This may be lighted with the 6-volt winding of an ordinary bell transformer and will operate the cell at a distance of 30 or 40 feet in certain cases. A flashlight accurately focused will operate the cell at about 30 feet. If the light beam need only go a short distance, say 6 feet or under, the 6.3 volt winding on the power transformer may be used with a 6-volt flashlight bulb mounted in a flashlight reflector as the light source.

(Page 15, please)

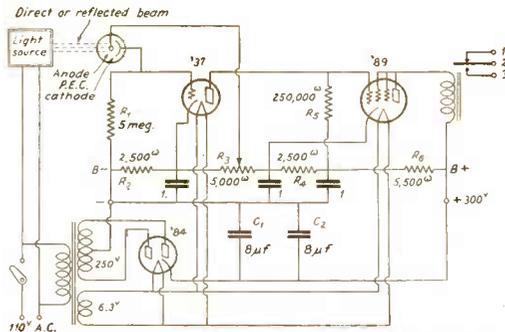


Figure 1—Diagram of a complete photoelectric relay

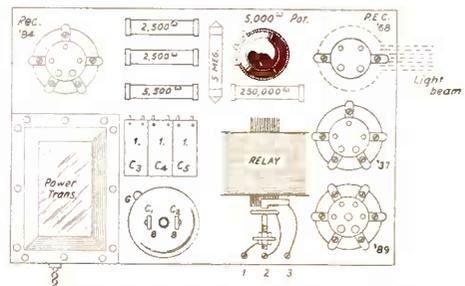


Figure 2—Mechanical mounting details

# Public Address Offers

**I**T HAS been stated that any capable, trained Radio man can make a good living in the Public Address field—provided he has the backbone to go out after the work. This branch of Radio is rapidly improving and offering money-making opportunities to the wide-awake Radio man.



Figure 2

Boy Scout Camp Public Address System at Allaire, N. J.

In the Public Address System field there are jobs of all sizes—small jobs the beginner can tackle to “cut his teeth on”—medium size jobs—and those installations that are really masterpieces of engineering.

To see the need for public address systems, it is only necessary to visit a church some Sunday morning and sit through the service. The very size and architecture of churches make them good prospects for an amplifying system. The acoustics are usually poor and it is not at all unusual to find a preacher who has a real punch in his sermon, but fails to get his message across because he is unable to make his voice heard in all parts of his church—particularly in the back rows and in the balcony. A good public address system would take his voice to the far corners of the edifice, and with far less effort on his part.

Lunchrooms and restaurants furnish another fine outlet for a proposition of this sort. Nowadays people expect music with their meals. It is not a difficult matter to sell the proprietors of lunchrooms and restaurants on this idea and then install a combination phonograph and amplifier system which will certainly please their patrons. They spend

money for cooling systems, for elaborate lighting effects—why not for music?

So are the dance halls—the skating rinks—good prospects. Orchestras are expensive—and in many cases the small dance halls and skating rinks cannot afford to pay the price of good music. Give them this opportunity to have the star orchestras of the country at their beck and call merely by use of phonograph records amplified through the proper public address system. Many proprietors of such establishments have never thought of this plan.

Schools—large and small—are rapidly coming to the use of public address systems—a microphone located on the principal's desk enables him to make announcements to all classes simultaneously. In auditoriums—in meeting places—wherever there is a center for political and social activities—there is a need for the public address system.

Statistics prove that factory workers can turn out more work in a given period of time if music is present. Many large manufacturing organizations in the country have installed loud speakers in all parts of their factory and keep music in the air at all times. Are there factories in your locality? They'd be glad to know how to increase individual production and increase morale among workers.



Figure 3

Public Address Systems Are Popular at Athletic Events

Public Address In Memorial Pa.

# Money Making Opportunities

Innumerable breweries are going back to work. In most cases these are old buildings—the equipment dating back to 1917. Brewers are realizing the need for modern equipment—and they therefore furnish a wonderful opportunity for the sale of public address systems.

While the sale of public address system equipment for permanent installation can be very profitable—there is also the opportunity to make quite a bit of money by renting portable public address system equipment. It may be an outfit which can be quickly installed and dismantled in a hall, or other inside location—or it may be permanently mounted on an automobile or truck, driven from one place to another and used for outdoor installations.

Some interesting uses for public address systems which may be an inspiration to our readers are pictured on these pages. For instance, Figure 1 is the installation in the beautiful Carillon Tower. This tower, located in Hillcrest Memorial

Park, Omaha, Neb., stands on a knoll overlooking the park, which, with the adjoining cemetery, comprises about two hundred acres. The structure in itself is very beautiful. The landscaping adds to its impressiveness. Music is provided for funerals—and in warm weather concerts can be given for the public.

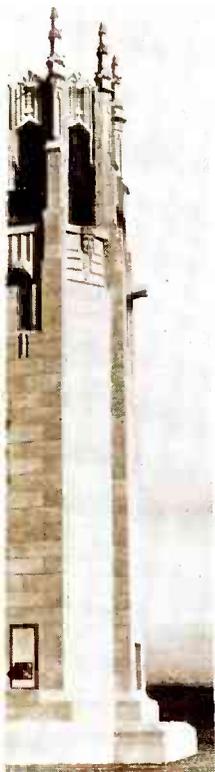


Figure 1  
Installation in Hillcrest  
Park, Omaha, Neb.

The tower is fifty-two feet high and one Wright-DeCoster No. 207 reproducer is located in each of its eight sides—thus giving an even distribution of sound. The reproducers are equipped with individual volume controls, so that better balance may be obtained. Approximately 13 watts of audio



Figure 5  
Installation at State Fair, Sedalia, Mo.

power is available for each of the eight units, but, due to the sensitivity of these new 207's, they have never been required to use more than half volume and even with that volume the music can be heard clearly for a mile. Provisions are made so that programs may be furnished either through phonograph recordings, Radio or a microphone system.

Another interesting use for public address systems in outdoor installations is shown in Figure 2. It represents one of a series of speaker towers in use at the Boy Scout reservation, Camp Burton, Allaire, N. J. In the insert Governor Larson of New Jersey is shown speaking to the Scouts through the microphone of this public address system.

A typical example of how a public address system mounted on an automobile can be used effectively at college athletic meets is shown in Figure 3. This is a track meet—the University of Wyoming vs. the Colorado State Teachers College. The car, equipped with the amplifying system and loud speakers, may be seen over the entrance in the extreme right of the picture.

(Page 14, please)



Figure 4  
The Mobile Public Address Unit of N. R. I.  
Graduate Fred Nichols

# TUNING RADIO WITH A SHADOW

**A**CCURATE tuning of a Radio receiving set equipped with automatic volume control is very difficult because with this type of control the listener cannot depend upon a change in loudness to guide him in setting the station selector dial to the correct position—that is, a slight error in the tuning adjustment may cause annoying distortion to some critical listeners.

To insure fidelity of reception—that is, an accurate reproduction of the input signal—a tuning meter is being used in some sets, which gives an indication by means of a shadow effect on, or near, the station selector dial.

When the receiver is not accurately tuned to a station, a broad shadow is spread across the meter's face. As the receiver is tuned sharper to the station, the shadow band narrows. The best tuning adjustment is indicated by the narrowest shadow cast. As the width of the shadow varies with the strength of different stations, for any given station it is easy to watch the shadow and get the best effect.

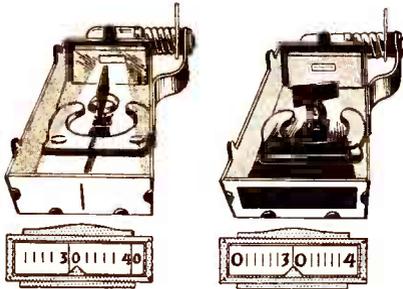


Figure 1

Figure 2

The tuning meter consists of a light aluminum vane mounted on a moving coil in a magnetic field. A shutter fastened to the vane intercepts the light rays of a miniature lamp arranged as shown in Figs. 1 and 2. The shutter casting a shadow on the translucent (semi-transparent) dial serves instead of the usual pointer.

When the set is untuned, the shutter extends across the path of the light rays, resulting in a shadow of maximum width. As the receiver is tuned sharper and sharper to the station, the vane keeps turning until, at the point of best tuning, the shutter is parallel or nearly parallel to the light rays of the lamp and therefore casts a line shadow or a very narrow shadow on the tuning dial.

Fig. 1 shows a schematic drawing of the Westinghouse shadow tuning device. In this position the station is accurately tuned, as the shadow band is at the narrowest point possible. The very broad shadow shown in Fig. 2 indicates that the Radio receiver is not correctly tuned to the broadcasting station.

## PUBLIC ADDRESS OPPORTUNITIES

(Continued from page 13)

The truck installation pictured in Figure 4, a mobile unit owned by N. R. I. Graduate Fred Nichols (vice-president of the N. R. I. Alumni Association), is a close-up view of the one shown in Figure 3.

We also present a view of the speaker installation at the Missouri State Fair, Sedalia, Mo. (Figure 5). In looking for a suitable place to install the speakers, the public address engineers decided upon a telephone pole. This installation was highly successful.

We could go on at quite some length, showing ways and means to use public address systems—advantageously for both user and for the Radio-Trician who sells the equipment or the service.

However, it is not necessary to speak further about these matters—because with a little thought the Radio-Trician can find any number of opportunities to cash in on such installations—right in his own community.

## N. R. A. "Blanket Agreements"

(Continued from page 10)

Radio Manufacturers, and most likely other branches of the Radio Industry *will* operate under an N. R. A. Code, and only recently Radio Manufacturers agreed to subscribe to the Code of the electrical manufacturing industry, which was one of the first Codes approved by President Roosevelt.

Should you really need information about a Code affecting some branch of the Radio Industry, you can get this information by writing: W. L. ALLEN, Deputy Administrator, National Recovery Administration, Department of Commerce Building, Washington, D. C.

# A PRACTICAL PHOTO-ELECTRIC RELAY

(Continued from page 11)

You should use whatever light source you find practical for this purpose. One light source, of course, may be better than another for a particular job.

A voltage is impressed across the photocell and grid leak  $R_1$  in series, between the photocell sliding contact and B—. This voltage is variable from 50 to 150 volts. It is the drop across resistors  $R_2$  and  $R_3$  with 20 ma. flowing. When the photocell is not illuminated, its resistance is very high; that is, almost infinite. Practically no current can flow through  $R_1$ , keeping the grid substantially at the potential determined by B— on the voltage divider. As light is cast on the photocell, its resistance lowers in proportion to the amount of light, allowing current to flow through it and  $R_1$ . Current flow through the photocell and grid leak circuit makes the grid positive with respect to B— by an amount equal to the current flow multiplied by the resistance  $R_1$ .

When the grid rises in potential above the plate current cut-off value, the plate current of the '37 tube flows through the resistor  $R_5$  causing a large voltage drop in this resistance. This means that the bias on the control grid of the '89 tube is substantially below the cut-off point for this tube. The relay solenoid is therefore carrying no current.

Now, when the light beam is intercepted, the photocell resistance instantly rises, current flow through  $R_1$  practically ceases, the grid of the '37 tube becomes highly negative, current flow through  $R_6$  is cut off, the grid of the '89 tube assumes a positive potential and the plate current of the '89 rises to a high peak value and the relay is actuated. The relay should be adjusted for the particular light source used by casting the light on the photocell and moving the photocell potentiometer  $R_3$  from its B+ end towards its B— end slowly until the relay trips. The potentiometer slider is then moved back just far enough for the relay to assume its normal position.

Perhaps the greatest application of such equipment in the present day is for operating

window display devices or house appliances in a display window.

The light beam is arranged so that the passer-by intercepts it, thus starting up the display apparatus.

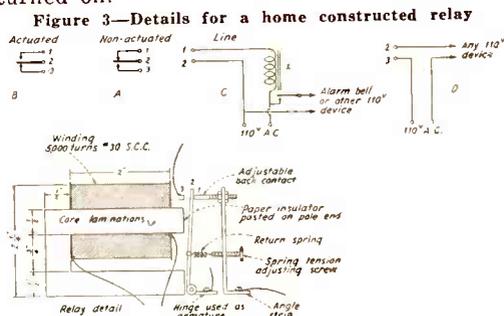
Fig. 3 shows the details for a home-constructed relay which will serve the purpose if you do not care to buy a relay for the job.

An ordinary audio transformer core is re-assembled, minus one of the shorter legs, a 5,000-turn winding of No. 30 SCC wire is placed on the core as indicated and an iron hinge may be used as the relay armature as shown. With a little mechanical ingenuity the back and forward contacts of the relay can be devised with a spring adjustment for the armature. This may be adjusted for the desired sensitivity.

At A we see the relay contacts before actuation, and at B after actuation.

An alarm may be operated from contacts 1 and 2 as shown at C. X is an A. C. relay operating from the 110-volt line, suitable for the alarm bell or device in question. The line may be 1,000 feet long if desired. This should operate from contacts 1 and 2, because if either the light beam or the alarm line is intercepted, in any way, the alarm bell will be actuated.

For ordinary relay operation, contacts 2 and 3 may be used where actuation of the relay simply closes the circuit. The 110-volt A. C. terminals may be placed in any convenience outlet and a similar convenience outlet may be mounted on the end of the cord or in such a way that any electrical appliance may be attached. When the light beam is intercepted, the electrical appliance will be turned on.



## Have You Received Your Share of the \$5,000 We Are Giving Away?

PLENTY of fellows are "in the money." Since this contest began, we've been writing checks, right and left. We've passed out three hundred and forty-three dollars. There are still well over \$4,000 waiting to be given away. Get your share! If you've already had some of this money—get some more.

Send us the names of a couple of fellows who could be benefited by N. R. I. training and who can afford it. If the names you send have not already been re-

ceived from someone else—just as soon as they enroll with us you'll get \$5 out of this contest fund.

You may send just as many names as you desire, but send good names—men who are real prospects. Here's a thought. Automobile Radio is becoming popular. Men working in garages should be able to service and install Automobile Radio. Therefore, bright young fellows working in garages—fellows who appear to want to get ahead—should be good prospects.

# THIS and THAT Success Stories in RADIO

The value of Radio as a rapid communication medium has again been demonstrated. How else—by what other means—could the N. R. A. plans have been given such wide and instantaneous publicity.

\* \* \* \*

In Germany they censor all Radio programs these days. And the name of the censoring body, until recently was Ueberwachungs-ausschuesse (we won't blame our printer if this is wrong). Anyway, maybe Mr. Hitler didn't like the name. The duties of censorship have been transferred to the ministry of propaganda.

\* \* \* \*

It looks like the Federal Radio Commission of this country and the Radio powers of Canada will have some reallocations on their hands unless something is done about the Mexican broadcasting situation. A number of high-powered stations, strung along the border in Mexico, threaten a lot of interference in the United States and Canada. Oh, well, Radio has ironed out bigger problems than this.

\* \* \* \*

A recent survey shows that in the Radio broadcasting industry there are over 12,000 full-time employees with an annual pay roll of over \$20,000,000. This is exclusive of artists and performers.

\* \* \* \*

To help along the re-employment situation the Federal Radio Commission will not consider applications from broadcasters to cut down operating time for the reason of "depressed economic conditions."

\* \* \* \*

The National Radio Institute is wholly in accord with the policies of President Roosevelt. They are doing their part to bring back prosperity.

They are in hearty accord with all provisions of the National Recovery Act and in consequence have adopted the minimum wage plan, knowing full well that such action increases the purchasing power of employees. N. R. I. is happy to do its share to bring about more employment, happiness, health and Prosperity.

The National Radio Institute was one of Washington's first BLUE EAGLE organizations.

The prize of \$1.00, which is paid for each Success Story accepted by National Radio News, this month goes to Student H. G. Davis, of Cleveland, Ohio. While this plan might not work in all cases—it did work in the case of Mr. Davis, and we are awarding him the prize for the originality of the idea.

## Success Story No. 6

I have tried any number of different forms of advertising and sales efforts—even some trick stunts to get business for my Radio store with only limited success—and I decided that in my particular locality I needed something sensational—something that would make even a feeble-minded person remember me and my business.

I gave the matter quite a bit of thought and here's what finally came out of it:

I borrowed a bicycle from one of the boys in my neighborhood and proceeded to ride around our community. At every house where I saw a man or woman in the yard or standing around in the driveway, I scooted in and told my story.

As I am a full-grown man—and as bicycles are becoming rather scarce—it is needless to say that I attracted lots of attention—everyone began to know me as the *Radio man on the bicycle*. It has stuck in their minds—and there is hardly a house at which I call that I have not at some time or other since then serviced their Radio.

Last, but not least, a bicycle affords very convenient transportation—in fact, the most reasonable transportation I've had in years. Any fellow with good legs can do this stunt and it gives a very familiar contact with the prospective customer. It has given me more results than anything I have tried so far.

H. G. DAVIS, Cleveland, Ohio.

*Have you some idea which helped you in your business—some plan of advertising—some method of getting business that you'd like to tell in the News? Send it in—it may be worth \$1.00 to you.*

# RADIO-TRICIAN SERVICE SHEET

REG. U. S. PAT. OFF. COMPILED SOLELY FOR STUDENTS & GRADUATES



## Majestic Auto Radio—Model 114

### ALIGNMENT

It will be necessary to use a special chassis container can that has had holes drilled in it to permit reaching the aligning condenser with the aligning tool. The bale should be removed before inserting the chassis in the special container can as it covers the two first I. F. aligning screws.

1. Completely connect the receiver as for operation with the volume control in maximum position. It will be necessary to connect the cathode of the G-85 tube to ground to stop the inter-station noise suppression action while aligning the receiver.

2. Supply a 175 kc. signal to the grid of the G-38 first detector tube and align the three I. F. aligning condensers for maximum output. (Two are located on the first I. F. transformer, and one just below the G-85 tube.)

3. Supply a 1500 kc. signal to the grid of the first detector tube and adjust the gang condenser for maximum output.

4. Supply a 1500 kc. signal to the antenna post and align the two trimmers on the gang condenser for maximum output.

5. Turn the gang condenser to approximately maximum capacity position (completely meshed) and supply a 550 kc. signal to the antenna post. Adjust the series aligning condenser, which is located just below the first I. F. transformer, for maximum output. For each adjustment of the series aligning condenser there will be a different gang condenser setting which gives maximum output. The combination of gang setting and series condenser adjustment which gives maximum output, disregarding setting, is the correct adjustment. Be sure to remove the ground from the G-85 cathode after completing alignment.

### INTER-STATION NOISE SUPPRESSION

Noise suppression is obtained by the use of the

resistor R-5 in the G-85 cathode circuit. There is a voltage across this resistor due to the space current of the triode portion of G-85, hence the ground end of R-5 is more negative than the cathode end, and R-3 is more positive than ground. A certain signal voltage must, therefore, reach the diode plates before the diode plate end of R-3 attains a voltage below ground potential. This is similar to the usual delayed A. V. C. while the condition of no signal exists, the grids of the G-39's tend to be positive, and are prevented from being actually more positive than their cathodes by the fact that they draw grid current through the resistors R-6 and R-1. The fact that these tubes are drawing grid current prevents them from giving the full amplification of which they are capable under proper voltage conditions. When, however, sufficient signal reaches the diode plates to produce a bias of three volts across the resistor R-3, the G-39 tubes attain their full mutual conductance and the entire system works as a normal A. V. C. circuit.

### CONNECTION FOR NEGATIVE GROUND ON BATTERY

The "B" eliminator on the Model 114 as supplied from the factory is connected for operation in automobiles which have the positive terminal of the battery grounded. When an installation is to be made in a car having the negative terminal of the battery grounded, it is necessary to reverse the two leads that come out of the generator near the choke and connecting assembly.

In some of the first sets made, it may be necessary to splice the wire that is now grounded so that it will reach to the terminal on the  $\frac{1}{2}$  mfd. condenser. Be sure to use wire that is large enough to carry the current required to run the motor.

### TABLE OF VOLTAGES

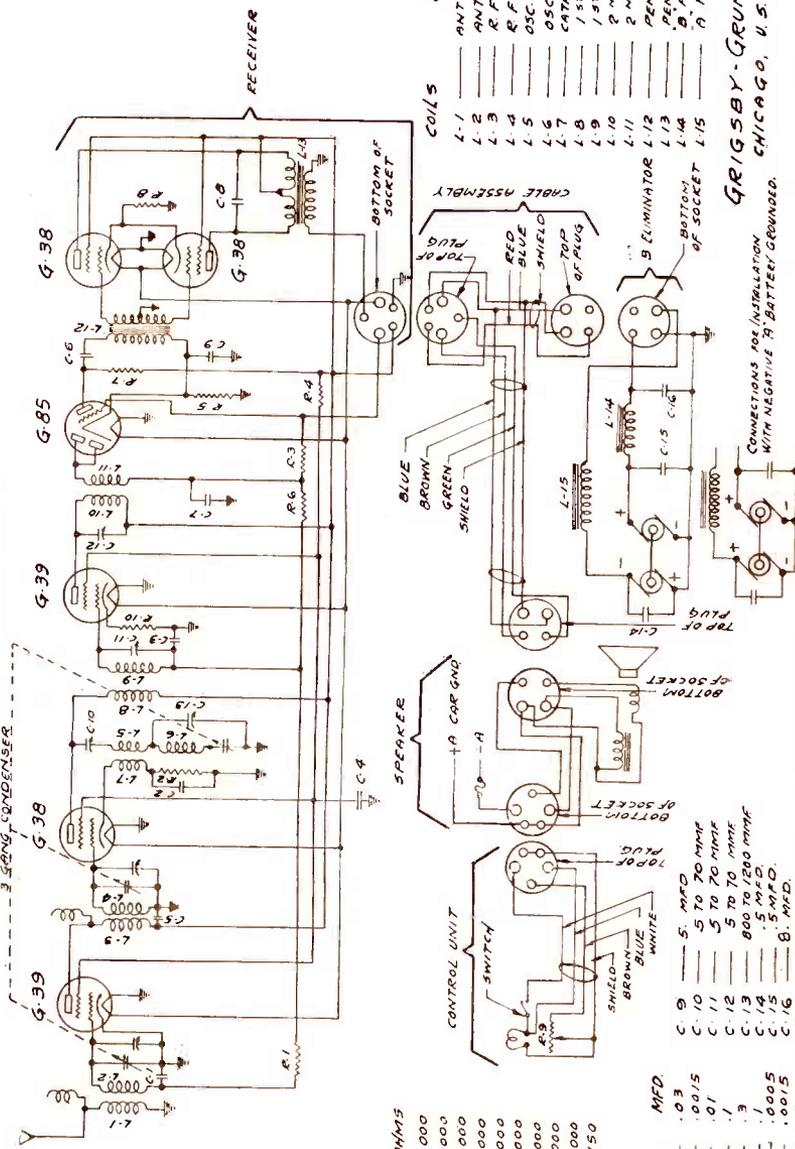
| Tube | Purpose in Circuit                             | Plate Voltage | Screen Voltage | Cathode Voltage |
|------|--|---------------|----------------|-----------------|
| G-39 | R. F. Amplifier.....                           | 180           | 85             | 0               |
| G-38 | First Detector Oscillator.....                 | 180           | 85             | 15              |
| G-39 | I. F. Amplifier.....                           | 180           | 85             | 1.1             |
|      | A. F. Plate                                    |               |                |                 |
| G-85 | Second Detector and First Audio Amplifier..... | 50            |                | 2               |
| G-38 | Power Amplifier.....                           | 170           | 180            | 17              |
| G-38 | Power Amplifier.....                           | 170           | 180            | 17              |

NOTE: Measurements made with a 1000 ohm per volt, 300 volt range, D. C. voltmeter, all tubes in their sockets and receiver connected to a storage battery supply delivering 6 volts at the cable terminals, under load.

Tubes should be previously tested to assure that they are in good condition. Readings to be taken from designated points to ground, with the condenser gang fully meshed and with no signal supplied to the receiver.

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

# SCHEMATIC DIAGRAM OF MAJESTIC AUTOMATIC VOLUME CONTROL SUPERHETERODYNE AUTOMOBILE RECEIVER MODEL - 114



| RESISTORS | OHMS    |
|-----------|---------|
| R-1       | 99,000  |
| R-2       | 8,000   |
| R-3       | 99,000  |
| R-4       | 30,000  |
| R-5       | 2,000   |
| R-6       | 900,000 |
| R-7       | 99,000  |
| R-8       | 1,000   |
| R-9       | 250,000 |
| R-10      | 150     |

| CONDENSERS | MFD.            |
|------------|-----------------|
| C-1        | .03             |
| C-2        | .0015           |
| C-3        | .01             |
| C-4        | .1              |
| C-5        | .3              |
| C-6        | 1.005           |
| C-7        | .5 MFD.         |
| C-8        | 1.0015          |
| C-9        | 5. MFD.         |
| C-10       | 5 TO 70 MMF     |
| C-11       | 5 TO 70 MMF     |
| C-12       | 5 TO 70 MMF     |
| C-13       | 800 TO 1200 MMF |
| C-14       | .5 MFD.         |
| C-15       | .5 MFD.         |
| C-16       | 8. MFD.         |

| COILS | USE           |
|-------|---------------|
| L-1   | ANT. PRI.     |
| L-2   | ANT. SEC.     |
| L-3   | R.F. PRI.     |
| L-4   | R.F. SEC.     |
| L-5   | OSC. TICKLER  |
| L-6   | OSC. SEC.     |
| L-7   | CATH. WINDING |
| L-8   | 1st. I.F.     |
| L-9   | 2nd. I.F.     |
| L-10  | 2nd. I.F.     |
| L-11  | 2nd. I.F.     |
| L-12  | PENT. INPUT   |
| L-13  | PENT. OUTPUT  |
| L-14  | B. FILTER CH. |
| L-15  | A. FILTER CH. |

CONNECTIONS FOR INSTALLATION  
WITH NEGATIVE TA BATTERY GROUNDED.

# N. R. I. ALUMNI *News*

## Radio Manufacturer Offers Alumni Association Membership in New Service Organization

The Philco Radio and Television Company appreciates the possibilities of a real Radio service organization, backed by a Radio manufacturer, and has organized what is known as the "Radio Manufacturers' Service." They want to line up the 25,000 best service men in this country to join and work with them in building up an organization which will be capable of rendering prompt and efficient service on any type Radio receiver.

Realizing the ever increasing strength and the high standard of the men who make up our Alumni Organization, Philco has offered free membership in their new Radio service organization to any N. R. I. Alumni member.

To men enrolling at this time Philco will give immediately valuable technical and advertising help—and as soon as a sufficient number of service men are signed up, they will be backed by national advertising from the Philco factory.

Under the special plan which has been worked out by Philco the Radio work of members will be guaranteed for ninety days—thereby giving them a wonderful selling point in talking to customers.

The advertising campaign which has been planned should result in many service calls which will be referred by the Philco distributor to the Radio Manufacturers' Service member nearest to the customer.

Members in this organization will receive regularly, from the nearest Philco distributor,

(Page 22, please)

## Cleveland, Ohio, Chapter Gets Underway

By CHARLES JESSE,  
Chairman, Cleveland Chapter

*Associate Editor:*  
National Radio News



Readers of National Radio News haven't heard a lot from the Cleveland Chapter up to the present time. Organization of this chapter began last January, but business conditions (particularly banking conditions) in Cleveland have been in such a state that we were marking time, more or less, awaiting an opportunity to get started when everything wasn't standing on its head, so to speak.

But everything is on the upturn now. I haven't stopped to analyze whether it's the N. R. A., the new political administration or what, that's causing the rapid revival of business in general and Radio in particular. I am not interested in the cause—it's the effect with which I am concerned. Sufficient to say that things are better, much better, and the watchword of the Cleveland Chapter of the National Radio Institute Alumni Association is FULL SPEED AHEAD from now on.

Our charter has been applied for. We have the definite assurance that our application will be approved and the charter delivered within a few days.

(Page 21, please)

# BUFFALO CHAPTER NEWS      PITTSBURGH LOCAL REPORTS

By. T. J. TELAAK,  
*Chairman Buffalo Local*

In our campaign to carry forward our most important duty—that of raising the standards of the Radio Service Business — Buffalo Chapter of the N. R. I. Alumni Association has recently completed plans for consolidation with the local units of two other strong organizations in this section. They are the Institute of Radio Servicemen and the Radio Service Engineers of Western New York.

This consolidation does not mean that the N. R. I. Alumni Association is in any way subordinated—nor that it will lose its individual identity. We will still function under the old N. R. I. banner—cooperating with these other organizations in Radio matters. We have already earned for ourselves an enviable reputation as an organization that is “going places and doing things.”

There have been many Radio Service Organizations started. Most of them find a gradual death of inactivity. This can never be said of the Buffalo Chapter of the N. R. I. A. A.

One Saturday evening recently, the Buffalo Chapter held a stag party at the Lake Shore and invited as guests the two other organizations mentioned above. The party was a huge success and we have the local service enthusiasts asking plenty of questions about our select body of Radio servicemen.

Already plans are underway to combat and eliminate “gyp” Radio men in this section. At a recent meeting held at our headquarters the local wholesalers voted 100 per cent cooperation to giving servicemen’s discounts only to bona fide members of this organization.

Within the next month a special membership committee will begin to function under able leadership of Fred C. Cutler, Secretary of the Buffalo Local Chapter. Our drive is for new members for the Local, which naturally means added strength. Special initiation plans are under way.

Any N. R. I. graduates who are members of the N. R. I. Alumni Association will find a welcome at our meetings. We want them in our Local Chapter. There’s work to be done and there’s strength in numbers. Get in touch with me, day or night. Phone Washington 3521 and put in your application for Local membership. Its your Alumni Association; make the most of it.

By THOS. A. DESCHANTZ,  
*Chairman Pittsburgh Chapter*

Our Local has progressed to a point where the membership is constantly growing with each regular meeting and we are glad to state that the following new members have been admitted into the local:

H. J. Burkhardt  
C. W. Weyels  
George Weber  
Albert Maas  
Charles Loch  
J. Semanchiek

Mr. Weber and Mr. Maas have established and opened a Radio store of their own, in Bellvue, a suburb of Pittsburgh. Before the store had actually opened the first Radio receiver was sold and installed in Wilkinsburg, another suburb, about fourteen miles away. *Incidentally, there is another Radio store only three doors away from the purchaser!* This proves the value of one of the resolutions adopted at our June meeting, which was, “*To refer new set buyers to N. R. I. men who are in the Radio sales business.*” Our local members will, of course, derive a goodly amount of sales as well as service through this procedure. We wish Weber and Maas the very best of luck in their venture.

And, by the way, Mr. Maas missed our June meeting for something very important. We all join together in heartiest congratulations and our very best wishes for a happy married life.

\* \* \* \*

The Radio business here in Pittsburgh is on the upward trend and we are in line for a big share of the fall season sales and service.

Members who are located in the outlying districts also report they are doing a fine amount of work and are steadily increasing the number of their customers.

\* \* \* \*

We wish to extend our many thanks to our official organ, National Radio News, for the timely “Tube Data Sheets” received in the June-July issue.

## Cleveland Chapter

(Continued from page 19)

Signers of the charter application were as follows:

|                  |                     |
|------------------|---------------------|
| Charles R. Jesse | P. G. Johnson       |
| Steve Horvath    | J. H. Neumann       |
| Ben Hartwich     | John W. Routledge   |
| Glenn H. Wright  | J. Henry Sheeler    |
| John Popp        | Albert Effinger     |
| William F. Kope  | J. C. Hannum        |
| Arthur Bloom     | Sidney Wiesenberger |
| Stephen Palagye  | Edward Erich, Jr.   |
| Steve Babinyecz  |                     |

There are any number of N. R. I. men in this city who, while they did not sign the charter application, will become members of our local in a very few days and we fully intend to have one of the largest and most powerful chapters of the N. R. I. A. A. The names of the new members will be reported in future issues of National Radio News.

I have plans for what might be called a "spot system" for the men of this chapter, which will become a city-wide Radio service organization, using a local Radio station as advertising medium and as the chief sales appeal the fact that we can have a trained Radio serviceman in a customer's home within five minutes after a service call is received at local headquarters. This plan has been worked before in this city under slightly different circumstances and it can be made to pay handsome dividends for our members. As soon as it is working, I shall be glad to furnish the details to any other N. R. I. local chapter upon the request of that chapter's chairman; or, if our editor will give me space, I'll be glad to give the information through the columns of National Radio News.

You Radio men out in the field get this point straight. If you claim there is no service work to be done you are wrong. If someone else tells you there is a lack of Radio service work you are being kidded. I doubt if there is a place in the United States that suffered financially, recently, as much as Cleveland and the surrounding territory, but in spite of this I have found more service work than I could do and I know plenty of other service men who are in the same fix. Of course, you

are not going to get the work by sitting around bemoaning conditions. Few customers are going to cart their Radio to your door and say, "Please, Mister, fix my set." They don't have to do that. There are enough wide-awake servicemen going after the business that you won't get much doing "rocking chair advertising" in these days.

## Nominations Now In Order

The executive committee is now ready to accept nominations for officers of our Alumni Association for the calendar year 1934.

According to the constitution and by-laws it is the duty of each member in good standing to submit two names for each office. There are seven offices to be filled: President, four vice-presidents, secretary, and executive secretary.

The two men having the highest vote for each office will be considered as nominees. Their names will be submitted to the members who will choose between them, finally selecting seven officers from the fourteen nominees. These men will be officers for one year.

With this issue of National Radio News all Alumni members will receive a nomination ballot form. You will want to select for your candidates the men whom you feel have worked hardest—done the best job for their Association during the past year. The Alumni Section of the National Radio News has been bringing you regular reports of their activities.

Feel free to cast your ballot for those you think best fitted for office. This is your Association—your vote is worth as much as that of anyone else. Every man has an equal chance to be an officer; they are elected on merit. Members absolutely have the privilege of voting for themselves if they so desire.

These ballots must be sorted, counted and recorded when they are returned to us. There is much clerical work to be done. And it must be pushed forward rapidly in order to have the final ballots ready for the next issue of National Radio News. We therefore request that you give immediate attention to this important matter of selecting your choice for next year's officers; and that the ballots be returned promptly.

## N. R. I. Graduate Killed In Crash

Graduate Raymond Richcreek, age 22, of Newark, Ohio, was instantly killed when the car he was driving left the highway near Cleveland, Tennessee, turned over and rolled down a six-foot embankment.

Mr. Richcreek graduated from the National Radio Institute in 1929. He was an excellent student and completed his course with very high grades. We were proud of him. His parents, Mr. and Mrs. J. F. Richcreek, and his brother William, are his only immediate surviving relatives.

National Radio News, the National Radio Institute and the N. R. I. Alumni Association join in expressing their sympathy.

## New Service Organization

(Continued from page 19)

copies of the "Philco Serviceman." They will receive bulletins on service work, giving as many helpful suggestions as possible to assist on Radio work of all types. Complete technical information on tubes will also be supplied.

Your Alumni Association is behind this movement because we believe that it will be the means of furthering one of our own aims—that is, the improvement of Radio service conditions in the country. We have been assured by the Philco organization that N. R. I. Alumni members will not be charged one cent to join this organization. It is merely necessary for you to write to Mr. Henry T. Paiste, Jr., Service Engineer, Philco Radio and Television Corporation, Philadelphia, Pa. He will see that you are supplied with the necessary application blanks and full information regarding the organization. GRADUATES ONLY ARE ELIGIBLE FOR MEMBERSHIP.

Demosthenes in Greece and Cicero in Rome were famous as the greatest orators of their day before they had reached twenty-five.

Page Twenty-two

# NATIONAL RADIO NEWS



Vol. 5—No. 10

Oct.—Nov., 1933

Published bi-monthly in the interest of the students  
and Alumni Association of the

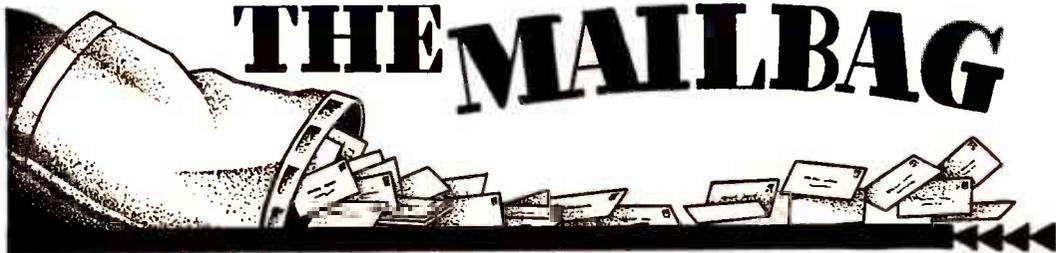
NATIONAL RADIO INSTITUTE  
Washington, D. C.

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

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## Index

| Article   | Page         |
|---|--------------|
| President Smith's Page.....                               | 2            |
| Rebuild Prosperity Campaign.....                          | 3            |
| A Few Words With the N. R. I.<br>Director .....           | 4            |
| Tube Data Sheets.....                                     | 5-6          |
| Data Sheet, Philco Transitone 5....                       | 7-8          |
| Queries and Answers.....                                  | 9            |
| N. R. A. Codes.....                                       | 10           |
| A Practical Photo-electric Relay....                      | 11           |
| Public Address Offers Money-<br>Making Opportunities..... | 12-13        |
| Tuning Radio With a Shadow.....                           | 14           |
| This and That in Radio.....                               | 16           |
| Success Stories .....                                     | 16           |
| Data Sheet, Majestic Auto<br>Radio 114.....               | 17-18        |
| Alumni News.....  | 19-20, 21-22 |
| The Mail Bag.....   | 23           |
| Calcaterra Catalog Service.....                           | 24           |



## An Auto Radio Tip

I have been specializing on automobile Radio service for the past six months and one of the tips I have picked up in connection with motor interference on G. E. 40 and RCA 40 sets is this:

The triangular plate which is mounted on rubber to which the tuning control sheath is attached has to be grounded to the side of the set by a piece of flexible copper. The cable sheath picks up the motor interference and passes it to the tuning cable, which is connected to the variable condenser rotor. I have cleaned up four installations this way.—A. L. Hissong, Rockford, Ill.

*Lynwood G. Condrey, Richmond, Va., operates Amateur Radio Station W3DAM.*

## Course Costs Nothing

The N. R. I. Course has cost me nothing, for I have made enough to pay for the course and a fine set of testing instruments and tools of which I am very proud. I wish to express my sincere appreciation for the interest N. R. I. has shown throughout my course of study. Although my lessons are all completed and I am a graduate, I am glad that our association is not ended.—James R. Shannon, New Albany, Miss.

## \$1500 Spare-Time Profits

I'm sorry to be late sending in my recent lesson. My reason is that I have been very busy with my school work, but now that I have graduated from high school, my lessons to N. R. I. will be much more regular.

In my spare time—after school hours—I've made a clear profit of about \$1500 since starting your course. I did no advertising in any way—but let my customers do the advertising for me. I have, at present, about 150 customers on my mailing list. I am preparing for a very prosperous future and will never stop until I attain my goal—success in Radio. Thanks to N. R. I. for everything.—Oliver Franz, Erie, Pa.

## Works Way Through College

I wish to express my appreciation for your N. R. I. Course, from which I graduated in 1927, at the age of sixteen. Since then I attended college and earned most of my way by working in a Radio shop and giving electrical demonstrations in my spare time to high school audiences and other gatherings.

These demonstrations were so successful that my major professor and I are giving full time next year to a more improved set of experiments. These demonstrations are, of course, available to those interested in scientific education.—Louis W. Hoskins, Oskaloosa, Iowa.

*Amateur Radio Station W8BGS is operated by Orville Bingman, Gloucester, Ohio.*

## Set Plays Without Speaker

The strangest thing I ever experienced in Radio was listening to a program on a set that had no speaker plugged in. There was an absolute reproduction of voice and music—and, mind you, no speaker was attached to the set. In one instance the effect was caused by a faulty by-pass condenser across the output—and in another case, a faulty shield grid tube was responsible.—T. M. Wilcox, Bell Island, Newfoundland.

*Cases are not infrequent where voice and music can be heard from a set with the speaker disconnected. It is the opinion of most Radio men that this condition is due to loose laminations in an audio transformer, which vibrates and reproduces the sound.—EDITOR.*

*Student Frances McAllan, Natick, Mass., operates Amateur Station W1FZX.*

There is nothing better than National Radio News and I've tried them all. I found more service tips in the N. R. I. News than in the rest of the Radio magazines put together.—E. P. Wagner, Punxsutawney, Pa.

*Amateur Station W4CDH is operated by Howard W. Stevens, Atlanta, Ga.*

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

## A FREE SERVICE DESIGNED TO SAVE YOU TIME AND MONEY

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

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

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

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

2. **HAMMARLUND 1933 PARTS CATALOG.** 8 pages. Variable and adjustable condensers, sockets, coils, intermediate frequency transformers, chokes, etc., for broadcast and short wave work.

5. **ELECTRAD 1933 CATALOG.** 12 pages. Standard and replacement volume controls, Truvolt adjustable resistors, voltage dividers, vitreous enamelled fixed resistors, public address systems, etc.

9. **INTERNATIONAL 1933 RESISTOR CATALOG.** 16 pages. Specifications and prices on International Metallized, Precision wire wound and enamelled wire wound resistors, motor radio noise suppressors and resistor kits.

16. **LYNCH RMA STANDARD RESISTOR COLOR CODE CHART.** Handy postcard size. Simplifies job of identifying resistance values of coded resistors. Gives a list of most commonly used resistor values and colors.

18. **CENTRALAB VOLUME CONTROLS, FIXED RESISTORS, MOTOR RADIO NOISE SUPPRESSORS AND POWER RHEOSTATS.** A 1933 catalog containing descriptions, specifications and prices of the complete line of Centralab standard, special and replacement volume controls, etc. Details are given on how to obtain, without charge, a copy of the 64-page Centralab Volume Control Guide for Servicemen.

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

41. **HOW TO BUILD THE ECONOMY "EIGHT."** A folder prepared by the Wholesale Radio Service Co., which gives complete data on how to build this efficient eight-tube receiver from a kit costing only \$13.75. These receivers can be built and sold in spare time at a profit.

42. **HOW TO BUILD USEFUL SERVICING AND TESTING INSTRUMENTS WITH SIMPLE, STANDARD METERS.** A folder prepared by the Lynch Mfg. Co. giving circuits and explanations showing how to increase the usefulness of simple meters to measure current, voltage or resistance through any desired range.

43. **HOW TO MODERNIZE OLD SET ANALYZER.** A valuable folder prepared by the Supreme Instruments Corp. which describes a new plan for the conversion of obsolete set analyzers and testers into modern instruments.

45. **POTTER CONDENSER BULLETIN FOR 1933.** Complete descriptions, specifications and prices of the Potter line of paper and electrolytic condensers for bypass, filter and replacement use and Potter interference filters and tone controls.

47. **UNITED SOUND ENGINEERING LOW-COST PORTABLE PUBLIC ADDRESS SYSTEM.** A bulletin containing specifications and price of a very efficient, low-cost portable public address system, using the latest tubes and a 10-inch dynamic speaker. Designed for use with crowds up to 1,000 people. Can be used for crowds up to 3,000 people with auxiliary equipment.

48. **THE FORDSON LOW-COST SUPERHETERODYNE RECEIVER.** A well illustrated folder which describes a remarkably efficient midget Radio especially designed to fill the need of servicemen who are seeking a well-designed chassis for replacement purposes. The set is sold on a 30-day free trial basis.

49. **COMMONWEALTH HOME AND PORTABLE TYPE RECEIVERS.** A very complete folder giving descriptions and prices of the complete line of receivers and chassis made by the Commonwealth Radio Mfg. Co. Models range from the most inexpensive midget sets to the higher cost console models and offers many profitable opportunities for dealers and servicemen.

51. **HOW TO BUILD A FIVE-TUBE PORTABLE A. C.-D. C. RECEIVER AT LOW COST.** This folder gives complete details of the "Pal" kit, designed by Wholesale Radio Service Co. to meet the need for a low-cost, efficient universal portable receiver. Servicemen and experimenters can build and sell this receiver at a profit.

52. **THE I. R. C. SERVICER.** A free monthly house organ published by the International Resistance Co. A sample copy will be sent on request through this service, after which you can subscribe to it, if you like it, by writing direct to the International Resistance Co.

54. **PUBLIC ADDRESS SYSTEMS, TRANSMITTING AND SHORT WAVE RECEIVERS AND ACCESSORIES.** A special 24-page catalog issued by Wholesale Radio Service Co., which covers the entire requirements of men in those fields.

(Please Use Pencil and Print in Filling in Coupon)  
**THE CALCATERRA SERVICE** NRN-1033  
Thornwood, N. Y.

Please send me, without charge or obligation, the catalogs, booklets, etc., whose numbers I have filled in below.

Booklet Numbers: .....

My connection in Radio is checked off below.

( ) Serviceman operating own business

Serviceman employed by:

( ) Manufacturer

( ) Jobber

( ) Dealer

( ) Servicing Organization

( ) Dealer

( ) Jobber

( ) Radio Engineer

( ) Experimenter

( ) Laboratory Technician

( ) Professional or Amateur Set Builder

( ) Licensed Amateur

( ) Station Operator

( ) Manufacturer's Executive

( ) Student

( ) Public Address Work

( ) .....

I buy approximately \$ .....00 of Radio material a month.

(Please answer above without exaggeration or not at all.)

Name.....

Address.....

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