

NATIONAL RADIO NEWS



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Inauguration Day

January 20, 1937!

Inauguration Day!

On that day Franklin Delano Roosevelt stood before the Chief Justice of the Supreme Court, on the steps of the Capitol here in Washington, and took the oath of office as President of the United States, ushering in his second Administration as the Chief Executive.

The "landslide" by which President Roosevelt was voted into office a second time was an overwhelming testimony of the confidence placed in him by the people of the United States and in his ability to handle the affairs of the nation. But before he or any other President is granted this power, he must have proved it could be safely vested in him. This proof had to be furnished by his past record of administering smaller public posts.

Running this proof back to its source, you will find that before he held any public office at all, President Roosevelt must have handled his own affairs, his own personal problems satisfactorily, else he would never have been entrusted with the responsibility of tackling problems affecting the welfare of, first, a state, and later the people of the entire country.

Not all of us can be President, or want to be. But all of us can and should take the first step of the way to the White House or to success in any line of endeavor. That first step is the discharge of our duties whatever they may be, the successful handling of our own affairs and problems.

All N. R. I. men have one problem in common, the problem of making a success in Radio. The day you enrolled for the training necessary to meet and solve that problem was your Inauguration Day.

How has your administration been thus far?

If it has been intelligent, industrious, and conscientious—if you have been willing to work and honest in your efforts—excellent! If it hasn't been all of these things—well, begin *your* second administration now, too, and make it one of which you can be proud.

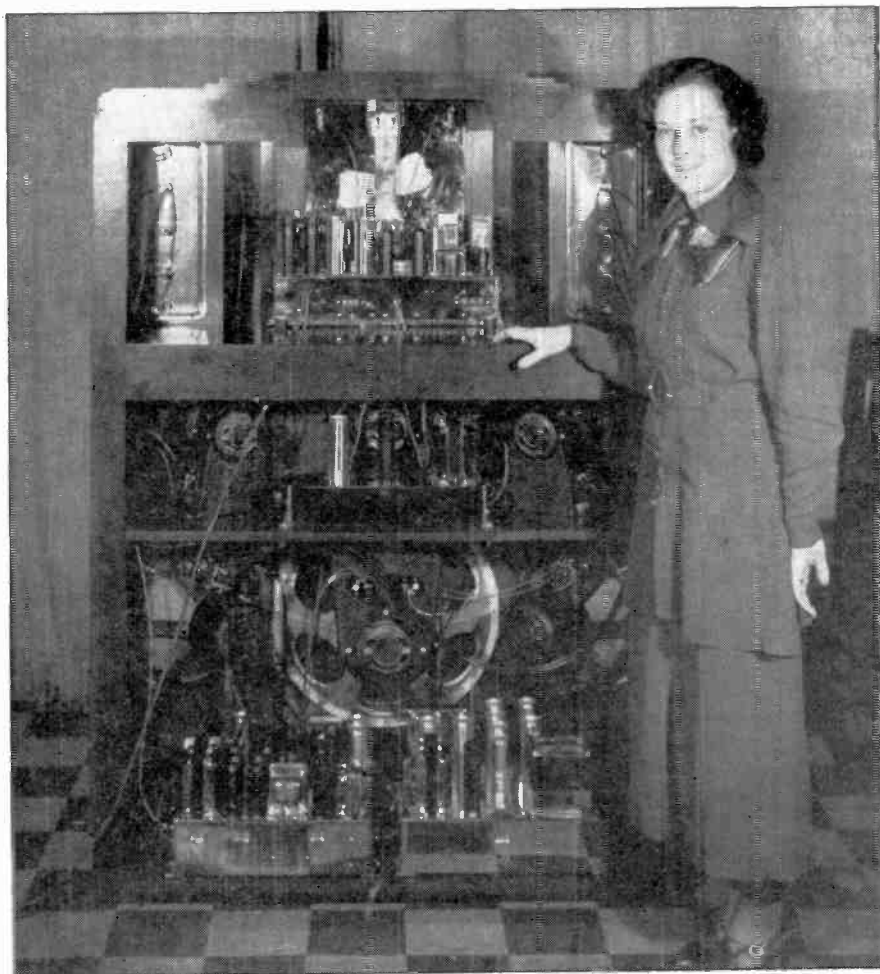
E. R. HAAS,
Vice-President and Director.

The New Crosley Super-Power Receiver

The ultimate in Radio receivers has just been introduced by the Crosley Radio Corporation, Cincinnati. It is a new De Luxe model 37-tube Radio, equipped with six speakers and other features that place Radio reception on a plane hitherto unattained. Its coverage is continuous from 540 Kc. to 18,300 Kc., divided into three bands. Its power output is from 50 to 75 watts. The list price is \$1,500. Because of its great size and power, it has been named the WLW Super-Power Model, symbolical of the great 500,000-watt broadcasting station which is the most powerful in the world.

One speaker is 18 inches in diameter and is used for the bass or low frequencies. There are two 12-inch speakers for the mezzo or middle musical range. Three smaller high frequency speakers of the high-frequency diaphragm type receive the treble or high frequency range of the higher notes and overtones. All tubes are metal with the exception of the one for the tuning light and the Auto-Expressionator tube. Four chassis are required for the arrangement of the equipment.

The superlative performance of this super-power
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The Crosley WLW Super-Power Model

The Illinois State Police Radio System

By GLENN E. WEST, Chief Radio Engineer

We wish to express our thanks to Chief Radio Engineer Glenn E. West, and the Illinois Bureau of Police, for this glimpse into an ultra-modern Police Radio System. We also wish to thank N. R. I. Graduate R. S. Lewis, an employee of the system, at whose suggestion the article is being presented.

The Illinois State Police Radio System now under construction will be the most complete and most modern State Radio Network in America. Carefully planned and thoroughly engineered, this new system will utilize more transmitters, more squad cars, and more police motorcycles than any other State-operated system in this country. Seven high-powered broadcasting stations utilizing modern Radio buildings, specially constructed 330-foot steel towers and high fidelity broadcasting transmitters will be located strategically throughout the State. Approximately 200 police cars and 325 Highway Patrol motorcycles will be equipped with modern police Radio receivers. These powerful transmitters will blanket the whole State with strong Radio signals 24 hours per day, and 365 days per year. The motorized highway patrol equipped with this modern means of rapid communication will be in

a position to carry out its duties and combat crime speedily and effectively.

History

The Illinois State Police Radio System was authorized by an act of the legislature in 1931. It was not until 1933 that the realization of the system became a possibility. At that time Governor Horner called his first Crime Conference. At that conference attention was focused upon police Radio work and the great benefits to be derived from such a system. Following that conference, and in accordance with his crime prevention campaign, Governor Horner directed officials of the Division of Highways to prepare plans and compile estimates on an adequate Police Radio System for the State of Illinois. The opinions of prominent engineers and proposals of the various Radio manufacturers were carefully analyzed and a logical plan of procedure was formulated.

The Field Survey

Plans submitted by commercial organizations and amateur Radio technicians showed arrangements varying all the way from three 2,000-watt stations to thirteen 50-watt stations. In order to determine the logical number, location and power of the Radio stations required, it was decided to hire a competent Radio engineering firm to make a field survey. The contract for this work was awarded to the R.C.A. Company who, in the summer of 1934, made a complete field survey of the State. The report submitted by the R.C.A. engineers showed that the propagation of Radio waves was uniformly good all over the State. It was found that a 1,000-watt transmitter, when used with a half-wave vertical antenna, would cover a radius of 65 miles, producing a signal strength of 100 microvolts or greater at all points. This field strength represents a much stronger signal than is ordinarily required by a broadcast receiver. However, it must be remembered that a police receiver located in an automobile uses a very small aerial compared with that provided for a household receiver. This,



coupled with the noise of the motor, the vibration of the machine, the limited battery power, and various other adverse conditions, make strong signals a necessity if satisfactory service is to be expected. It must also be remembered that a police Radio system must function 24 hours per day, 365 days per year. It must be able to deliver an intelligible message to the most distant squad car, even during electrical storms and through heavy static. With all of these things in mind, and after carefully analyzing the data obtained in the survey, it was recommended that seven 1,000-watt transmitting stations be erected at the following locations: Springfield, Pontiac, Chicago, Sterling, Macomb, Effingham, DuQuoin.

From the location of these seven stations it is evident there will be considerable overlapping. This is explained in the following manner. From the field survey data, it was evident that six stations were the economical number to use. However, a logical allocation of these stations throughout the State would not have placed any one of them in Springfield. Since Springfield is the Capital City and the home of State Police Headquarters, it follows that this should also be the central Radio control point. Consequently, a seventh station was added to the six previously planned.

The Federal Communications Commission

All Radio transmitting stations in the United States and Possessions are controlled by the Federal Communications Commission, Washington, D. C. Before any construction work on the stations could be started, it was necessary to obtain building permits from the Commission. Seven building permits, for State Police Radio Stations, were granted to the State of Illinois in August, 1935. The following call letters were assigned to these stations:

WQPS	Springfield
WQPC	Chicago.
WQPP	Pontiac.
WQPG	Sterling,
WQPM	Macomb.
WQPF	Effingham,
WQPD	DuQuoin.

It will be noted that the first three letters of each of the seven calls are alike, while the last letter designates the city in which the station is located.

Modern Radio Station Buildings

The Radio station buildings have been specially designed to meet the needs of a mod-



ern police Radio system. They include features which more than fulfill present day needs; they are being built with an insight into the future and may easily be said to represent a design two or three years in advance of current practice. The Radio buildings, of which there will be seven in all, are to be one-story, modernistic structures of cream colored brick. Four of the seven structures will house not only the Radio transmitter, but District Police Headquarters as well. The three smaller buildings where District Headquarters is not to be included, will provide a broadcasting room 20 x 20, a repair room, furnace room, lavatory and garage. The other four buildings will be provided with an additional suite of rooms for the police officers.

The broadcasting room where the Radio trans-
(Page 6, please)



The Illinois State Police Radio System (Continued from page 5)

mitting equipment is to be located will be modernistic in every respect. The walls and ceiling will be lined with accustotex. The floor will be covered with grey linoleum, having a wide black border. Plain modernistic furniture, finished in ebony black with chrome hardware, will be used. Semi-indirect lighting will be utilized. Walls and ceiling will be painted the new "Harris Green," while the woodwork will be of a darker grey. The broadcasting room will be air conditioned. The heating plant will be an automatic, thermostatically controlled hot water system. In fact, all of the details and appointments will be such as to make this room the equivalent of a modern broadcasting studio.

The Radio Towers

A single 329-foot steel tower will be used as the transmitting antenna. This antenna is an entirely new design, and is expected to produce much stronger signals than the conventional types of aerials. The tower is built almost entirely of round iron bars and is uniform in cross section, i.e., does not taper to a point at the top. Each of the three legs are anchored to a separate cement footing which extends 13 feet into the ground and weighs several tons. These legs are fabricated in the factory, and shipped in 20-foot sections. Each leg utilized three steel rods with an interlacing of welded steel webbing. The whole structure being only 20 feet wide at the base, and extending 329 feet into the air, presents a very unstable appearance. It is, however, scientifically designed, and will withstand a wind velocity of 110 miles per hour.

Tower Lights

The Bureau of Air Commerce requires that all Radio towers of this height be painted and lighted as a protection to airplanes. Alternate bands of white and International orange paint are used. Three sets of protective lights are required, one at the 100-foot level, one at the 200-foot level, and one at the top. At the lower levels, a 100-watt lamp in a red glass cover is

placed at each of the three corners of the tower. An electrically operated beacon with red glass lens is required. An electrically operated clock is used to turn these lights on and off at the proper time.

The Ground System

The ground system consists of 72 radials of No. 6 copper wire, buried 12 inches under ground and in the shape of the spokes of a wheel, with the hub at a point under the center of the tower. This ground system requires a tract of land approximately 11¼ acres in area.

The Transmitting Equipment

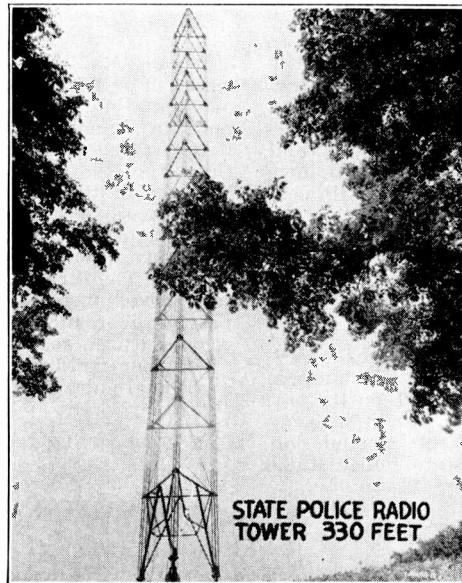
The transmitter is a modern, high fidelity Western Electric broadcast transmitter of 1,000 watts output. This transmitter is built to operate 24 hours per day, but will only be on the air at intervals of fifteen minutes or as often as necessary.

The auxiliary equipment associated with this transmitter consists of microphones, amplifiers, frequency monitors, etc. The microphones are the new "eight-ball" non-directional type used in broadcasting studios. The voice amplifiers all have a high fidelity response. The cathode ray oscillograph allows the operator to see just how his voice is modulating the carrier wave. By its use, the operator is able to maintain the modulation peaks near the 100 per cent point and so be sure of a strong signal without distortion.

Rack-Mounted Station Receivers

The operating room is equipped with a number of station house receivers for use in communicating with neighboring city and State police Radio stations. These receivers are all mounted together at one side of the room on a steel rack which gives a very neat appearance. Each receiver is tuned to a different station and is controlled from the operator's desk. In order to reduce noise in the studio, these receivers are equipped with a so-called "squelch" feature

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The Laboratory Page

By GEORGE J. ROHRICH

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

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



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

EXPERIMENT NO. 54

Object: To show that a condenser conducts alternating current but does not conduct direct current.

Apparatus Required: Power supplied to outlet which is known to be A.C. with voltage between 100 and 120 volts; power limiting panel described for Fig. S1 and Fig. S2 in preceding laboratory page; a 10-watt lamp; test wires or test prods attached to plug; a .5 mfd. condenser (Item No. 28), or a larger capacity paper condenser when using 60 c.p.s. A.C. You will need a condenser with a rating not less than 1mfd. when using 25 c.p.s. A.C.; an extra socket connected to two 45-volt batteries (or any combination of batteries of the A, B or C battery variety for providing 90 volts to 120 volts D.C.). Of course, if you also have 110 volts D.C. available at an outlet then the batteries are not necessary.

Apparatus Assembly: Connect the parts as shown previously for Fig. S3. Plug No. 1 may be inserted and used in socket No. 1 for A.C. or D.C. in any convenient manner, but it is advisable to insert it in the special way explained for Fig. S1 so the lamp (or lamps) will be in the ungrounded side of the power line. Insert the plug with test wires in socket No. 2. Place one 10-watt lamp in one of the lamp sockets in the power limiting panel.

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

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

3. Hold the test prods on the terminals of the condenser (Item No. 28) and note that the lamp lights again although somewhat dimmer.

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

5. Repeat experimental procedures Nos. 2 and 3, noting that the lamp lights in procedure No. 2 but will *not* light in procedure No. 3.

Observations: Your observations will allow you to draw your own conclusions that a condenser conducts alternating current but does not conduct direct current.

In Experiment 51 it was pointed out that the chief purpose of a "resistor" is to conduct current. Likewise the chief purpose of a "condenser" is to *conduct alternating current*. In other words, we can use a condenser for the same purpose as a resistor in an A.C. circuit.

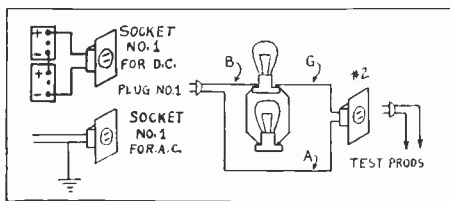


Fig. 83

Here we note that a condenser has "conducting ability" as well as "resisting ability." The property which identifies the "resisting ability" of a condenser is also called "reactance." This kind of reactance is distinguished from the kind associated

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The Laboratory Page (Continued from page 7)

with a coil by calling it "capacity reactance." The kind associated with a coil is called "inductive reactance."

When we measure the "capacity reactance" (also called "capacitive reactance") of a 1 mfd. condenser for 60 c.p.s. A.C. we will find it has a value of 2,650 ohms. In a circuit where 60 c.p.s. current is present, a 1 mfd. condenser will pass as much current as a resistor that has a value of 2,650 ohms. When this same condenser is used where the frequency is 25 c.p.s. then it will act the same as if it were a resistor having 6360 ohms. A .5 mfd. condenser has twice the reactance of a 1 mfd. condenser. A .5 mfd. condenser will act the same as a resistor of 12,720 ohms where the frequency is 25 cycles per second. Yet this same condenser will act as a resistor having only half of an ohm where the frequency is near 600 kilocycles per second. These statements will be most readily understood by referring to the table listed below:

(Frequency)	(Reactance in ohms for)	
c.p.s.	1 mfd.	.5 mfd.
25	6,360	12,720
60	2,650	5,300
250	636	1,272
600	265	530
2,500	63.6	127.2
6,000	26.5	53.
60,000	2.6	5.3
600,000	.26	.53

Practical Application: The properties of a condenser noted in this experiment are used extensively for a variety of purposes. A few uses will be mentioned.

Often a portion of a circuit handles a combination of A.C. and D.C. Where the amount of D.C. must be kept to a low value and the amount of A.C. must not be hindered it is customary to place a condenser across a resistor. The condenser conducts no D.C., so its resistance is infinite. The resistor alone conducts the required amount of A.C. The resistor conducts some A.C.. Likewise, the condenser conducts additional A.C. If we choose a condenser which has only a few ohms reactance it will act the same as having the resistor short-circuited. In other words, the condenser is used to *pass* current which would be hindered by the resistor. It is, therefore, called a by-pass condenser.

In other instances we may want to exclude all the D.C. and retain all the A.C. The condenser is included in the circuit which handles only the A.C. Its properties readily *block* or stop the D.C. and yet pass the A.C. In this use it is generally called a coupling condenser or stopping condenser.

Occasionally you may be confronted with a problem which will require you to find out whether a house lighting system is being supplied with direct current or alternating current. This information may be necessary in order to connect a Radio set, a certain type motor, or other special apparatus to the line and have it function properly and safely.

You can get the necessary information by referring to the name plate on the electric meter which measures the amount of power delivered to the premises where the current is used. This name plate always specifies the "frequency in cycles" in case A.C. is supplied. Therefore, if you see any notation about "cycles" on the name plate followed by a number such as 25, 50, or 60, then you will know definitely that alternating current is being supplied.

Furthermore, the "number of cycles" will help you select the proper type of equipment which is designed, especially for A.C. of that frequency.

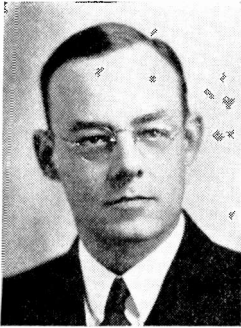
The name plate on a direct current power meter bears no notation of "cycles." Therefore, it is an easy matter to determine whether the house lighting system is supplied with D.C. or A.C.

Where it is not possible to obtain access to the power meter the following method for determining the type of current is suggested.

As you now know, an electric lamp will work just as well with A.C. as with D.C. However, if a condenser is connected in series with the electric lamp, the lamp will light if A.C. is supplied to the power line. To make a simple tester, obtain a 10-watt, 110-volt lamp and connect it in series with a 1 mfd. condenser. The lamp will light to approximately three-quarters of its full brilliancy if the apparatus is connected to a 60 cycle A.C., 110-volt line. The lamp will glow with a cherry red color if it is connected to a 25 cycle, A.C. 110-volt line. The lamp will not light at all if this apparatus is connected to a D.C. line.

Should it be impossible for you to obtain a 10-watt lamp, then use a 25-watt lamp in series with a 2 mfd. condenser. The degree of brilliancy of this lamp will be the same as described above.

A 25-watt lamp in series with a 1 mfd. condenser will glow with a cherry red color when connected to a 60 cycle A.C., 110-volt line, but it will not light if connected to a 25 cycle 110-volt line or to a D.C. line. Knowing how to use the peculiarities of condensers let us make approximate comparisons of frequency. To compare means to measure. Thus, we can roughly measure the frequency.



The Service Forum

Conducted by

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

EMERSON MODEL 102

WEAK RECEPTION

When this complaint coupled with plenty of distant stations occurs, look for trouble in the audio system. Pay particular attention to the phonograph pick-up as a defect may occur in it incompletely closing the circuit when in the radio position.

— n r i —

CROSLEY MODEL 143

PILOT LIGHT DOES NOT TURN OFF

This is due to a defective electrolytic condenser. A new 8 microfarad condenser rated at at least 150 volts should be used.

— n r i —

BRUNSWICK MODELS 24 AND 25

NOISY RECEPTION

When this trouble is intensified by moving the tuning condenser dial the trouble is due to small metallic particles peeling off of the condenser plates. To eliminate this trouble disconnect the leads to the stators of the condensers. Then apply voltage from the high voltage winding of a power transformer across the different sections. As you rotate the condenser gang these metallic particles will be burned out. A 100 watt lamp should be placed in series with the primary of the transformer to protect it against a complete short. It is inadvisable to use the set transformer for this purpose and a transformer for this particular use may be kept on hand as the complaint is common to many receivers.

— n r i —

MAJESTIC MODEL 290

POOR CONTROL OF VOLUME

If this set operates on only a portion of the volume control, replace condenser C20 in the diagram, used to couple the G4F to the first A.F. This condenser is in the upper right-hand corner of the chassis when the chassis is upside down and you face its rear.

— n r i —

MAJESTIC MODEL 300A

POOR CONTROL OF VOLUME

When this set operates on only a portion of the volume control, replace condenser C17 in the diagram, used to couple the G4F to the first A.F. tube. Use a .1 mfd. 600 volt condenser.

GENERAL ELECTRIC MODEL J125

HUM

Twist the dial light wires and move them from the vicinity of the R.F. choke located on top of the chassis.

— n r i —

GENERAL ELECTRIC MODEL K-50-P

INTERMITTENT RECEPTION

Replace the 720 micro-microfarad condenser in the oscillator tuning circuit. A factory replacement part should be employed. The dual 4 microfarad electrolytic condenser mounted under the chassis sometimes opens up. When replacing one condenser it is wise to replace both units to avoid a call-back.

— n r i —

GENERAL ELECTRIC K-50 AND K-50-P

NOISE

If the noise sounds like a loose connection check the flexible leads to the 57 plate choke. Make sure that they do not rub against the green 500 ohm cathode resistor for the 2A5 type tube. This resistor is located between the R. F. choke and the rear of the chassis.

— n r i —

GENERAL ELECTRIC MODEL C14

DEAD

If the receiver will operate at low volume with a regular antenna but not on a car aerial and the volume control has no effect, check for an open .02 microfarad condenser between the diode section of the second detector tube to the grid of the pentode section of the same tube. This check should be made by actual substitution of a good condenser rated at 600 volts.

— n r i —

GENERAL ELECTRIC MODEL S-22

POOR CONTROL OF VOLUME

Carefully check the tubes in the R.F. and I.F. stages. If 24 type tubes are employed, this action will occur and the original 35 type tubes should be installed.

— n r i —

HOWARD MODEL 67

WEAK AND DISTORTED

Check and if necessary replace the .25 microfarad condenser by-passing the plate resistor of the 6F5G tube to ground.

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The Illinois State Police Radio System (Continued from page 6)

which maintains each receiver in a quiet, low-level operative condition except when the calling station is on the air. By use of an ingenious circuit, only the receiving antenna is used to supply all of these receivers and only one loud speaker is used to monitor them. This makes it unnecessary to surround the station with a maze of receiving aerials and makes for a neat-looking, business-like station.

The Special Control Desk

The special control desk is located in the center of the operating room and in front of the transmitter. This desk is finished in dull black color with chrome plated hardware. Surrounding the operator's position is a raised circular portion with sloping panels which carry the transmitter controls, receiver controls, receiver controls and loud speaker grille. In the center of the desk and directly in front of the operator is a modern synchronous clock. From his position behind this desk, the operator can control the transmitter, turn on and off the receivers, increase the volume of loud speakers and, in fact, perform all of the operations necessary for the routine operation of the station. Telephones, road maps, police data, automobile license plate numbers and various other aids are all within easy reach. An operator sitting at this control desk in this modern police Radio station has within his control a wonderful law-enforcing machine of lightning speed and irresistible power.

Police Car Receives

200 State Police cars are or will be equipped with new R.C.A. receivers. These receivers have been designed and built to withstand the hard use which this service imposes. A police car receiver operates under very adverse conditions. In the first place, the receiver must be mounted in a mobile machine where severe vibration and extreme temperature changes are unavoidable. Only a small, inefficient aerial can be used. The power supply must operate from a 6-volt storage battery. The receiver is expected to deliver service 24 hours per day if necessary. Only a receiver designed for the purpose and of

the most rugged construction can be expected to withstand this service.

The receivers are mounted on the bulkhead under the dash and are controlled from the steering column. The receivers used in the Illinois Police cars are extremely sensitive, responding to a signal of only a fraction of a microvolt. These receivers give unusual clear reception and possess the "squelch" feature. An officer riding in a squad car hears no static or frying noise until the police Radio station comes on the air, causing the audio amplifier to open, allowing the message to be received. This feature is very desirable as it becomes extremely annoying to listen to the continual roar of a loud speaker for hours at a time.

Motorcycle Receivers

Approximately 325 State Police motorcycles are to be equipped with Radio receivers. Only a very few cities or States have equipped their police motorcycles with Radio receivers. The demand for motorcycle receivers has been small and development work has not been carried on to the same extent as in the case of police car receivers. A receiver mounted on a motorcycle is subjected to more severe vibration and more extreme weather conditions than is a car receiver. The aerial on a motorcycle receiver usually is not over 18 inches long. Even with this small collector, reliable reception from a 500-watt station has been obtained over distances of fifty miles. During the summer months the Illinois State Police will depend upon motorcycle receivers to bring them orders from headquarters.

Radio Operators

All Radio operators are required by Federal law to hold a Government Radio operator's license. A Radiophone second class license is the lowest grade operator's license, approved by the Federal Communications Commission for use in a State Police Radio System. A Radiotelegraph first class license endorsed for Radiotelephone first class operation is the highest grade of license procurable and is held by only a few ex-

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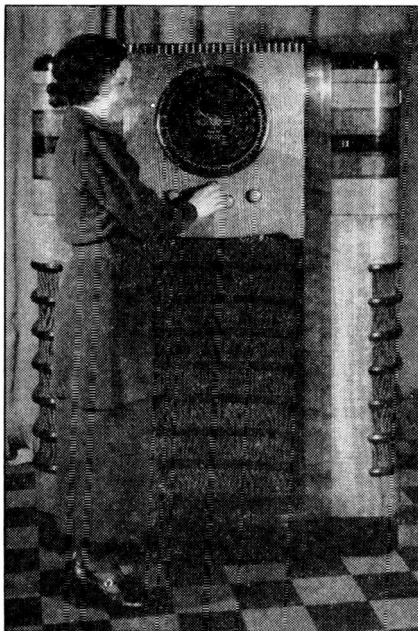
R. S. Lewis holding a W. E. 211-E tube used in the 1,000-Watt State Police transmitter.

The New Crosley Super-Power Receiver

(Continued from page 3)

Radio is the result of a circuit that is capable of reproducing up to 20,000 cycles audio frequency, and has reproduced as high as 25,000 cycles. The receiver has a low range of 20 cycles, which reproduces the lowest notes of a pipe organ, the lowest in the musical scale.

The set is replete with the Auto-Expressionator, bass compensation, six-step tone control, in addition to volume control for each different audio



Front view of the WLW Super-Power Receiver

range—bass, mezzo and treble, the Mystic Hand for automatic tuning and other features developed by Crosley engineers. It is also provided with a public address system.

The cabinet stands four feet ten inches high, is 42 inches wide and 22 inches deep. The complete Radio weighs 475 pounds. It has a 12-inch airplane type dial.

The cabinet itself is a masterpiece of the cabinet maker's art, surpassing the capacity of words to accurately describe it

"Pin-Head" Dry Electrolytics

"Pinhead" Tiny-Mikes is an appropriate name for the new Sprague cardboard dry electrolytic condensers recently announced by the Sprague Products Company of North Adams, Mass.

These new "Pinhead" units, known as Sprague Type PTM, are made in answer to the growing demand for extremely small, fully reliable units at lowest possible cost. In size they are even smaller than the original Sprague Tiny-Mikes, the 8 mfd. unit, for instance, being only 2½" long by 11/16" wide and 1-1/16" high. Other units are 4 mfd. and an 8-8 mfd. condenser with four leads.

"Pinhead" Tiny-Mikes are conservatively rated at 525 volts but, like other similarly rated Sprague Condensers, servicemen themselves have found that they will actually take surges as high as 560 to 580 volts without breaking down and with extremely low leakage. Another feature lies in the fact that, despite their low price, these PTM Condensers have the famous Sprague humidity proof sealing which definitely eliminates one of the most common causes of failure in units of this type. Moisture simply cannot get into the windings where it so frequently causes trouble in ordinary old-style condensers.

Servicemen will find Sprague PTMs indispensable for servicing midget receivers where space is at a premium and also where low cost for replacements is an important consideration.

A new 1937 catalog listing this and many other equally important Sprague Condenser developments will be sent upon request to Sprague Products Company, North Adams, Mass.

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National Union Seeks New Products

It is said that J. H. Robinson, recently appointed Director of New Products Research of the National Union Radio Corporation, has been assigned the task of seeking out and analyzing the marketability of new products, patents and ideas having to do with Radio, electronics, television and electrical industries.

Inventors are invited to correspond in strict confidence with Mr. Robinson, c/o National Union Radio Corporation, 570 Lexington Avenue, New York, N. Y. It is the belief of the National Union organization that an era of great development and advancement is at hand and they are prepared to encourage the promotion of new practicable ideas.

The Illinois State Police Radio System (Continued from page 10)

ceptionally well qualified operators.

Each of the seven State Radio Stations will be manned by five operators, one of which will be designated the Chief Operator and upon whom the responsibility of the maintenance and operation of the station will rest.

The service and repair work on the police car and motorcycle receivers will be done as far as possible by the Radio operators during their spare time. Additional service men will be employed as the need becomes apparent. All service men will be required to hold a Government operator's license in order that they may "stand watch" during times of illness or during vacations of the regular operators. Ordinarily each operator will stand one eight-hour watch each day for six days in any one week.

Responsibilities of Operators: Federal Laws

While on watch the operator will be in charge of the station. He will be responsible for everything that happens in the station. All Radio laws and the Rules and Regulations of the Federal Communications Commission must be complied with in every respect. Any infraction of these Federal Laws or regulations may result in loss of license as well as the infliction of heavy fines and imprisonment.

Qualifications for Operators

An operator on watch in one of these Police Radio Stations will be charged with heavy responsibilities. In case of a serious disorder such as a bank robbery, a strike, or a flood, he may be called on to direct the activities of fifty or more State Police Officers. Under such conditions the operator must be able to think clearly and act quickly. Lives and property may be at stake. A single blunder might cost the life of an innocent citizen or the loss of valuable time in the apprehension of a long sought criminal.

An operator who applies for such a position should possess a keen intellect, a good education and be thoroughly experienced in the maintenance and operation of Radiotelegraph and Radiotelephone apparatus. He should know the geography of the State and be acquainted with the roads, rivers, bridges and cities within his district. He should know something of the State laws as well as traffic rules and regulations. In short, the better the man's education and the broader his experience, the better operator he will make.

The Operation of the System

Many questions have been asked as to how the system will operate; how traffic will be handled.

In answer to these questions it should be explained that each of the seven Police Broadcasting Stations will be operated as separate units so far as their own Radio districts are concerned. Each station will handle the Radio traffic within its district, sending messages to the cars and directing the activities of State Police Officers within its district.

All of the seven stations will be under the control of the central station at Springfield. Whenever necessary the activities of all seven stations may be directed from the central station. In case of an emergency requiring the mobilization of all State Police forces, the Superintendent of State Police may direct the activities of the whole State Police force from the control apparatus to be located in his office. Whenever a message of general interest is to be broadcast from all stations, it will not be broadcast simultaneously but will be sent out from each station in succession and according to a previously arranged sequence.

Advantages of Radio System

By the use of the Radio it will be possible for the Superintendent of Police, from his office in Springfield, to control the activities of the whole State Police force. A message may be directed to any squad car or highway patrolman by simply pressing a button and speaking into the microphone. If a serious disorder such as a jailbreak—let's say an escape like the John Dillinger case—all of the State Police could be quickly mobilized through the use of the State-wide system. Bridges, highways and other strategic points could be quickly blockaded. In addition to this, most of the country and city police forces could be quickly notified and their facilities effectively utilized. It is doubtful whether John Dillinger ever could have escaped through the State of Illinois had such a State-wide Radio system been available.

The speed with which the officers arrive on the scene of a crime is one of the great advantages of the police Radio. Recent statistics show that in city areas it requires, on the average, only seventy-five seconds for squad cars to reach the scene. In a state-wide system this time will be considerably longer, but the speed factor is just as important.

The coordination of all law-enforcing agencies, including State Officers, county sheriffs and city police, will be possible through the proper use of the State Radio System. All county sheriffs' offices and city police stations should be equipped with receivers tuned to the State Police Radio stations. Police bulletins of general interest will be broadcast at regular intervals. Special mes-

(Page 15, please)



RADIO-TRICIAN

REG. U.S. PAT. OFF.

Service Sheet

Compiled Solely for Students and Graduates
NATIONAL RADIO INSTITUTE, WASHINGTON, D. C.

INTERNATIONAL

MODELS 76 & 676

This chassis is designed to operate from 115 volt power lines, either alternating or direct current. It is a single band receiver covering the American broadcast band. The following tubes are employed:

6D6—Untuned R. F.	43—Pentode Output
6D6—Tuned R. F.	25Z5—Rectifier
6C6—Detector	165R4—Regulator

ALIGNMENT

Alignment may be accomplished using either a signal generator or weak broadcast signals although the signal generator is preferable. An output meter should be connected from the plate of the 43 tube to ground.

Set signal generator at 1500 kilocycles and feed signal to antenna. Keep the output from signal generator as low as possible. Tune in signal on Radio and make adjustments for maximum output. Rock the tuning condenser back and forth across the signal while adjusting the R. F. trimmer for resonance.

Next check the alignment at 1000 Kc. Insert a thin bakelite, celluloid or mica feeler strip between the plates of the variable condensers to determine whether the circuits are properly matched. The action is this—the dielectric constant of the celluloid feeler strip being higher than that of the air it displaces, results in an increase of capacity. Open the variable condenser just enough to indicate two or three points below maximum signal.

As the feeler is inserted the meter reading should indicate increasing signal and then decreasing as the feeler is inserted farther. This procedure should be followed on both sections. Should the meter fail to show an increase in signal as the strip is inserted in one section this indicates too great a capacity for the section. This may be corrected by bending the outside rotor plates out at the point where they begin to mesh with the stator.

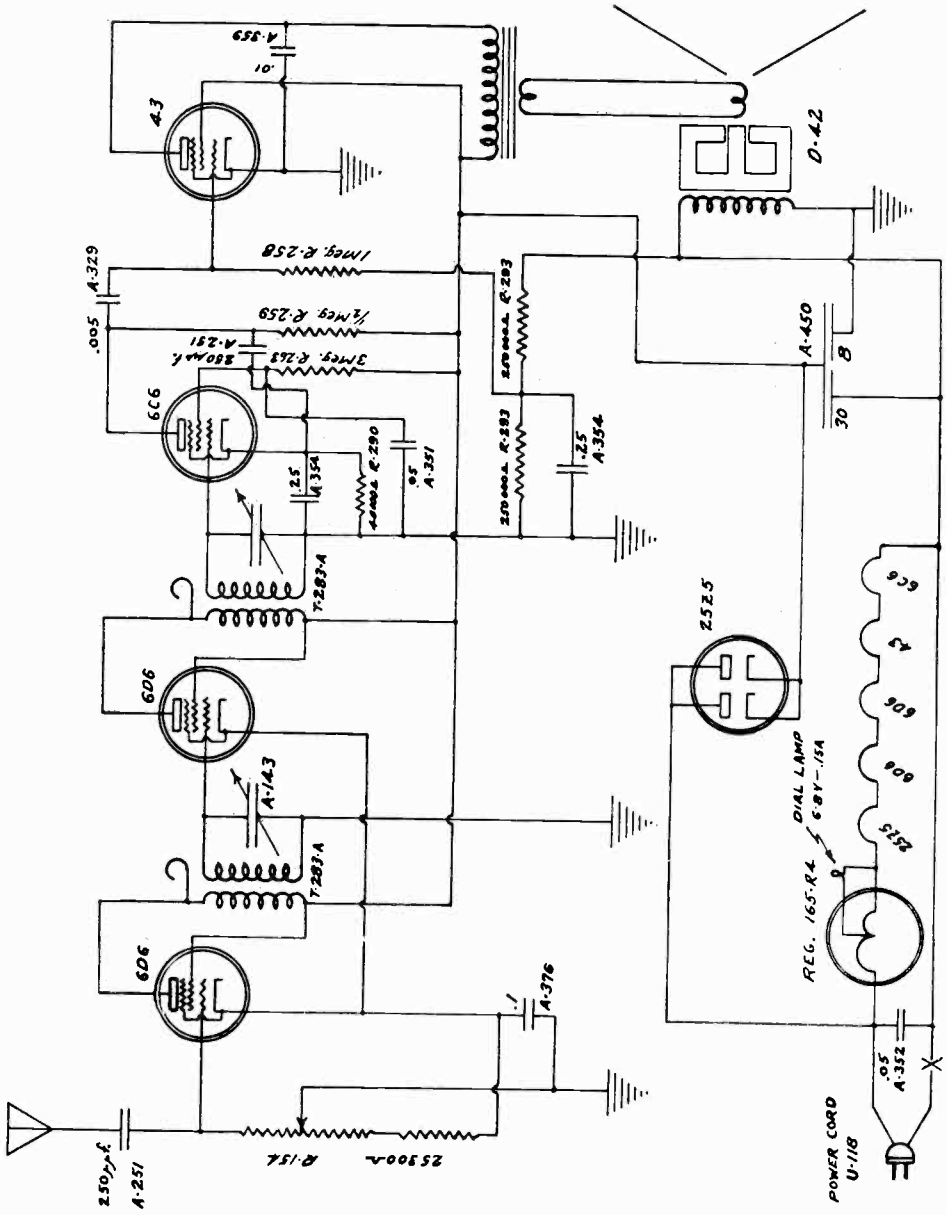
After checking the alignment at 1000 Kc. repeat the process at 600 Kc.

AVERAGE SOCKET VOLTAGES

TUBE	POSITION	E K	E G3	E G2	E P
6D6	Untuned R.F.	4	4	100	100
6D6	Tuned R.F.	4	4	100	100
6C6	Detector	2*	2*	5	20
43	Output	0	—	100	92
25Z5	Rectifier	100	—	—	115 A.C.

Line 118 volts. Volume control full on. 10% variation allowable. Measurements made from tube prongs to ground with 1000 ohms per volt instrument on 250 volt scale except figures with * which are on 50 volt scale.

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



INTERNATIONAL—MODELS 76 & 676

The Illinois State Police Radio System (Continued from page 12)

sages may be directed to mobile units at any time.

The State Radio stations will cooperate with city Radio systems, such as Chicago, St. Louis, Peoria, Springfield, etc., to the mutual benefit of all. In addition to this, the Illinois police stations will work with similar systems in our neighboring States of Indiana, Michigan, Wisconsin, Iowa and Missouri. Such cooperative activities will make the police forces of all states more effective.

Nation-wide Radio Network Planned

The Federal Communications Commission is laying out plans for a new Radio network which will link many of the large city and state Radio systems into a big nation-wide Radio hookup. Inter-city and inter-state police traffic will be handled over Radio channels provided by the Federal Communications Commission. Regular voice transmission will probably be used between nearby cities and adjacent states, but Radio code will be utilized for the exchange of a great deal of the traffic, especially between distant points. It should be explained that a CW or Radio code transmitter requires a band of frequencies only a few cycles wide, while a police voice transmitter requires a band 8,000 cycles wide. This means that a great number of police code stations can operate in the frequency channels required for

a single voice transmitter. Moreover, the code transmitter will cover from three to five times as much distance as the voice transmitter.

The Federal Communications Commission has already licensed several cities, including Indianapolis, St. Louis, Kansas City and Detroit, to use code transmitters for such police use. Regular schedules are now being maintained between these cities. The Federal Government realizes the many advantages of Radio in apprehending criminals and preventing crime. All states are being encouraged to install adequate police Radio facilities. Whenever the nation-wide network comes, the State of Illinois will be ready to embrace the opportunity to become a part of this most powerful and extensive law-enforcing agency.

Conclusions

The Illinois Police Radio System will be the most complete and the most extensive system in this country. It will combine more transmitters, more receivers, higher towers, more elaborate ground systems and more modern equipment than any other state system now in existence. When this Radio network has been installed and put into operation, the citizens of Illinois will be assured of the maximum protection and safety which such a system can provide. The people of Illinois will indeed be able to point with pride and satisfaction to this new Radio system.

— n r i —

Good Condensers Insure Transformer and Rectifier Life

Economies effected through the use of good condensers are more extensive than is usually appreciated, according to Charles Golenpaul of the Aerovox organization. "Good condensers last longer," he states, "so that when their cost is figured in total hours of useful service, they prove less expensive than the lowest priced condensers of questionable quality. Condenser cost, in the final analysis, should be figured on the basis of hours or days, months or years of service.

"Also, there is another and still greater factor of cost, and that is the wear and tear on power transformer and rectifier tube. A poor electrolytic condenser with a high leakage factor and slow forming rate, throws an undue strain on transformer secondary and rectifying tube. And when such a condenser breaks down, the transformer and rectifier may be ruined, representing a considerable loss.

"All in all, it pays to use dependable condensers, even though they may cost a trifle more at first."

Metal Tube Ballast Resistor Replacements

Still another line of handy replacement parts now appears in the form of metal-tube ballast resistors offered by Clarostat Mfg. Co., Inc., 285 N. Sixth Street, Brooklyn, N. Y. Having originated this type of voltage-dropping resistor and produced countless thousands for set manufacturers, this organization is now making available a line of replacement units.

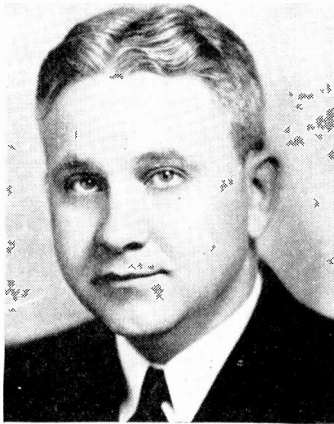
The requirements have been critically studied and reduced to the smallest number of different types to take care of the greatest variety of sets so equipped. A representative stock kit of twelve different types is proving popular with servicemen who wish to take care of most calls with a minimum investment.

— n r i —

Bad Turn

"How's your wife getting along with her driving?"

"She took a turn for the worse last week."



JOSEPH KAUFMAN

No doubt the reading of this article will bring many special problems to mind that cannot properly be discussed in the article. If you will acquaint us with them by writing the Consultation Department on the regular yellow Consultation Service sheets provided each student for the purpose, a specific answer to your particular problem will gladly be given you.

No practical Radio-Trician ever reads a complete circuit diagram of a receiver in order to make a single repair or adjustment; in fact, it would require many hours to study and analyze each separate circuit in a schematic diagram of a modern all-wave superheterodyne receiver. A Radio-Trician refers to a circuit diagram only to secure specific information concerning the one stage, or even section of a stage, which his experiments or tests have led him to suspect is defective; at other times he will use the circuit diagram to back up his "hunch" that the observable defect in the operation of the receiver can be caused by trouble in a particular part or stage.

Another important use for circuit diagrams is in supplying the electrical specifications for a certain part in a receiver; when the defective part has been located, but sufficient information does not appear on the part to make a correct replacement, the Radio-Trician turns to the circuit diagram for the required replacement data. Fortunately, the circuit diagrams now being prepared by receiver manufacturers give all necessary replacement parts information.

Before beginning the servicing of a Radio receiver, the Radio-Trician wants to know several things: whether the set in question is a superheterodyne of the broadcast or all-wave type or

Hints on Reading

By JOSEPH KAUFMAN

N.R.I. Director

a simple tuned R.F. receiver; whether the set is of the universal, A.C., D.C. or battery-powered type; what tubes are used in the set and what function each tube performs; and in general what kind of performance he can expect from the receiver. The experienced man can obtain much of this information simply by inspecting the receiver chassis; this ability is not hard to acquire if you first use circuit diagrams as your guide.

Identifying Receivers

You can identify a superheterodyne by the presence of I.F. coils on the chassis; the dial scale and the wave band switch are clues identifying an all-wave receiver: a set having a rectifier tube in the power pack but no power transformer must be a universal A.C.-D.C. receiver; if neither a rectifier tube nor power transformer is present, you know immediately that you have a line voltage D.C. receiver; batteries are a "dead giveaway" to a battery operated receiver; and so each chassis tells its own story, allowing you to identify the type of receiver at a glance.

Details of a receiver circuit are not, however, revealed by a simple study of the chassis; a circuit diagram and very often the chassis parts layout sketch must be studied to secure such information as how the various tubes are used; where the adjusting trimmers are and what they are for; and whether the receiver has such special refinements as AVC gain amplifiers, noise squelching circuits, automatic frequency control (A.F.C.), automatic base compensation (A.B.C.), etc. Some of these unique features can be determined by noting the action of the receiver. For instance, any one who has operated a receiver having AVC or AFC will know immediately whether these features exist in an unknown receiver.

Getting the "Lay of the Land."

Even though there is seldom any need to "read" more than one or two small sections of a circuit diagram, it is always wise to glance over the entire circuit to get a general idea of how the various sections are inter-related, or as some say, to get the lay of the land.

First of all, you can divide the receiver into three logical sections, namely: 1, the power supply system and its distributing network; 2, the signal circuit; 3, unique special circuits such as

Circuit Diagrams

KAUFMAN

of Education

AVC, etc. It is in this particular order that most Radio experts study schematic circuit diagrams.

1. Power Supply Circuits. First, then, you consider the power supply system. As you know, each and every tube in the set must be supplied with either A.C. or D.C. filament power; for example, in an A.C. operated receiver, the rectifier tube will have its own secondary winding for the filament, and the filaments of all other tubes will be connected together in parallel to the other low voltage secondary winding. Oftentimes the actual filament connections are not shown on a schematic circuit diagram, the secondary terminals of the transformer being indicated by letters or numbers and corresponding letters or numbers being shown at the filament terminals of each tube. For example, in Fig. 1 the two secondary terminals are marked *x y* and the filament leads of the type 58 tube are similarly marked, indicating that wire connections exist between corresponding letters.

You also know that the plate, control grid, screen grid and suppressor grids must be supplied with pure D.C. voltage; having located on your schematic circuit diagram the secondary windings of the power transformer, you can easily find the rectifier tube (we are still considering as our example an A.C. receiver, since this is the most common). You will find a network of filter coils and condensers connected to the high voltage secondary winding and to the rectifier tube; the field coil of a dynamic loudspeaker, which requires rectified A.C. current, may serve as one of the filter coils, thus doing double duty.

In the case of a full-wave rectifier, the center tap of the high voltage transformer winding serves as the negative terminal of the power pack; this is usually grounded to the chassis. The other power pack output terminal, which connects through the choke coils to the filament or cathode of the rectifier tube, is therefore the positive terminal. From these two terminals the filtered and rectified power pack output current is distributed to the various tubes and circuits; you may find a voltage divider connected directly across these terminals, but more often you will find voltage dropping resistors and voltage dividers scattered throughout the circuit and connected to individual tubes as in Fig. 1; in either case each stage gets its required voltage independently of the other stages. No matter what scheme is used, you can always trace a particular supply circuit by starting at the cathode of

the rectifier tube, going to the various screen grid and plate terminals of the tubes, through the tubes to the cathodes and from the cathodes to the mid-tap or to one terminal of the high voltage secondary winding. This procedure is often followed in actual servicing of receivers and transmitters, especially when it is found by test that a certain stage has abnormal supply voltages or no voltage at all. By referring to the circuit diagram and checking with an ohmmeter, it is generally very easy to locate the defective part.

2. Signal Circuits. Next come the signal circuits. You know that modulated R.F. current enters the set through the antenna circuit, where it is amplified by the R.F. stages; the second signal is then demodulated by the detector stage. The A.F. signal is amplified further until it has sufficient power to operate the loudspeaker. In a superheterodyne the signal is amplified by one or more R.F. stages, then fed, together with a signal from a local oscillator, to the first de-

(Page 18, please)

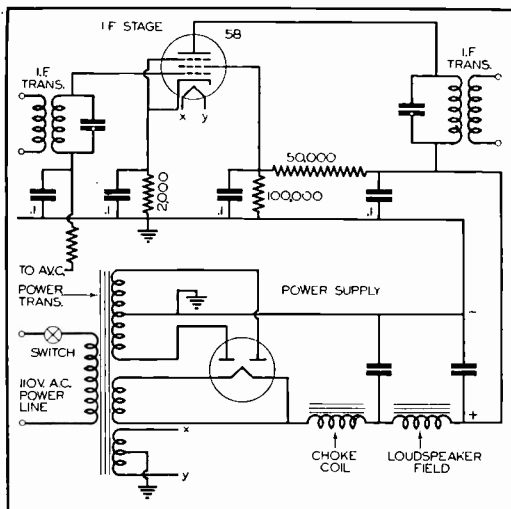


FIG. 1

Section of schematic circuit diagram of a typical superheterodyne receiver.

Hints on Reading Circuit Diagrams (Continued from page 17)

detector or converter tube, which lowers the carrier frequency to a definite fixed value known as the I.F. value. After passing through one or more I.F. amplifiers, the A.F. signal is demodulated by the second detector and the resultant A.F. is amplified by an audio stage, then fed to a power amplifier stage containing one or two tubes, before it is sent to the loudspeaker. Thus a complete chain of stages is formed, and naturally trouble is experienced if any link in the chain fails for any reason. There is usually no trouble in tracing through this chain, for it is common practice to draw the schematic diagram in such a way that the tubes follow in their proper order. Even though the tubes may not be arranged in this order on the chassis, the circuit diagram will be your guide in identifying each part.

The condensers, resistors and choke coils which are used to isolate electrically the signal and power circuits, keeping R.F. and A.F. signals out of the power supply system, seem to be the most confusing to a beginner attempting to read a circuit diagram. The better quality receivers use many filter condensers connected between the tube electrode supply terminals and the chassis or ground, and many resistors or chokes in the power supply leads; this is why the circuit diagrams and under-chassis connections appear so complicated. Once you realize the purposes of these by-pass condensers and filters, they will no longer confuse you when reading circuit diagrams.

The ability to understand the details of the various circuits which act upon the signal as it passes from one stage to another calls for a study of the fundamentals of receiving circuits; all the information needed is given in your Fundamental Course. Learn what could happen if any of these signal circuit parts were to become defective and you will be a Radio "Sherlock Holmes." Again the symptoms will give a clue to the defect.

3. *Special Circuits.* A schematic circuit diagram can be of great value to you in identifying unique circuit features. For example, the AVC circuit may start either as part of the second diode detector or as a special AVC tube connected to the output of the I.F. amplifier (in parallel with the second detector). The unique and easily identified discriminator circuit feeding back to the local oscillator in the first detector immediately identifies an AFC circuit; ABC (automatic base compensation) can be identified by the condenser and sometimes the coil connected to the volume control. Thus a knowledge of circuit characteristics is of vital importance in reading a circuit diagram.

Once you have learned to recognize the common schematic symbols used for tubes, coils, condensers, resistors, transformers, etc., it will not be long before you will be able to read a circuit diagram in terms of the parts themselves and tell how the circuit is going to behave when certain defects occur. Naturally all this takes study and experience.

Tracing Chassis Connections

The beginner who is making his first attempt at following circuits on an actual Radio chassis while using a circuit diagram as a guide often becomes quite confused. It is true that chassis connections are not as simple as they appear to be on the circuit diagram, for these diagrams are always drawn in the simplest possible manner, no attempt being made to conform them to the chassis layout; otherwise the tracing of schematic diagrams would be a real "headache."

Locating Trouble-Spots

Except for making a thorough inspection of a Radio chassis for loose parts and poor connections, the Radio-Trician makes no attempt to follow all of the circuits on a chassis as he might on a circuit diagram. Life is too short for this kind of play. The experienced man isolates the defective stage and part, then concentrates his efforts on this one section of the chassis. Sometimes the observable symptoms tell him where to look; he then locates the part in question on the circuit diagram, determines its position with relation to certain other parts, and looks for this particular combination of parts on the Radio chassis. For example, if he suspects a coupling condenser connected between the first A.F. tube plate and the grid of the second A.F. tube, he locates the tube electrode terminals on the circuit diagram and notes what other parts are connected to these terminals. In this way he can locate the proper terminals on the chassis without referring to a tube chart, and can thus locate the defective coupling condenser. Next comes a test of the suspected part; if it proves to be good, he must try another "hunch." In any case, however, these "hunches" are not based on wild guesses, but rather on knowledge and experience.

When the set is dead or the observable symptoms do not disclose the defective part, the wise Radio-Trician uses an isolation test to spot the defective stage. With a circuit diagram for reference, he checks the voltages and currents in the defective stage or checks resistances in the circuits of that stage. The circuit diagram tells him what parts will be encountered and what their electrical values are.

(Page 22, please)



RADIO-TRICIAN

REG. U. S. PAT. OFF.

Service Sheet

Compiled Solely for Students and Graduates

NATIONAL RADIO INSTITUTE, WASHINGTON, D. C.

INTERNATIONAL

MODELS 66X, 86 & 96

This chassis is designed to operate from 115 volt power lines, either alternating or direct current. It is a two band receiver covering the American broadcast and police and airport bands.

The following tubes are employed:

6D6—1st Detector-Oscillator

6D6—I. F. Amplifier

6C6—2nd Detector

43—Pentode Output

25Z5—Rectifier

165R4—Regulator

ALIGNMENT

ESSENTIAL DATA: The intermediate frequency employed is 448 Kc.

The standard type of output meter should be used to indicate signal strength. It should be connected from the plate of the 43 tube to ground.

Poor sensitivity may be an indication of incorrectly adjusted I.F. trimmers.

Aligning of Broadcast band should be done on 1400, 1000 and 600 kilocycles.

INTERMEDIATES: To align the I.F. circuits, set the signal generator to 448 Kc. and feed its modulated signal direct to the antenna. Adjust the first I.F. transformer trimmers for maximum meter reading. Go over both adjustments at least three or four times for accuracy. Repeat this process on the second I.F. transformer. If adjustments are not made accurately, selectivity will be poor and I.F. oscillation may result. Finally, adjust the trimmer in the tuned wave trap for minimum meter reading.

BROADCAST BAND: Place the band change switch on the Broadcast position. Turn the dial to 1400 Kc. and feed a very weak 1400 Kc. modulated signal from your signal generator to the antenna. Adjust the broadcast oscillator trimmer and detector trimmer (on condenser gang) for maximum reading.

There is no adjustable padder condenser in this model so resonance on lower frequencies is accomplished by bending plates on tuning condensers.

SHORT WAVE BAND: No alignment necessary.

AVERAGE SOCKET VOLTAGES

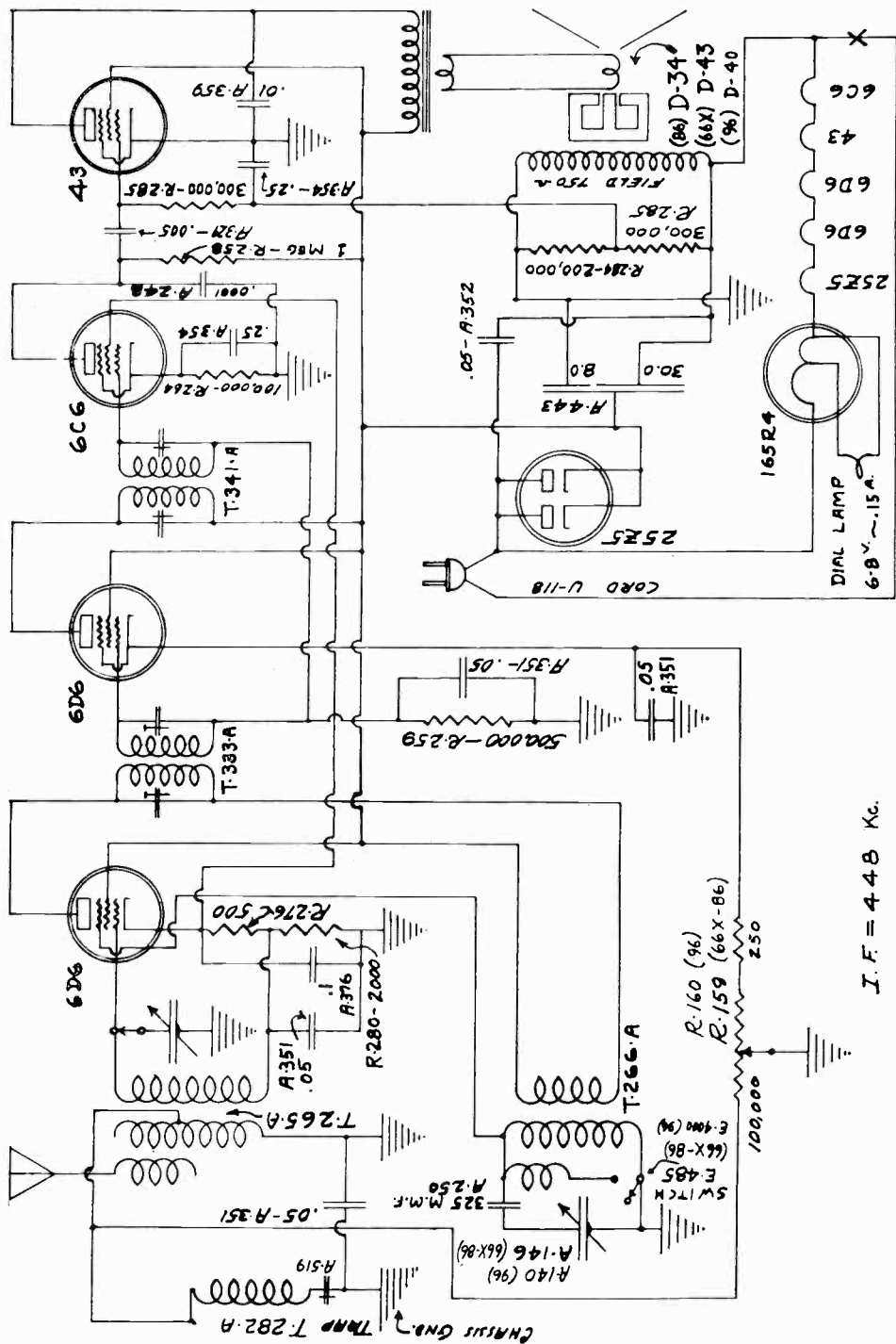
TUBE	POSITION	E K	E G3	E G2	E P
6D6	Det. - Osc.	14	0	100	100
6D6	I. F.	1	1	100	100
6C6	2nd Det.	2.5	—	14	25
43	Output	0	—	100	87
25Z5	Rect.	100	—	—	35

LINE 118 VOLTS. VOLUME CONTROL FULL ON. 10% VARIATION ALLOWABLE.

Measurements made from tube prongs to circuit ground.

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

INTERNATIONAL—MODELS 66X, 86 & 96



I. F. = 448 Kc.

Opportunity

A Talk Given on the Ford Sunday Evening Hour

By W. J. CAMERON

(Courtesy of the Ford Motor Company)

There is a good old word that has been badly abused by our muddled thinking, but a word that manages to survive, and is certain to recover its former standing. That word is opportunity. It means the port or the opening or the door that stands opposite you, and of course anything to be opposite you must be directly before you. The best observers and interpreters of life have added the sense that always there is such a door, and that it is accessible.

In this latter sense opportunity has met much recent challenge. There are many who say it no longer exists. Mostly they mean, we may suppose, that the door that now stands opposite them, the door at present accessible to them, is not the door they want. They thought opportunity meant a big door, or at least an inviting door; and this present one may be small and plain, a side door or even a back door; and because they do not understand that this is *their* door, they say there are no doors, no opportunities. That is one mistake we make. A thousand doors may be closed, *our door is the one that stands open*, providing nothing dishonorable is on its threshold. That it is a plain and humble door makes no difference whatever; every door, big or little, opens upon the same wide world of possibilities, and every career will stretch or shrink to the size of the person who makes it.

We mistake once more when we think that given the opportunity, that is all we need. But opportunity has been the ruin of many. Opportunity is a day of judgment. It is to be regarded with respectful deference, for every opportunity is a test. Far sterner than what a man may require in his opportunity is what the opportunity may require in the man. There are three kinds of opportunity.

There is first *the opportunity that makes you*. Everyone has that. In youth it is the opportunity to learn. The boy or girl asks: "What good is all this stuff going to do me?" None can answer that but you. We can only say that it took mankind a thousand years to learn *this* thing, and if you learn it now you are richer by a thousand years; it took mankind 100 years to learn *that*, and if you learn it now you can start abreast of your times. If not, how and when do you expect to catch up? There's not a single fact you learn or a tiny discovery you make today that may not stand forth—even a quarter of a century hence

—as the very thing you need in some crucial hour. The days and all their duties are full of the sort of *opportunity that makes you*.

Then, there is the *opportunity that takes you*. When you talk with great and useful men to learn how they became what they are, you will discover that it is just as much a mystery and surprise to them as to anyone else. They thought they knew what they wanted to be, but a petty incident, identifiable only in the afterlook, suddenly turned them into another path. And there they are! Few persons choose their jobs; the job reaches out and chooses them. But it chooses them at the level of their preparation. Some young people have not the remotest idea what they are going to be, and there need be no anxiety about that. Neither did the present leaders of the automobile world know what they were going to be—there were no automobiles when they were growing up. They thought they were going to be this or that, but along came the other thing. Neither did the leaders in the electrical, or chemical, or aviation or Radio worlds know what their life work would be—these things could not be chosen because they did not exist; a man could not prepare for them, he could only prepare to do whatever life might ask him to do. And most of you, my young friends, are going to engage in work that has not appeared yet. But get ready. Look ahead 20 years. Try to see what *ought to come* in the world of housing, transportation, heating, banking, literature, farming, education, merchandising, journalism, drama—anything, and prepare for anything! Acquire all possible equipment, none of it will come amiss, and you will be ready *when opportunity takes you*.

If you do this you need have no fear of the third kind of opportunity—*the opportunity that breaks you*. The worst thing that can happen to some men is to get a promotion—they are not ready for it. Many a young fellow can sell himself, and when he has done that he is through—he has nothing more to deliver. His opportunity is his defeat—he was not ready. He did not invest in himself. Serious thinking was too hard on his head. Good books required too much of his time. He wants to be a passenger in the boat of life, but pulling his own weight blisters his hands. He knows how to arrange his hair but not how to

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Hints on Reading Circuit Diagrams (Continued from page 18)

Missing Connections. Many beginners become confused because a circuit diagram may show a wire connecting two, three or even more parts, whereas on the Radio chassis no such wire is present. Parts are often mounted close together so no interconnecting wires are needed, or are connected in a different order from that shown on the schematic diagram. As an example, the circuit diagram always shows the rotors of the gang variable condensers connected to ground; in the Radio chassis, however, the act of bolting the condenser to the chassis frame provides this connection. The connecting together of two terminals with a wire in a schematic circuit diagram merely indicates an electrical connection between the two points; do not always expect to find a wire connection on the chassis. You will get along much better if you simply use the

circuit diagram to tell you what electrical connections should exist and not how the various parts are connected. Fig. 2 shows a practical connection of parts; compare it with Fig. 1.

Some circuit diagrams give valuable additional information, telling what voltage you may expect with reference to the negative plate supply terminal at various points in the chassis, telling the color of the various leads to help you in locating connections, showing socket connections, etc. Always make use of these aids to speedier servicing.

Once you get the "knack" of tracing circuits in suspected regions of an actual chassis, using a circuit diagram as a guide, you will find that tracing chassis connections becomes an automatic process. Experience will prove a valuable teacher.

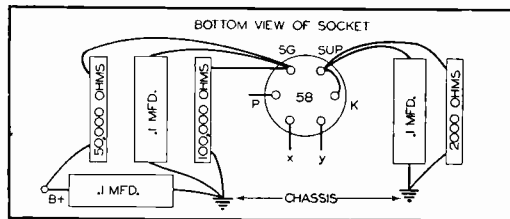


Fig. 2. Quite different from the schematic circuit diagram is this actual connection diagram, showing a few of the parts which are connected to the type 58 tube in Fig. 1.

— n r i —

Two New Handy Resistor Containers by IRC

Realizing that most servicemen face a problem in keeping a complete stock of resistors, the International Resistance Company, Philadelphia, Pa., announces two handy new containers known as IRC Resistor Kits No. 10 and No. 12.

These are attractive boxes with slide trays containing IRC Insulated Resistors in ranges for which there is frequent need. Hundreds of additional values may be obtained by combining these resistors in series or in parallel. Thus, a few of these handy new IRC Kits provide the most convenient, most accessible and most compact means for keeping resistors for almost any low wattage requirement.

Kit No. 10 contains a convenient assortment of ten 1-Watt (Type BT-1) IRC Insulated Metallized Resistors.

Kit No. 12 is similar to No. 10 except that it is proportionately smaller in size, containing ten ½-Watt (Type BT-½) IRC Insulated Metallized Resistors. This Kit will come in particularly handy in the servicing of midget receivers inasmuch as these IRC Resistors can be used universally for dependable service wherever the circuit calls for ¼, ½ or 1-Watt Resistors. There is no additional charge for the Kit itself.

Moisture and Wire Insulation

The greatest change in the moisture content of wire insulation occurs within the first 24 hours of exposure, reports the Boonton Radio Corporation engineering staff. This makes it possible to obtain excellent comparative tests in a 24-hour period, or even less time.

Enamel insulation shows a relatively small drop in insulation value, or from a Circuit Q of 225 to slightly under 200 in 24 hours, with very little further drop. Silk insulation drops from 190 Circuit Q to 110 in 24 hours, and on down to 70 in 120 hours. Cotton insulation in a few hours drops from 165 to 10 or less.

Test samples of the three types of insulation were made by twisting together pairs of the same wire about 4 inches long for about half their length, leaving 2-inch leads for connecting across the measuring circuit of the Q-Meter. These twisted pairs formed small condensers having a capacitance of a few micro-micro-farads, most of which was in the insulation. The capacitances were adjusted to the same value by clipping off the twisted ends. Test samples were measured at room conditions, then placed in a small desiccator cabinet in which the air was maintained at 90% humidity. After suitable intervals, the samples were removed one at a time, and measured at once.

Novel Radio Items

—BY L. J. MARKUS—



RADIO SHOOS RATS! A farmer in Denmark, greatly annoyed by the presence of a large number of rats on his farm, installed Radio loud-speakers in each barn and stable and kept them going regularly night and day. In a few days all rats had disappeared.

Attention, "Would-Be" Announcers!

Applicants for announcing jobs at Radio Station WSM decide for themselves whether they qualify. The "would-be" announcer stands in front of a recording microphone and reads a standard test paragraph. If the applicant still wants to be an announcer after listening to this recording, he is given further tests, but few applicants ask for more.



CRICKETS SILENCE P.A. SYSTEM! The habit of climbing up everything in sight cost many crickets their lives at the recent Texas Centennial Exposition. Climbing inside sound pylons, the crickets formed short circuits between high voltage terminals and ground, blowing the power supply fuses. Only crisp hollow shells of crickets were left.

BATTERY PROBLEM: If there are 70 standard No. 6 dry cells in the giant battery described on this page, how are the cells connected together? Readers who send the correct answer to the Editor before Feb. 20 will have a chance to win one of the following prizes: 1st prize—one high quality electric soldering iron; next 15 prizes—spin-type socket wrench sets. Judging is based on accuracy and neatness; in case of ties, duplicate prizes will be given.

Phonograph Needles Grow on Trees!

The Hawaiian *Kiawe* tree grows thorns which are almost perfect substitutes for phonograph needles. One of these trees in the backyard of Radio Station KGMB of Honolulu provides a more than adequate reserve supply of needles.

—n r i—

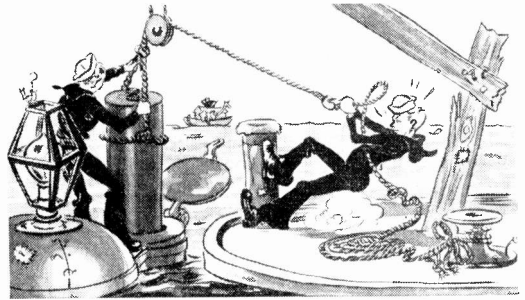
Sun Operates Radio Amplifier!

The rays of the afternoon sun in the Nation's Capital provided sufficient power to operate a portable audio amplifier used by Station WMAL. The sun power machine, developed by Dr. Abbott of the Smithsonian Institute, focuses rays of light from the sun on to a slowly moving stream of a mysterious black liquid, raising the temperature of the liquid to about 400° C. This hot liquid is passed through a boiler, where it generates steam to operate a midget steam engine which in turn drives a D.C. generator connected to the Radio system.

—n r i—

Typing Through the Air!

Radio typewriters, on which you can type messages which will be reproduced perfectly on any number of similar machines hundreds or even thousands of miles away, have now been perfected.



BEACONS USE GIANT DRY BATTERIES! Dry batteries as tall as an average man are being made by Ray-O-Vac Co. for beacons used on the Mississippi River. Each giant battery weighs about 135 lbs. and has a voltage output of 7½ volts. One unit will operate a flashing beacon lamp continuously for over a year.



N.R.I. ALUMNI NEWS

P. J. Dunn President
Earl Bennett, Clarence Stokes Vice-Presidents
R. H. Rood, F. E. Oliver Vice-Presidents
Earl Merryman Secretary
Louis L. Menne Executive Secretary

1937 Alumni Election Results!

President—P. J. DUNN

Vice-Presidents—EARL BENNETT, C. STOKES,
R. H. ROOD, F. E. OLIVER

Secretary—EARL MERRYMAN

Executive Secretary—R. B. MURRAY

The 1937 Officers are elected. P. J. Dunn, National President, has been re-elected for the third term. His popularity among the Alumni members is not undeserving.

Dunn deserves a lot of credit for the fine work he has done for the Association. For several years he was Chairman of the Baltimore Chapter where his ability as an organizer was demonstrated. We know he will carry the Association on to new achievements during 1937.

It must be admitted, however, that L. J. Kunert, opposing candidate, gave him a rather stiff fight in the New York area where he resides. Mr. Kunert is a swell fellow and would no doubt make a fine National President.

Mr. Kunert has demonstrated his ability as an Officer of the New York Metropolitan Area Chapter. We will say that Mr. Kunert is an all-around good fellow and sincerely hope he is again in the running in the next elections.

Both Earl Bennett and Clarence Stokes have been re-elected as Vice-Presidents. They were overwhelmingly voted back in office. Both of these gentlemen had strong support from their respective Chapters in Chicago and Philadelphia.

"Ed" Myer and Witherstone lost out to two new members. R. H. Rood of Los Angeles, California, and F. E. Oliver, of Detroit, Michigan.

We are looking forward to seeing some real "pep" from these two new Officers. While these men

are in far-distant parts of the country, the information they can send Headquarters on current Radio problems will help to serve our members better in all sections of the country.

R. H. Rood is employed by the City of Los Angeles in a Radio capacity. F. E. Oliver is an active member of the Detroit Alumni Chapter. National Headquarters for the entire membership wishes them well and a great measure of success in their new offices.

It seems as though this fellow Earl Merryman certainly does not know what the word defeat means. He has been re-elected for the seventh term of office. Mr. Merryman, who was formerly with WRC, the NBC outlet in Washington, is now connected with Station WJSV, Alexandria, Virginia, which is one of the CBS Stations covering the Washington area.

"Bob" Murray was also re-elected to serve the Association as Executive Secretary for the year 1937. Mr. Murray recently returned to National Headquarters from a trip to the Chicago and Detroit Chapters. In these cities he gave a talk on the "Business Side of Radio." Unfortunately, he will no longer be able to serve as an officer of the Association (see page 28).

The Alumni Association wants to thank the former Officers of the Association for their fine work in helping to develop this fine organization. Now that the elections are over, we are all looking forward to a mighty busy year.

Building Your Business on the Square Deal

With the new year ahead, it behooves Radio service men to consider seriously the ethical side of Radio. Fair prices and honest service go hand in hand with business success, we will all no doubt agree. So it is with pleasure we reprint excerpts from an article on the subject written in the 1932 Alumni Yearbook by Hoyt Moore, former Vice-President of the Association.

We are the first and only known association of the Alumni of a home study school. Since we own that distinction let our Association also be individual in the fact that we, as a body, build our businesses on the principle of the square deal.

The engineering and manufacturing of Radio receivers is, of course, the first step in the great business of Radio. This, however, does not complete the job, since the millions of receivers which are sold to the public must be kept in first-class operating condition.

Servicing and Merchandising of Radios is the business in which a large number of our National Radio Institute graduates are vitally interested; it is a branch in which I am vitally interested, and hence my reference to it is particularly important.

One of the first requisites of a good service man is a thorough understanding of the underlying principles of Radio. This, members of our Alumni Association, have gained through our Course of study with our Alma Mater, the National Radio Institute. Unless a service man has this underlying foundation, he has the same right to tamper with an expensive Radio receiver of a customer as the plumber to perform an operation for appendicitis.

It isn't necessary to enter into a discussion as to "Whether the Customer is Always Right." Bigger firms than any of us may ever expect to own, claim that the one secret of the success of their business was that very slogan.

I have always made it a policy never to charge a cent unless my customer is absolutely satisfied. Surely, I have lost money in some cases where an unscrupulous customer saw an opportunity to get a lot of free service. Let us be thankful that the great majority of the American Public is honest and loves fair play; therefore, that kind of customer is in the very small minority. Instill confidence in your customer; answer his questions frankly; be strictly honest in all of your dealings with him.

Rather than deal in lengthy uninteresting gen-

eralities, I am going to tell of a few personal experiences to illustrate my point.

I was called upon to service the power supply of a set which belonged to an old customer of mine. After preliminary examination, I told the gentleman I was satisfied that there was a broken-down condenser in the unit. After figuring the price of the replacement of the condenser, I was told to take the unit and proceed with the repair. Upon opening the unit I found that while my analysis was correct—there was a bad condenser—there was an extra condenser in the condenser bank which had not been used. All I had to do was switch a wire from the bad condenser to the good one and the unit was ready to go. Now I had given this gentleman a price on a new condenser, plus the labor and service charge. How easy it would have been to keep still about the whole matter and sell him his own condenser back. I returned the unit and explained in detail exactly what I had done. Needless to say, he was extremely pleased.

A friend of mine, who is in the Radio service business, told me of a case somewhat similar. A customer of his not being able to get in touch with him called another service man. When the man arrived, the lady explained that the set was dead—when she turned on the switch the dial and tubes failed to light up. The man checked the set and told the lady the power-transformer was burned out, that it would be necessary to take the set to his shop and quoted a price of \$8 for the installation of the transformer and 50 cents for the service call. She said she would consult her husband. The service man went away and waited to be called.

A few days elapsed. As the repair of the set was going to be rather expensive the family decided not to take any immediate action. In the meantime, my friend returned to the city and dropped in on this family for a friendly call. He remarked to the lady that he had never been in her home before when the Radio wasn't going. Whereupon the lady explained their predicament. My friend walked across the room and inserted the plug which had been pulled out of the receptacle by the lady when she moved the Radio in cleaning. The set began to play okay. Nothing in the world had been wrong with it except that it was disconnected accidentally.

Ninety-nine chances out of a hundred, if that set had been taken away it would have been allowed to stay on the shop shelf for a few days when it would have been returned and \$8.50 collected and the service man would have considered himself that much ahead.

(Page 28, please)

Chicago Chapter



On his Chicago trip and for his talk at our meeting, our National Executive Secretary, R. B. (Bob) Murray, chose for his subject a phase of the Radio servicing profession which has all too often been neglected.

The average Radio-Trician is a technically minded man who is interested in learning all he can about the inside of receivers and what to do when they fail to function properly. There is much for him to learn, and when he finishes a Radio Course he realizes that his education along the technical lines has just begun. Every set manufacturer has a staff of engineers who are constantly devising improvements as a Radio serviceman must keep up with all of them to be able to give satisfactory service.

It is not sufficient merely to be an expert technician and able to do a difficult service job in a profitable manner. One must have the service jobs before he can do them. Salesmanship is the determining factor in the success of any business, Radio servicing is no exception. It makes no difference whether the serviceman handles new receivers or not, he is selling service, just as much a commodity as a new receiver. Local conditions must determine just what type of advertising is most effective, but regardless of conditions there is some type which will fill the bill and the serviceman must be business-minded enough to find which plan will be most effective.

The majority of set manufacturers realize now that the serviceman is the most important cog in the machine, and many of them have spent considerable time and money in helping him along these lines. They have contacted successful servicemen all over the country and compiled booklets and pamphlets showing how it is done; how business is procured, types of advertising which has proved effective under every conceivable condition; the approach, doing a satisfactory piece of work; keeping the customer satisfied; books and records; calculating overhead and operating expenses; figuring charges for service; collections—every phase covered by some one who has successfully solved the problem.

The lecture by "Bob" Murray was of necessity confined to generalities, but we believe the boys have a little better realization of the importance of the business side of the industry.

Joseph Balsamello was scheduled for a lecture at another meeting, but for some reason failed to appear, so Bennett stepped in with another of his informal talks on time saving repairs on various makes and models of receivers. He has devised a filter which he claims will positively eliminate cross-talk and oscillations and showed how it was constructed. We haven't seen it tried, but Ben has been using it for some time, and if he says it will work we'll bet it will.

Diekten was back after an absence of several months and obliged us boys with a short talk on servicing Silvertones. Being connected with a large chain of stores handling this make he is thoroughly familiar with all models and really had something to say.

Something is going to have to be done about Lewandowski. This fellow walked off again with the prize. This time a Philco tool set donated by N.R.I. It's getting to be a habit with him; no wonder he hasn't missed a meeting this year. Quite a number of new N.R.I. men were present at recent meetings and several of them signed up for membership in the Chapter while several others said they would join in the near future. Those who signed were:

Eugene A. Dorgan
Thomas Lackner
Albert Kapherr
Angelo Cantele

Come on down and let's give the new members a royal welcome, boys; we're glad to have them.

Meetings are held the first and third Friday of every month at the Sherman Hotel, Chicago.

— n r i —

Directory of Chapters

- Baltimore—I. A. Willett, Secretary, 2411 Arunah Ave., Baltimore, Md.
- Philadelphia-Camden—Clarence Stokes, Treasurer, 3347 N. Front St., Philadelphia, Pa.
- New York—L. J. Kunert, 66-11 74th St., Middle Village, L. I., N. Y.
- Buffalo—T. J. Telaak, Chairman, 657 Broadway, Buffalo, N. Y.
- Toronto—Ed. Witherstone, Secretary, 363 Nairn Ave., Toronto, Ont., Canada.
- Chicago—Samuel Juricek, Secretary, 4223 N. Oakley Ave., Chicago, Ill.
- Pittsburgh—Albert Maas, Secretary, 9 S. Howard Ave., Bellevue, Pa.
- Detroit—F. E. Oliver, Secretary, 218 Alter Rd., Detroit, Mich.

STEWART WARNER INTERMITTENT MODEL 1121

This defect is often caused by the output transformer. A check with a pair of headphones across the primary and secondary of the transformer will enable you to identify the transformer as an offender. A factory replacement part is advisable.

— n r i —

STEWART WARNER MODELS 801, WEAK 801A, 811, AND 811A

This is generally due to failure of the 100,000 ohm detector plate resistor. This resistor is located under the front of the bottom resistor assembly strip.

— n r i —

STEWART WARNER OSCILLATION MODEL 800

Ninety-five percent of this trouble is these receivers can be cured providing that no other trouble occurs. Obtain a stiff piece of wire and bend a right angle hook on it. Insert the hook under the antenna coil through the speaker jack opening and pull it to a position where the set stops oscillating. This work must be done with the outside case on the chassis plate, the coil being located under the rear left-hand corner of the set facing its tuning control. When the antenna coil is correctly centered, oscillation will stop.

— n r i —

PILOT MODEL 93 OSCILLATION

This condition accompanied by symptoms of misalignment is often due to a defect in the three section .1 microfarad condenser unit located below the 170 ohm filament resistor. Excessive heat sometimes causes the block to open and in some cases intermittent reception may occur.

— n r i —

PILOT MODEL 43 IMPROVING VOLUME CONTROL

A considerable improvement in the volume control action can be accomplished by connecting the detector screen bleeder resistor to ground instead of the R.F. cathodes and by substituting a 10,000 ohm resistor for the original control. Should the change result in oscillation, the volume control should be set for 100 or 200 ohm minimum.

— n r i —

PILOT MODEL 31-81 INTERMITTENT

Replace the 10,000 ohm resistor in the cathode circuit of the detector oscillator with a 6,000 ohm one-watt resistor. The use of a lower resistor will make it easier for the oscillator to operate at the low frequency end of the dial and stoppage of the oscillator should cease.

PILOT MODEL 10 EXCESSIVE HUM

Check for a short between the reflector mounted behind the pilot light and the chassis. The reflector is electrically connected to one side of the filament winding and a sharp corner of the reflector may pierce the fibre insulation, resulting in a short circuit.

— n r i —

FADA I. F. PEAKS

The I.F. peaks for a number of popular Fada receivers are as follows:

MODEL NA 265 kc.	MODEL RN 470 kc.
MODEL NE 265 kc.	MODEL RP 175 kc.
MODEL RA 175 kc.	MODEL RS 470 kc.
MODEL RC 175 kc.	MODEL RU 265 kc.
MODEL RE 175 kc.	MODEL RV 175 kc.
MODEL RG 175 kc.	MODEL RW 265 kc.

— n r i —

FADA FLASH-O-GRAPH

If action is only observed on very strong signals, connect a 1 microfarad 600-volt condenser from one side of the flash-o-graph to ground. This condenser is to be connected to the side opposite to the control. This connection will enable you to turn the control all the way on and the flash-o-graph will then work on all signals without interfering with the operation of the set.

— n r i —

FADA MODELS 40, 41, 42, 44, HUM 46 AND 47

Connect a 2 microfarad non-inductive paper condenser rated at 200 volts from the cathode of the 27 type detector amplifier to the chassis.

— n r i —

FADA MODELS 25 AND 25Z FRYING NOISE

This is often due to a partial short between the windings of the first A.F. transformer. Replacement will clear up the trouble and it can be isolated by means of testing before and after the stage with a pair of phones.

— n r i —

CROSLEY MODELS WEAK AND NOISY 170 AND 171

Replace the .0005 microfarad condenser in series with the antenna coil.

— n r i —

ECHOPHONE MODEL S-5 DEAD

Remove the cardboard cover from the coils at the end of the chassis. Move the coils close together, maintaining an angle of 90 degrees.

— n r i —

ECHOPHONE MODEL S-4 WEAK AND DISTORTED

If this action occurs, check the 1-megohm resistor on the panel at the rear and underneath the chassis. This resistor is in the detector screen grid circuit. A 2-watt resistor can be employed.

(Page 29, please)

Detroit Chapter

While all of the details have not been worked out as yet, we are planning on electing an entire new set of officers. We are a little late in getting started, but the next issue of NATIONAL RADIO NEWS will carry the complete story.

F. E. Barlow, the present chairman, is resigning—a successor will be appointed shortly. The Detroit Chapter reports that they want to give the other fellows an opportunity to operate the Chapter and get some very valuable experience in administration work.

At one of our recent meetings, we had the pleasure of a visit from our National Executive Secretary, R. B. Murray, who gave a talk on the business side of Radio. We sincerely hope he had a pleasant stay here in Detroit, and we hope he will have the opportunity of visiting us again soon.

We are continuing our plan of having our own members prepare talks on interesting subjects for each meeting. In the first place, it gives the members selected for the talks wonderful experience in gathering data on certain subjects. It gives the other members the opportunity of hearing these lectures, which are very beneficial, but what we believe is the greatest advantage—it teaches our members self-confidence and gives them an invaluable public speaking training. Meetings will continue to be held at 11305 Woodward Avenue, Detroit, Michigan. These meetings are held on the second and third Friday of every month.

— n r i —

Building Your Business on the Square Deal

(Continued from page 25)

That type of service man is found out sooner or later—he soon loses his reputation and his customers. It will be found that good, conscientious service at a reasonable charge makes the greater profit in the long run. Let every one of us in the N.R.I. Alumni Association operate our business on the lines of proper service and proper charges. Let's give our public a square deal.

— n r i —

Directory of Officers

(To Serve Until January, 1938)

President—P. J. Dunn, Baltimore, Md.
Vice-Presidents—Earl Bennett, Evanston, Ill.
R. H. Rood, Los Angeles, Calif.
F. E. Oliver, Detroit, Mich.
Clarence Stokes, Phila., Pa.
Secretary—Earl Merryman, Washington, D. C.
Executive Secretary—L. L. Menne, National Headquarters, Washington, D. C.

Page Twenty-eight

R. B. Murray Resigns Post

It is with sincere regret that we announce the resignation of R. B. Murray as Executive Secretary of the N.R.I. Alumni Association. "Bob," as he has been affectionately known to many hundreds of Alumni members, has faithfully served the national organization first as assistant Executive Secretary and later as Executive Secretary.

He has visited Alumni members in various parts of the country, and given them personally the benefit of his advice and experience. To Bob's untiring efforts, the present close cooperation existing between the national organization, local chapters, and individual members may be said to be due.

Although we are all sorry to see R. B. Murray leave, it is gratifying to know that he is taking a position which will give him more opportunity to put to use his many talents. Best wishes for the success which you richly deserve, Bob! We hope and trust that you will not forget your many friends in the N.R.I. Alumni Association.

We have been fortunate in securing the services of Mr. L. L. Menne to carry on the work so ably started by P. J. Murray and continued by R. B. Murray. Knowing well that the success of the whole national organization depended upon the energy and efficiency of the national secretary, we feel that President Dunn has made a most fortunate choice in appointing Mr. Menne as Executive Secretary for 1937.

Mr. Menne comes to the N.R.I. Alumni Association eminently well fitted for this most important position. He is a man who has had thorough training and wide experience in the business world as a leader, executive and organizer. He has made a thorough study of the peculiar problems confronting the graduates of the National Radio Institute who have joined together for self-improvement and the betterment of conditions for the Radio man. Undoubtedly he will have many splendid suggestions for the improvement and strengthening of the Association.

Every clear thinking Alumni member realizes that our job has just begun. A great deal of good has been done, but much more remains to be accomplished. What is needed is an even closer cooperation among members with the national organization and with each other, for the common welfare of all.

Let us start by giving Mr. Menne the help and encouragement he needs to carry on this splendid work—the sincere promise of each and every Alumni member that he will work wholeheartedly for the success of the organization.

EDISON MODELS R4, R5 AND C4 WILL NOT NEUTRALIZE

If you find it impossible to neutralize the first R.F. stage, check the .1 microfarad condenser in the cathode circuit of the first R.F. tube. Substitution of another condenser will show if this one is open. When any neutrodyne set will not neutralize, look for the usual causes of oscillation such as open by-pass condensers, open bleeder resistors, etc.

— n r i —

EDISON MODELS R4, R5 AND C4 NOISE

If the setting of the volume control has no effect on the noise, the detector plate choke is usually at fault. The wires from the choke partially ground to the case. An 85 millihenry choke will prove a satisfactory replacement, although the set may work satisfactorily with the choke removed.

— n r i —

EDISON MODELS R-1, R-2 AND C-2 INTERMITTENT

This is generally due to a poor connection in one of the R.F. condenser cases. Pulling on the leads or pushing on the case will usually show up the defect and the condenser can be replaced with another.

— n r i —

MIDWEST 16 TUBE DISTORTION AT RESONANCE

This is caused by lack of AVC action and is generally traceable to improper alignment of the AVC amplifier transformer. The trimmer for this transformer should be aligned when tuned to a fairly strong station for clearest output—not greatest volume.

— n r i —

MAJESTIC G2 TUBE

This tube and the G2-S tube is a diode employed as a second detector and AVC. It can be replaced with a standard 56 or 27 type tube. The same applies to the Majestic G4 and G4-S tube.

— n r i —

MIDWEST 16 TUBE DISTORTED ON PHONOGRAPH

Replace the cathode by-pass condensers on all the audio tubes with 10-microfarad 25-volt electrolytic units.

— n r i —

MAJESTIC MODEL 520 INTERMITTENT

This is oftentimes caused by stoppage of the oscillator. If a 2-volt storage cell is used the trouble may be cured by shorting out the resistor in the A minus lead. The application of slightly more filament voltage allows the tube to oscillate all over the dial at all times.

— n r i —

MAJESTIC MODEL 460 DEAD

When this condition occurs with no voltage on the plate of the detector oscillator, check for

an open in the primary of the first I.F. transformer. Lack of voltage on the plate of the I.F. shows an open in the primary of the second I.F. transformer, while lack of R.F. screen voltage is caused by an open in the end section of the Candohm voltage divider farthest from ground. A 10,000 ohm resistor should be used as a replacement. Excessive voltage throughout the set is caused by an open in the next section which has a value of 9,000 ohms. Lack of B voltages throughout the set is usually due to a shorted 16 microfarad electrolytic condenser mounted on top of the chassis.

— n r i —

MAJESTIC MODEL 400 WEAK

Check for an open in the speaker field by noting the pull on a screw-driver held near the speaker pole before and after the set is turned on. Lack of pull or increased pull when the set is turned on indicates an open at this point, and if the break is at one end of the field it is oftentimes possible to unwind a few turns and replace the field.

— n r i —

GENERAL ELECTRIC MODEL M-61 INTERMITTENT

Due to an open in the .02 microfarad 600 volt coupling condenser located at the bottom of resistor mounting board at back of set. Pulling and shaking with long nose pliers on the condenser leads shows up trouble.

— n r i —

PHILCO MODEL 20 OSCILLATIONS

If none of the usual cures are effective, try bypassing both sides of the R.F. filament circuit, at a tube socket, to the chassis with .05 mfd. 200 volt condensers. The trouble, due to opening up of the filament center tap, is thus easily solved without replacement of the power transformer. The open circuit allows the filament leads to conduct R.F. energy from one stage to another and this feed-back results in violent oscillations.

— n r i —

STEWART WARNER MODELS 1181, 1182 DEAD

If the receiver is completely dead or if there is a faint signal due to strong local stations, look for an open coupling condenser connected to the slider arm of the volume control.

— n r i —

STEWART WARNER MODEL R100 OSCILLATIONS

This is often due to a change in value or an open in the orange resistor located in the center of the resistor mounting strip. The resultant high voltages cause oscillations and a generally unstable condition. Replace with a 20,000 ohm two-watt unit.

Philadelphia-Camden Chapter

A letter was recently received from the new Chairman, Mr. Joseph M. Helmig, informing National Headquarters that new Officers had been chosen to operate the local Chapter for 1937.

Here is the result of their election:

Chairman—Joseph M. Helmig.
Vice-Chairman—James Mooney.
Recording Secretary—James Hornbrook.
Financial Secretary—Joseph Keenan.
Treasurer—Clarence Stokes.
Sergeants-at-Arms—Adolph Zeinter, Charles Spurdens.
Librarian—Alfred Wyszczanski.

Here's wishing the best of success to these new Officers. National Headquarters is looking forward with keen interest to the next issue of the Chapter's magazine "*Phil-Cam Key*." We find this publication mighty interesting—it is one of the liveliest papers published by Local Chapters at the present time.

Students and graduates living in the Philadelphia-Camden area should make every effort to attend meetings and take part in the splendid activities of this progressive Chapter. Here is your opportunity to hear good Radio speakers, increase your fund of Radio knowledge and get the very most out of our association with the National Radio Institute. Meetings are held twice a month. Write Mr. James Hornbrook, 555 East Van Kirk Street, Philadelphia, Penna., for full details of Chapter activities.

— n r i —

New Self-Aligning Punch Announced

An improved type of self-aligning punch for making large holes in chassis for tube sockets, filter condensers, etc., has been brought out by the Insuline Corporation of America, 25 Park Place, New York, N. Y.

This new punch produces perfectly clean, round holes in a few seconds. Because of a spring-supported inner member, the cutting edges center themselves automatically when the head of the punch is struck by the hammer, and shearing is entirely impossible. No drilling of center hole is required. Hardened and tempered steel is used throughout, and hundreds of holes of uniform size can be made in succession.

The tool is available in five sizes, to make holes of the following diameters: $\frac{3}{4}$, $\frac{7}{8}$, $1\frac{1}{16}$, $1\frac{3}{8}$ and $1\frac{1}{4}$ inches. Prices may be obtained from the manufacturer.

Page Thirty

Success Letter

I enrolled with N. R. I. in May, 1934, at the age of 16. I was coming to the end of my high school days and, not having parents, I could not go through university. In about November of the same year I had completed about twenty-five lessons and understood enough about Radio to do part time service. At that time I had work in the fur trade.

A month later I was taken on as inside service-man for one of the biggest Radio stores in this city. I am still with this firm and I also have my own service business, which I look after in the evenings.

The following are some of the methods I used to obtain a mailing list of Radio set owners, to whom I would send monthly service reminders. I also placed small ads in the local newspapers.

I obtained window space in a hardware store that was located in a busy section of the city. In the window I displayed a type 47 amplifier tube in operation and offered a complete set of tubes to the owner of a Radio who guessed most accurately the burning life of the tube. To place a guess it was necessary to fill out a form in the store. Besides the guess this included the make, year and model number of their present Radio. The tube burned for many months and provided me with a list of set owners well worth the cost of replacing a set of tubes.

I also placed small ads in the paper offering a prize of \$10.00 for the owner of the oldest Radio in the city. In about one week I had a list of old sets and owners to whom I sold more up-to-date machines and also tubes.

I estimate that during the Radio season I earn about one thousand dollars.

GRADUATE MITCHELL DIAMOND,
Winnipeg, Man., Canada.

— n r i —

Insuline's New Catalog Available

The 1937 catalog of the Insuline Corporation of America, 25 Park Place, New York, N. Y., is now available to amateurs, service men and experimenters. Containing 40 pages, it describes the extensive "ICA" line of receiving and transmitting parts and accessories, service tools and attachments, racks, panels and chassis and hundreds of other items.

Copies of this new catalog, which bear the number 190, are being distributed by parts jobbers and dealers everywhere, or are obtainable, free of charge, directly from the home Insuline office.



Favor Graduate Sankey's Suggestion

"Regarding Graduate Gus Sankey's plan of changing the Service Forum, I wish to second the motion.

"I think this plan would result in the graduate or student keeping his NEWS much longer, as he would know that each article was complete."

OLIVER J. RUTH, JR.,
Baltimore, Md.

— n r i —

"I am in favor of the plan submitted by Graduate Gus Sankey. I myself like the NATIONAL RADIO NEWS as the best of magazines. It makes you feel there should be more to read. I can hardly wait for the next issue to be sent to me.

"As a student it gives me the inspiration to dig down and make things move."

ERVIN E. HACKBART,
Grafton, Iowa.

— n r i —

So many graduates and students have written us in favor of Graduate Sankey's plan that at the last minute, the plan was adopted in part in this issue. Beginning with the next issue, the Service Forum will appear entirely on opposite pages of the ALUMNI NEWS.—EDITOR.

— n r i —

Wants More "Sightseeing" Trips

One of the most interesting articles connected with Radio I have ever read was "Sightseeing in an Electrolytic Condenser Factory," by L. J. Markus, in the October-November NEWS. I also liked the other somewhat similar articles appearing in former issues—"A Trip Through a Tube Factory" and "A Trip Through the Farnsworth Television Laboratories."

Why don't we have more articles of this kind? They are not only very interesting reading and informative but also fit right in with our training, help us better to understand the Radio apparatus and devices that we study in our text books.

ALFRED MORE,
Montreal, Que., Canada.

Additions to N.R.I. Ham List

Amateur operators continue to be well represented in the N.R.I. student body. If you haven't sent in *your* call letters yet, better do so right away so as to get on the record. The following men have submitted their call letters in time to be included in this issue:

J. D. Pinkerton—W5FQB—Lawton, Okla.
Fred Massetti—W6NUZ—Madera, Calif.
Elmer Estrumse—W9SVQ—Eau Claire, Wis.
Paul Chaison—W1CWB—Bangor, Me.
Stanley J. Zuchora—W8QKU—Detroit, Mich.
George Huebner, Jr.—W5GDK—Lane City, Tex.
Guy H. Fetterley—VC3ALN—Chippawa, Ont.,
Canada.

Frederick L. Schneider—W9ECE—Cape Girardeau, Mo.

Jos. P. Skutnik—W2JWK—Pine Island, N. Y.

— n r i —

"Novel Radio Items" Boosted

I notice in a former issue of the NEWS that comments are wanted on Novel Radio Items. I say *continue* them as they are quite enjoyable.

How about some more of those "Three Guesses" by Al Wysoczanski in the June-July issue? They help a fellow to "check up" on his knowledge.

JACK FRITH,
Yates, Alberta, Canada.

— n r i —

I enjoy the NATIONAL RADIO NEWS more than ever, especially Novel Radio Items. They are very interesting and give one an insight into the strange uses that call on Radio and electricity for help.

THEO. GEISELHART,
E. Rutherford, N. J.

— n r i —

Has somebody suggested abolishing "Novel Radio Items?" Thumbs down on this suggestion, if it was made. We want bigger and better "Items."

THOMAS GEARHART,
New York, N. Y.

Opportunity

(Continued from page 21)

manage his mind. Opportunity comes and finds him out. But because he has the right stuff in him, he will learn from that experience, and when opportunity returns, as it always will, it will find him ready.

Look again at that opportunity which is directly before you—it may not be what you dreamed, but once in it, it will take you anywhere you want to go—if you are ready. If you are not ready, beware of opportunity.

— n r i —

Precision Plug-In Resistors

Precision resistors in handy plug-in form and of selected ohmages permitting various combinations for any total resistance value, are now offered by Clarostat Mfg. Co., Inc., 285 North



The Clarostat Precision Plug-In Resistor

Sixth Street, Brooklyn, N. Y. These plug-in resistors were originally developed for use in resistance bridges and other test equipment employed in the Clarostat laboratory and plant. Housed in a standard 4-prong tube base, these units are available in values of 1 to 10,000 ohms, with any accuracy up to 1/10th of 1 per cent. Due to the ingenious design, they are quite inexpensive.

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FROM N. R. I. TRAINING HEADQUARTERS

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

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