SEPTEMBER, 1926

$110.00 IN PRIZES FOR IDEAS
— See page 413 —

— For the Experimenter —
How to Build an Impedance-Coupled Amplifier

— For the Broadcast Listener —
How to Wire Your Home for Radio

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means the ultimate in reproduction
How can radio broadcast programs be improved? Nine cash prizes will be paid to readers of POPULAR RADIO for the best answers to this question. For details turn to page 413.

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A good speaker is the only kind worth having. A poor one will ruin otherwise good reception.

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A development by All-American laboratories—the Rauland-Lyric-Trio. You know the Rauland Lyric Transformer, famous among music critics for its exceptional tone perfection. It is now combined with two Rauland Trio impedance units; retaining the advantages and eliminating the weaknesses of the two leading systems of audio amplification. The result is the last word in audio amplification. Free book, "Modern Audio Amplification," tells more about this interesting development. Write for handbook "B-90."

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A PAGE WITH THE EDITOR

One of the Experimental Models of the New LC-27 Receiver

This newest product of the Popular Radio Laboratory—which is considered the best by the experts who have tested it—will be described in such complete detail in the next number of this magazine that the average experimenter should have no difficulty in building it himself—at a cost for parts not to exceed $85.00.

This coming issue of Popular Radio—for October—will contain the complete constructional details of the new LC-27 receiver.

Popular Radio believes that this new circuit, which is the special contribution of the Popular Radio Laboratory to the experimental set-builder for the 1926-27 season, is one of the most important contributions that have so far been made to the radio art.

The outstanding features of the new LC-27 receiver may be briefly summarized thus:
1. From a standpoint of quality of reception, it is unsurpassed;
2. It is a beautiful piece of furniture;
3. It is highly selective and practically free from interference;
4. It has a good distance range;
5. It is simple to tune.

This new receiver may be used entirely without batteries or with any of the various types of power supply that are in use at the present time.

The final development of the LC-27 is the result of the grouping of the individual features that are demanded by radio experimenters and set-builders; it also embodies the newer developments, from a scientific aspect, that have been made during the last year.

The LC-27 is non-regenerative and contains no adjustments outside of the tuning control and the one knob that controls the volume.

In a word, this new receiver design, with its easy control, its wealth of rich full volume and its artistic cabinet, should fulfill the desires of the most progressive radio set-builder and experimenter.

"At this time I wish to tell you that I have been a constant reader of Popular Radio, both here in Sausalito, California, and in New York, and have watched its progress from the start. I like your policies, the material which the magazine contains, and the way in which you are handling things. Many congratulations!"

—Peter Taylor

On page 433 of this issue is told the story of how another radio amateur has won the Popular Radio Medal for Conspicuous Service—Mr. C. B. Harrison of Belleville, Illinois, whose conspicuous service was rendered while he was under suspension.

While the documents in the case were being scrutinized by the Committee of Awards the question was asked by Dr. John H. Finley "what did Harrison do that the radio inspector had to suspend him for three months?"

Merely as a matter of interest (because the reasons for the suspension had no bearing upon the award), the editor quotes below from Mr. Harrison's own report of his technical delinquency:

"You ask about my suspension. Well to begin with, I started in the game in the old spark days in 1911. My first license was 9XX. Then when the power tube came in 9DG was my call. During all this time I had never been called for examination, and as my speed was 28, I didn't bother about going to Chicago. The examinations in St. Louis were held as a rule during June. Just at the time I was due at Gloucester, Massachusetts, so I missed three or four examinations by being away at the time.

"I tried to take the examination in Boston one year but those in charge of the office asked why I didn't take it in my own district and asked it as if I was trying to put one over on some one.

"The Chicago office evidently thought I was trying to evade being examined and suspended me for three months. This brought the desired results, and I lost no time in presenting myself for examination. That out of my system, the new call 9DOZ, which promises to stick, was issued to me."

Last month's issue of Popular Radio again demonstrated the place that the magazine holds in the regard of both the reader-public and the radio industry, by carrying more neat advertising than any other radio magazine.

Just because Prof. L. A. Hazeltine took the precaution of jotting down in his laboratory note book certain observations concerning his experiments, the priority of his claims to his mathematical exposition of the principle of neutralization was legally established. This simple precaution saved him patent rights that have been valued at $1,500,000.

The care that every radio experimenter should exercise in protecting his discoveries and inventions is the subject of a helpful, practical article that will appear in a coming issue of Popular Radio, "How to Patent Your Radio Invention."

Kendall Manning

Editor, Popular Radio

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COMPACT CAPACITY

Putting capacity into a paper condenser is comparatively simple. Providing for unvarying capacity in a paper condenser of small size, and building it to withstand high voltages in continuous operation—this required years of work in Dubilier research laboratories.

In Dubilier paper condensers only the finest of linen paper and tin foil are used. But it is the Dubilier process used in making them; the exacting standards set by Dubilier tests—that give to Dubilier Condensers the kind of quality demanded by the greatest radio stations in the world.

Efficiency and a liberal margin of safety are never sacrificed for size or appearance—where a reputation such as that held by Dubilier must be maintained in every country in the world. You buy compact capacity and safety when you buy condensers made by Dubilier.

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All apparatus advertised in this magazine has been tested and approved by Popular Radio Laboratory

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1926 - 1927

New Amsco Condensers Allocating by Meters or Kilocycles
Metaloid Grid Gates and Resistors Stable and silent
Amsco Filatrols The Perfected Automatic Rheostats
Tom Thumb Rheostats The midgets for giant performance
Amsco Floating Sockets Positively non-microphonic at last

For Details See Following Pages

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AMSCO ALLOCATING CONDENSERS of all types may be obtained single, siamese, or in gangs matched within less than 1%. Their unfailing uniformity makes practical the hitherto theoretical ideal of single control in radio receivers.

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Grid Gates and Resistors are entirely unique, making possible unvarying electrical characteristics even under excessive overload.

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FLOATING SOCKET
Rugged and substantial, this socket is yet extraordinarily tiny — and "it floats!" All types of tubes fit with the click that accompanies positive wipe contact. The tubes almost literally float on air, practically isolated from the base or panel. Microphonic noises, mechanical feedback and audio vibration are effectively eliminated. An imperative choice for the sensitive set — or the set with built-in loud speaker.

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A true midget for saving space front and back of the panel. No less effective because of its compactness — it has the normal amount of resistance, the normal electrical contacts. It is simply that needless bulk is eliminated by AMSCO design. Air cooled construction — Bake-lite base and knob with indicator arrow. Sold under the usual AMSCO guarantee.

Exhibits, Third Annual Radio World's Fair, New Madison Square Garden, New York, September 13th to 18th, inclusive.

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Exhibitors, Fifth Annual Chicago Radio Show, Coliseum, Chicago, October 11th to 17th inclusive.
$110.00 for Ideas!

Nine cash prizes, ranging from $50.00 to $5.00 for the best 500-word letters that answer the question:

“How Can Radio Broadcast Programs Be Improved?”

What changes should be made in the programs, in the methods of presentation, in the arrangement of time schedules, in the quality or quantity of broadcast features, or in any other way that will add most to the pleasure and profit of listening in?

Popular Radio invites its readers to express their constructive opinions.

For the letter that embodies the most interesting, the most helpful and the most practical suggestions—in the opinion of the judges—Popular Radio offers a prize of $50.00 in cash.

For the letter that contains the next best suggestions a second prize of $20.00 in cash will be awarded.

For the third best letter a prize of $10.00 will be given.

And for the fourth, fifth, sixth, seventh, eighth and ninth best letters, prizes of $5.00 each are offered.

The Rules of this prize contest are:

1. Address letters to the Editor of Popular Radio, 627 West 43rd Street, New York.
2. The letters may be as short as the writers care to make them, but they must not exceed 500 words in length.
3. Any contestant may write as many letters as he or she desires.
4. Each letter may either confine itself to one specific idea or suggestion, or it may cover the several ideas suggested above.
5. All letters submitted in this contest must be in the mails not later than Friday, October 15, 1926.
6. All letters submitted in this contest shall become the property of Popular Radio, which reserves the right to publish them in whole or in part.
7. Letters may be either typewritten or written in long hand, but they must be written on one side of the sheet only.

The prize winning letter will be published in Popular Radio together with as many other letters or parts of letters as may contain ideas of value to the radio fans and to the broadcasting interests.

The judges of this contest are:

Dr. Alfred N. Goldsmith, Secretary Institute of Radio Engineers.
W. E. Harkness, Vice-President Broadcasting Company of America.
Frank H. McDonald, President Broadcast Listeners Association of America.
Frank W. Elliott, President National Association of Broadcasters.

The Editors of “Popular Radio.”
What the Weather Map Tells

In the upper map the low pressure area below the Great Lakes indicates severe storms in that region and poor reception from New York to the western states. In the lower, a cold wave ("high") is pushing down from the northwest to cover the entire country so that within twenty-four hours there will be a fine chance for coast to coast reception.
Foretelling Radio Reception from the Weather Map

There is no doubt that radio reception over distances of more than a few miles is profoundly affected by the condition of the weather. Static is almost entirely a creature of weather disturbances, especially of thunderstorms. The United States Weather Bureau prepares and circulates a daily weather map showing the conditions of air pressure, temperature and other weather elements for the entire United States; it has long been a hope of radio engineers to learn how to use these maps to predict radio reception or to control the operation of transmitting stations which are attempting to reach out for long distances. None of these attempts have been fully successful, doubtless because the problem is an extremely complicated one. In this article Mr. Dashiel explains what is now known about this important problem and outlines some predictions about radio reception which are possible from an inspection of the daily weather map.

—EDITOR

By B. FRANCIS DASHIEL

The belief that some correlation exists between radio and the weather is now generally established in the minds of the radio public. The fact is, however, that this mutual relationship has never been fully determined. The laws that control radio communication and its correlation with weather conditions are obscure and little understood. Radio reception is limited in its general usefulness to small areas of the surface of the earth, while atmospheric disturbances, often of such magnitude as to affect an area equal to that covered by the average broadcast, frequently occur. The development of tentative theories concerning the effect of meteorological conditions on radio operations, will be an important scientific achievement.

There is no definite conclusion at this time that phenomena in connection with radio operations are directly associated with the changes in the weather, but it may be said that some radio disturbances have their origin in atmospheric electric discharges.

Static is the greatest natural phenomenon with which radio has to contend. Fading seriously interferes with reception but is probably caused more frequently by mechanical difficulties than by the weather. Static is believed, however, to be directly associated with the weather conditions existing in the lower atmosphere. This part of the atmosphere is known as the troposphere and extends upwards to a height of seven or more miles, varying from a lesser height over the poles to a much greater height over the equator. Throughout this region the atmospheric gases are kept continuously mixed by winds and by convection. Here our storms occur, clouds exist, rain or snow falls and temperatures change.

The intensity of static varies at different portions of the earth's surface, increasing progressively from the polar toward the equatorial regions. The intensity, at any one point, also increases with the advent of summer and with weather changes; as for instance, from fair to stormy weather or from lower to higher temperatures. It must be remembered, also, that as we progress southward the depth of the troposphere increases and more static-producing atmosphere is piled up overhead. The changes in the electricity of the atmosphere occurring in the troposphere as the weather changes are accompanied by natural electric disturbances which produce static outbursts.

Another atmospheric zone, the stratosphere, exists above the troposphere level and extends upward to a height of perhaps more than a hundred miles. Water vapor is not present in this zone; temperatures are believed to remain constant; convection ceases. No clouds or weather variations are known. The same condition exists throughout the ages. In this great zone there is much less likelihood that static disturbances will occur. With the exception of the great auroral electromagnetic storms at infrequent intervals, but little interference with radio communication would be noted. Atmospheric electricity, however, reaches well into the stratosphere. There may be powerful discharges taking place there that radiate static waves to the earth below, but
there is no sound theory upon which to base such conclusions or analyze them. It is either above or within this stratosphere that the theoretical conducting layer known as the Heaviside Layer is supposed to exist. The height of this surface has not been determined exactly, but is approximately between seventy-five and a hundred miles. The atmosphere goes up and up, getting rarer and rarer. At only about fifteen miles above the earth's surface, 95 per cent. of it is left below. Yet there is sufficient gas to produce a white heat in meteors, as they rush into it, as high up as a hundred miles or more. At these very high levels the composition of the atmosphere may be entirely changed and is in dispute.

The earth, a spherical conductor and negatively charged, is surrounded by an atmosphere in which exist positive charges of electricity. If the earth were a perfectly smooth conductor and if winds and convection ceased, we would then have parallel equi-potential surfaces in the atmosphere and concentric with the earth itself. The possible irregularities of the upper conducting layer and the movements of storms through the atmosphere tend to distort the concentricity of the electrical surfaces and to increase or decrease the potential differences. The breaking up of air molecules and of rain drops by impact and friction remove electrons from the atoms of atmospheric gases and leave positively charged ions. These ions are carried about by the air currents and produce changes in the potential relationship between the atmospheric electric gradients and the negative surface of the earth. These potential differences may become so great that, in the case of a thunderstorm, the air dielectric is broken down and a lightning stroke results. At such times static is at its greatest height. The degree of atmospheric interference with radio reception reaches its culmination in the lightning discharge.

Storm areas, and even small areas comprised of highly ionized air, are surrounded by electrostatic fields, the sizes of which depend upon the extent of the disturbance. If we know the intensity of the disturbance and whether it is increasing or decreasing, the temperatures to be expected, the degree of moisture present, whether rain or snow will be precipitated and, taking into consideration the season of the year, we might be able to determine the area of the storms' electrostatic fields and their rates of movement.

The expert meteorologist can determine the kind of weather to come with a high degree of accuracy. The weather forecasts, supplemented with a study of atmospheric electric phenomena, should establish eventually a system whereby forecasts of the effect of weather on radio may be made. The predicting of static and fading, as well as the probable directions from which best reception may be obtained during the ensuing twelve to twenty-four hours, may yet be practicable. These radio phenomena seem to be controlled by atmospheric electricity and indirectly by changes in air pressure and associated weather. But much study and research will be necessary before any fully practical rules can be propounded.

The troposphere, in which the familiar meteorological disturbances take place, is continually in a state of agitation, due to the unending succession of areas of high and low air pressure that pass, usually from the west toward the east, over the North American continent. Generally speaking, a "low," or area of low air pressure, is associated with inclement weather and with rising temperature. A "high" (high air pressure area) is associated with falling temperatures and clearing or clear weather. Weather maps have all points of equal air pressure at the same hour joined together by lines which are called isobars. These are more or less concentric and never cross, as the air flows in
smooth semi-parallel paths. The greater the difference in air pressure between the centers of adjoining "highs" and "lows," the greater is the intensity of the disturbance, with stronger air movements and more decided temperature changes. The isobars will then be closer together and a gradient of relative steepness will exist.

The ions in the atmosphere, those produced through impact and friction rather than by the action of the rays of the sun, may be distributed fairly evenly through areas of equal air pressure. With such a distribution static is at a minimum, especially during cold weather and when the moisture content of the atmosphere is low. At such times distant reception is always probable.

On the other hand, the movement of a "low" is accompanied and preceded by much humid air and the production of ions within the disturbance. Due to the action of the air movement, these are drawn toward, and compressed within, the storm area. This comparatively heavy ionization, moving with the disturbance, tends to blanket the regular transmission of radio waves. It produces irregular periods of fading from stations within the area. It creates heavy electric charges, along with a tremendous increase in the potential differences of the atmosphere and a distortion or compression of the equipotential surfaces. In certain types of storms, the stresses and strains in the atmosphere become so great that the excess charges are discharged in the form of lightning. Static results. When we consider that millions of discharges of lightning occur within a relatively short interval throughout the world, it is not strange that static noises are almost always present in sensitive receiving sets.

Many of these electrical discharges are not to be seen or heard. They occur between clouds or within the cloud itself; silently, except to the radio receiver. It is not always necessary that thunder clouds be at hand for a discharge of internal lightning. Often the nearest excuse for a cloud will be so charged that the portions of it which constantly detach themselves during its passage across the sky, may become charged by induction and many small discharges may take place. A single cloud, under proper conditions, may send out hundreds of electro-magnetic waves during its passage over a small sized town.

With the passage of a "low," cool dry air flows in its wake. The pressure rises, humidity falls; clouds evaporate. The conditions favorable for the mechanical production of atmospheric electric charges disappear. As a storm area

recedes from a receiving station the audibility of static becomes less. When one great area of high air pressure, or "high," covers the land, the static is scarcely noticeable. But the static noises do not always cease with the advent of the "high." This is because another "low" of some intensity is closely following or is coming from another direction. Its approach is heralded by the continuance of the static.

Rain, as well as snow, produces great amounts of positive electricity, heavily ionizes the atmosphere and is heralded several hours in advance by the increasing presence of static. Rain and snow bring down much more positive electricity than negative. This must be neutralized when the snow flake or rain drop comes in contact with negatively-charged or grounded objects. Tiny electromagnetic waves are then set up. Drops or flakes which touch an antenna may produce static impulses in this way that may interfere with reception.

It appears from many years of tests that certain types of weather, as indicated by the weather maps, imply that reception will be better from one direction than from another. No good reasons are known for this relationship, either meteorologically, electrically or magnetically. The best reception is encountered, usually, when signals are being received from a station located across (at right angles) the isobars, and when this line of direction is east and west. When the line of direction between the stations is north and south, reception is usually good even when the isobars are parallel to this direction. These rules, however, are far from perfect. Quite often the reverse is true.

In general, however, a receiving set located at a point which is directly across the isobars from a transmitting station, as shown by a weather map for the same period, should receive broadcasts best from that station.
THE UNIT USED WITH A SIMPLE RECEIVER

Figure 1: The new power unit in use with a non-regenerative detector and tuner on the testing board in the Popular Radio Laboratory. The volume obtained with this simple combination was equal to that obtained from much more complicated receivers. The quality of reproduction was superb.

HOW TO BUILD AN

Impedance-coupled Amplifier

This new audio amplifier unit, which embodies all the newest features of impedance-coupled amplification, has been especially designed for the discriminating fan who wants to keep up with all the latest developments in audio-amplifier methods.

By LAURENCE M. COCKADAY

The list of parts given below includes the exact instruments used in the unit from which these specifications were made up. The experienced amateur, however, will be able to pick out other reliable makes of instruments which may be used with equally good results. But we recommend that the novice follow the list, as the diagrams in this article will tell him exactly where to bore the holes and exactly where to place the connections. If instruments other than the ones listed are used, the only change that will be necessary will be the use of different spacings for the holes that are drilled in the sub-base for mounting the instruments. To any reader who has difficulty in obtaining any of the parts which are necessary in making up these model receivers and power units, Popular Radio Service Bureau, 627 West 43rd Street, New York City, will gladly assist in seeing that his requirements are promptly supplied.

Cost of Parts: Not more than $33.50

Here Are the Parts That Were Used in the Laboratory Model of This Unit—

A, B and C—Acme audio amplifying impedances, type Z-2;
D—Acme 30-henry filter choke, type B-2;
E—Electrad Royalty variable high resistance, type 0 to 500,000;
F and G—Lynch fixed resistors with mountings, .5 meg. as illus. (Durham Daven, Tobe or equal may be used);
H, I and J—Dubilier condensers, type 712, .5 mfd. capacity;
K—Dubilier condenser, 4.0 mfd., type 902;
L—Sangamo mica condenser, .0005 mfd. as illustrated (Dubilier, Micamold, Aerovox or equal may be used);
M1, M2 and M3—Benjamin "Cle-ratone" sockets, No. 9040;
N—Amperite, No. 1, 1 ampere;
O—Carter short jack, No. 1 (open circuit) as illustrated (Frost short jack or equal may be used instead); P—hardwood baseboard, 7 inches by 15 inches by 3/4-inch;
Q—binding-post strip, 7 inches by 1 inch by 3/16-inch;
R—binding-post strip, 3 inches by 1 inch by 3/16-inch;
S—small brass angle brackets for supporting binding-post strips;
8 Eby binding posts.

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The Schematic Wiring Diagram

Figure 4: The electrical hook-up for all of the instruments that go to make up the amplifier circuit. All of the parts are designated by letters that correspond with the lettering in the list of parts at the head of the article and in the text.

The Picture Wiring Diagram of the Unit

Figure 5: Here is shown in detail the exact way in which to run the wires that hook up the various instruments. The wires are shown by heavy white lines that run between the terminals on the parts, which are shown in about their relative positions on the baseboard. If the experimenter follows this drawing, he should have no trouble in getting the unit to operate in a satisfactory manner.
THE UNIT AS SEEN FROM ABOVE

Figure 2: The general layout of the apparatus as it is mounted on the baseboard. The input binding posts are located at the left and the output jack is located at the right on the same strip as the "A", "B" and "C" battery terminals.

THE broadcast listener, as well as the radio set manufacturer, has realized this year more than ever before the prime importance of a good amplifier in obtaining clear and faithful reproduction from a receiver.

One of the modes of audio-frequency amplification that has been growing in favor, since the high impedances necessary for this means of coupling have been placed on the market, is the impedance-coupled amplifier.

With this in mind, the impedance-coupled amplifier described in this article has been designed by Popular Radio for the broadcast listener.

This amplifier is easy to build, it may be mounted (as shown) on a board and used as an adjunct to the owner's present set or it may be built into the set itself with the general arrangement given here.

The amplifier contains three stages of impedance-coupled amplification with efficient apparatus arranged for quality reproduction. It is equipped with the new UX-171 power tube in the last stage, which operates into an output filter so that the high current required by the power tube that is furnished by the "B" batteries or the power-pack unit will not burn out the loudspeaker windings.

In the preceding stages either standard UX-201-a tubes or any standard make of 3/4-ampere high-Mu tube may be used.

The amplifier is furnished with vibrationless sockets and also with a volume control that is unique in that it does not change the quality of reproduction with an increase or decrease of sound volume.

The amplifier is equipped with two binding posts for the input and with an output jack from the last stage. Binding posts are also furnished for connecting to the "A" and "B" circuits and also for the "C" batteries for the various stages of amplification.

How to Construct the Amplifier

After all of the instruments and materials for building the amplifier have been procured, the baseboard, P, should be prepared and cut into a rectangular shape, 7 by 15 inches. The binding-post strips, R and Q, should be made and attached to the baseboard as shown in Figures 2 and 5. The two binding posts at the left are for the input leads to the first impedance A.

Looking at the binding posts at the right of Figure 2, the top binding post is for the "A" battery minus (−) and the second for the "A" battery plus (+). The next post down is for the "B" plus (+) 135-volt for the two amplifier tubes, the next for the "B" plus (+) 180-volt for the power tube. The next is for the "C" battery minus (−) 7½-volt for the two first amplifier tubes and the last for the "C" battery minus (−) 40½-volt for the power tube.

These connections are shown exactly in their correct positions in Figure 5.

Next, mount the three impedances, A, B and C, as shown in Figure 5 with the terminals pointing towards the builder. Then, mount the choke coil, D, and the three condensers, H, I and J, by means of wood screws, into the hardwood base P.

Then mount the potentiometer, E, and the three sockets, M1, M2 and M3, as shown in Figure 5. Then mount the condenser, K.

The final job is to mount the resistance mounting, F and G, and the filament control mounting, N, as shown in this same figure. Notice that the jack, O, is mounted right on the binding-post strip, Q, along with the binding post.

This completes the construction work on the unit and it may now be wired.

How to Wire the Amplifier

The design of this amplifier is such that the grid circuits of each of the three tubes is kept as short as possible and isolated from the other parts of the circuit.

The set should be wired with bus-bar. Either a tinned copper round bus-bar or an insulated bus-bar such as "Celotape" may be used for all connections. All wire should first be shaped to fit and all connections should be made permanent by soldering.

It is best to refer constantly to the wiring diagram in Figure 4 and more specifically to the picture diagram in Figure 5 for the exact way in which to run the wires.

The fixed condenser, L, is supported by the wiring and should be included in the circuit when the wiring is being done.

(Continued on page 448)
How the New Glowing Crystal Tubes Are Used

Five of the radiant crystal tubes used in a set-up for calibrating a vacuum-tube oscillator. The crystals in the tubes are ground to different frequencies, and when the oscillator is tuned exactly to the frequency of any one of the tubes, the crystal glows with a brilliant, orange-red color and the gas in the tube gives out a soft orange tint. At the right is shown what happens when the oscillator is exactly in tune with the center crystal.

The use of quartz crystals to control wavelength or frequency in transmitters and, as standard frequency oscillators, to calibrate sets and wave meters, is rapidly growing.

The way in which they are used, however, is similar in all cases—except in the particular instance that is described here.

Dr. Sigmund Loewe, the German inventor, has recently discovered a new way to use crystals for accurate calibration. He has produced a tube in which is suspended, by a new means, a very small quartz crystal.

The crystal itself is ground so that its natural frequency depends upon its length rather than its thickness as is ordinarily the case.

Instead of a vacuum in this tube, there is a vapor.

In ordinary operation five of these tubes are used in parallel, connected to a pick-up coil, as shown in Figure 1. They are all mounted on a suitable support. When one of these tubes is connected to a pick-up coil and a suitable radio-frequency energy is passed on to the tube from the coil, the gas in the tube will glow with an orange-pink color, if the frequency is not the same as the frequency to which the particular crystal in the tube has been tuned by grinding.

If the frequency of the incoming oscillations is varied slowly so that its frequency will at one point coincide with the frequency of the crystal, the glow in the tube will disappear and the crystal itself will glow with a bright orange-red color.

This optical indication only takes place when the incoming frequency is exactly the same as the natural period of the crystal.

The crystals are generally used in a set of five, of which the middle one has (Continued on page 448)
The Daven Bass Note Receiver

This receiver contains two stages of tuned radio-frequency amplification, detector and three stages of resistance-coupled audio-frequency amplification. Sensitivity and fidelity of reproduction together with tremendous amplification are some of its features. Note that switch S2 opens the filament circuit of VT1 thus making the set either a five or six-tube receiver at will. In sockets VT2, VT4 and VT5, type MU-20 tubes should be used; a MU-6 should be inserted in the last socket. The other tubes may be of the 201-a type.

Popular Radio Circuits

INSTALMENT No. 2

THE PARTS THAT ARE RECOMMENDED FOR USE IN THIS RECEIVER ARE—

RFT1, RFT2 and RFT3—Daven radio-frequency (DRF) coils;
R1—Daven ballast resistor, 1/8-ampere;
R2—Daven ballast resistor, 1/4-ampere;
R3—Yaxley potentiometer, 400 ohms;
C1—Daven special condenser, type A;
C2, C4—Dubilier by-pass condensers, 1 mfd;
GC, GL—Daven Leakandenser, No. 22;
C3 and C5—Sangamo mica by-pass condensers, .0005 mfd. and .0006 mfd.;
C6 and C7—Yaxley toggle switches;
VT1, VT2 and VT3—Benjamin sockets;
VC1, VC2 and VC3—U. S. Tool, SLW or SLF condenser, .00035 mfd.;
P—Bakelite panel, 7 by 28 inches;
B—Hardwood baseboard, 7 by 27 inches;
Daven Super Amplifier consisting of:
R3, R4 and R5—Plate resistors;
R6, R7 and R8—Grid resistors;
C9, C7 and C8—Fixed blocking condensers;
VT4, VT5 and VT6—Sockets;
Antenna binding-post strip;
Binding posts (3 required).
The "T. C." Receiver

This receiver is very selective and will give good reception with great volume; it is easy to build and simple to operate. The circuit employs one stage of radio-frequency amplification, a detector and two stages of audio-frequency amplification. This set is designed to be used with 201-a type tubes. If the operator desires to use 199 or WD-12 type tubes, the "A" battery voltage should be 4 volts for 189 type tubes and 1.5 volts for tubes of the WD-12 type. Rheostats R1 and R2 should also be changed; they should have a resistance of 30 and 30 ohms respectively when 199 tubes are used and two and six ohms respectively for WD-12 tubes.

The Parts That Are Recommended for Use in This Receiver Are—

L1—Samson fixed coupler;
L2—Samson radio-frequency transformer;
L3—Samson R.F. choke;
VC1 and VC2—Samson variable air condenser, .0005 mfd.;
VC3—Samson neutralizing condenser;
GC—Dublier mica condenser with grid-leak clips, .0005 mfd.;
GL—grid-leak, 5 megohms;
C1—Dublier mica condenser, .00025 mfd.;
C2—Dublier mica condenser, .001 mfd.;
R1—General Radio rheostat, 10 ohms, type 301;
R2—General Radio rheostat, 30 ohms, type 301;
VT1, VT2, VT3 and VT4—Benjamin sockets for 201-a type tubes;
S—Carter "Imp" switch;
J1—Carter jack, type 104;
J2—Carter jack, type 103;
AFT1 and AFT2—Samson audio-frequency transformers, ratio 3 to 1;
P—Composition panel, 7 by 18 inches;
B—Composition panel, (used as sub-base), 7 by 17 inches;
Sub-base brackets, 2 required;
Eby binding posts, 10 required;
Condenser dials, 2 required.
HOW VOLTAGE-REGULATION CURVES ARE RUN ON AUTOMATIC FILAMENT ADJUSTERS

FIGURE 1: The set-up that was used to make the curves that are given in Figure 3. The circuit that was used in making this test is shown diagrammatically in Figure 2.

HOW TO SIMPLIFY YOUR SET WITH

Automatic Filament Controls

What they are, what they do, how they are made and how they are used

By K. B. HUMPHREY

WITH the present day type of tube there is no necessity for a fine graduation of filament voltage such as was essential for the efficient operation of the earlier types.

This is especially true for a tube which is operating in the audio-frequency amplifier of a receiver.

On the radio-frequency side of the set some manufacturers use a variable filament control to regulate the tendency to oscillate.

This article is concerned only with the automatic or semi-automatic filament controls as they are used in connection with the amplifier tubes in a receiver.

The rated voltage of the well-known UX-201-a type of tube used with the storage battery is 5 volts and the current taken at this voltage is .25 ampere. By Ohms' law the voltage divided by the current gives us an internal resistance of 20 ohms in the tube. Although the rated voltage of the tube is 5 volts it will operate with good efficiency in the receiver at as low a value as 4.6 volts. The values given run remarkably uniform for the standard makes of tubes in use to-day. The upper range of the tube is considerably higher than 5 volts and the tube will give good results as far as operation is concerned up to 6 volts. However, the life of the filament is considerably shortened at these high voltages and it is not considered good practice to run the voltage much higher than five for any extended length of time. We may consider that the proper value then should range from 4.6 up to possibly 5.2 for efficient operation at all times.

Now, the storage battery of the 6-volt type has a voltage range of from 6.3 volts when fully charged down to about 5.3. This minimum voltage is not what the battery will give, to the last moment, but is the point at which it should be recharged. It must also
be remembered that the voltage of 6.3 volts only holds for a very short space of time when the battery is first charged and falls rapidly to 6 volts or a little under and remains at that point during most of the period of discharge. In other words the storage battery, while not a constant potential device, remains at practically a constant voltage over a considerable range of discharge.

To take care of the varying voltage of the battery and the need of a rather constant potential on the vacuum tube filament for operation at the most efficient point, several devices have been developed which automatically control this voltage. The principle upon which they operate is the fact that certain metals increase in resistance when they are heated. Some metals have this property to a remarkable degree. Iron wire shows this property but it has been found that others may be used with perhaps better results.

This is the action which takes place when an automatic control is used; when the battery voltage is high, as when the battery is fully charged, more current is forced through the filament. This excess current heats up the wire in the control resistance and makes the resistance higher which in turn cuts down the current thus having a tendency to keep the voltage at more of a constant value than with the use of a constant value of resistance in the circuit. In a like manner, when the supply voltage is low, the current flow is less and the control resistance cools off and allows more current to flow.

This type of filament control may be obtained for use with one to five tubes, and the buyer should be sure to specify how many tubes and what amperage they take. They are usually mounted in convenient clips so that they may readily be changed when it is desirable to change the style of tube in the receiver, say from a .25 ampere tube to a power tube using from .5 ampere and up. An advantage which is of real account is the fact that the user of such a device cannot under any circumstances get a high enough voltage on the tube to cause filament burnout. Another indirect advantage is that the storage battery cannot be run too low and cause the consequent damage due to sulfation of the plates. It is a protection to the tubes and to the battery at all times.

For the experimenter who wishes to
(Continued on page 453)
A SET THAT OPERATES WITHOUT BATTERIES, EXTERNAL ANTENNA OR GROUND

FIGURE 1: This new model of the Radiola receiver (shown at the right) draws all of the operating electric current that it requires from the regular house-lighting lines, through the new model of combined loudspeaker and power unit shown at the left. Note the care with which these units have been designed to harmonize with the furnishings of the modern well-furnished home—a characteristic feature of the new season’s models.

INSIDE INFORMATION ON

New Radio Receivers

By S. GORDON TAYLOR

First Installment

THE RADIOLA NO. 28: THE FADA "8:" THE STROMBERG-CARLSON "TREASURE CHEST".

The advance and exclusive data that is incorporated in this series of articles, concerning the outstanding features of the newest and best types of radio apparatus, has been obtained at first hand by the technical staff of this magazine, not only from the engineers or inventors who are responsible for the development of the receiver, but as the result of unbiased experiment and test in the Popular Radio Laboratory itself. The information is given here not only for the benefit of the prospective set owner but also of the experimenter.

—The Editors

The New Model Radiola AC Operated Receiver

A RADIO receiver that operates entirely without batteries, ground connection or external antenna wires! Ever since the popularization of broadcasting the great radio public has been looking forward to the time when this ideal receiver would become a practical reality. And now it has become a reality in the shape of the new Radiola No. 28 (AC operated) receiver, with its model No. 104 loudspeaker power supply unit (shown in Figure 1).

This combination outfit provides a highly efficient receiver which draws all of its electrical operating power from the alternating current, house lighting lines. There are no batteries to replace or recharge nor does the receiver require upkeep attention of any kind. From the standpoint of convenience this set takes its place with the other electrical household devices that have made an essential place for themselves in everyday life.

The Radiola No. 28 (AC operated) with its stand, has real distinction as a piece of furniture. The cabinet and stand are of solid dark mahogany with insert panels of a lighter tone. The few necessary metal fittings are made of a dark bronze that matches the color of the woodwork and the wood framework of the loop antenna, which in operation is plugged directly into the top of the receiver.

The Model No. 104 loudspeaker unit is made to match the receiver. While the workmanship and general details of the cabinet of the loudspeaker unit and its stand follow closely those of the receiver, too great a similarity in the design of the two units has been avoided.

One glance at the interior of either the loudspeaker or the receiver unit is sufficient to convince the layman that the same extreme care that is evident in the exterior design has been employed in the construction of the entire outfit. Practically all of the receiver parts, for instance, are assembled and wired in a small metal case that measures only 12 inches by 3 inches by 3 inches. This case also protects the electrical mechanism from dust and moisture and prevents tampering with the internal elements.

The confining of so many instruments in so small a space as is provided by
this metal case is an engineering feat of no small proportions. When successfully accomplished, however, as in the case of this receiver, it represents a decided advantage not only in space saving, but in electrical efficiency.

This receiver and the loudspeaker power supply unit, once they have been installed in the home, operate simply and without interruption. The combination is always ready to “go” at the pull of a switch.

There are two tuning controls in the center of the panel. Instead of the usual dials these tuning controls consist of two vertical discs that are mounted behind the panel in such a way that their milled edges project part way through slots in the decorative bronze plate on the panel.

To each of these discs is attached a drum which turns with them. The edges of these drums are calibrated in kilocycles and a space is also provided in which the call letters of stations may be written opposite the point on the scales at which the stations are tuned in. When the settings of the tuning controls have once been marked for a given broadcasting station, that station may always be tuned in again at the same setting of the controls.

The calibrated scales on the drums provide a simple method for tuning in stations which have not already been noted on the drums. If it is desired to tune in station WEAF, for instance, a consultation of the daily newspaper radio programs will show the frequency of this station to be 610 kilocycles. The two controls are rotated until the figures 610 appear opposite the indicating arrow. This will provide approximately the right setting of the controls for this station and a slight readjustment of one or the other of the controls will bring in the signals at the desired volume.

A novel feature of the receiver is that it may be used either as a single-control or a two-control set. The two-tuning controls are so designed that if either is turned the other will turn with it unless held with the other hand. Thus when they are once adjusted to the proper relationship with each other practically all tuning may be accomplished with one hand.

The superheterodyne circuit is made use of in this receiver to provide the great degree of sensitivity that is required to make the use of a small loop antenna practical. The details of the superheterodyne theory will not be gone into here except to explain that it involves the changing of the frequency of the incoming signals to a lower frequency. This is done to take advantage of the much greater radio-frequency amplification that is obtainable with a given number of stages of radio-frequency amplification at the lower frequencies.*

The Radiola No. 28 receiver makes use of three stages of radio-frequency amplification, a vacuum-tube, detector, a

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*The patents on the superheterodyne circuit are controlled by the Radio Corporation of America and this company has the exclusive right to manufacture receivers making use of this principle.
Vacuum-tube frequency changer (or first detector) and two stages of audio-frequency amplification. When it is used with the No. 104 loudspeaker power supply unit the last stage of audio-frequency amplification in the set is not used; this will be explained later.

The No. 104 loudspeaker power supply unit includes in a single cabinet the loudspeaker, one stage of high-power audio-frequency amplification and the apparatus necessary to convert the 110-volt alternating-current to direct current and supply this to the receiver and the power amplifier at the proper voltages.

Fortunately, every precaution has been taken to make this unit absolutely safe even in the hands of a child. The voltages used range up to several hundred volts (for the supply to the power amplifier stage) but it is impossible for anyone to come in contact with any part of the high-voltage apparatus. It is completely enclosed in the cabinet of the unit and if the door of the cabinet is opened the current is automatically cut off. Likewise, one cannot get at the terminal board of the unit until the plug which connects to the alternating current line has been pulled out of its socket. In this way great power is combined with absolute safety in the home.

The power audio-frequency amplifier stage, located in the No. 104 unit, makes possible the excellent quality and great volume that are obtainable with this receiver. Such volume would choke an ordinary vacuum tube output with the result that signals would be distorted and of poor quality. But the UX-210 tube used in this stage is capable of handling even the most powerful signals with a quality close to perfection.

The loudspeaker must also be given its share of the credit for the quality of reproduction procured with this outfit. It is of a special design for maintaining quality with volume, and works admirable with the combination of the two units.

During the tests that were made with this receiver under normal reception conditions it accomplished everything that could be expected from the standpoints of selectivity, sensitivity, tone quality and volume.

Another test was made later under unfavorable conditions of location and atmosphere. The receiver was set up in the heart of the downtown section of New York City, a location that is in itself enough to greatly hamper reception. To add to the difficulties there were not less than seven or eight broadcasting stations in operation within a radius of two miles of the receiver.

These two conditions are ordinarily enough to make reception almost impossible, but, in addition, the time happened to be one of these sultry nights when radio waves seem unable to push their way through the atmosphere.

When the switch was pulled out, stations up to 50 miles and more away came rolling in, one after the other, as the tuning control was manipulated. The many local stations were easily separated, and in fact reception of all the local stations was just about the same as it had been previously under more favorable conditions. It was necessary to keep the volume control well over toward zero at all times.

It was only when more distant stations were tuned in that the volume control could be pushed up to the half-way mark. Stations in Philadelphia, Cleveland and Schenectady were brought in with more than ample volume without...
pushing this control up all the way. The quality of reception from these stations was good, although reception from Cleveland was somewhat marred by the considerable amount of static that prevailed at the time. This test was conducted during the week of June twenty-first, 1926.

In view of the prevailing conditions this evening's work represented a most severe test for any receiver. Only a very sensitive and selective receiver could possibly provide adequate reception under these conditions.

The New Model Fada Eight-tube Receiver

The Fada "8," shown in Figures 2, 3 and 4, is another receiver that represents the latest word in modern set design. Great sensitivity, excellent reproduction of music and voice, simplicity of operation and the elimination of the necessity for external antenna and ground connections are among its attributes.

The newest developments in radio-frequency amplification embodied in this new model have made possible the use of four stages of this type of amplification whereas a year ago the practical limit was not more than two stages. The net result of this improved design is far greater sensitivity, greater selectivity and more simple operation.

Audio-frequency amplification in this receiver has also come in for its share of improvement, with the result that the reproduction of music and speech now is more truthful than through any other mechanical or electrical means. This is partly accounted for by the development of new tubes, which are capable of handling greater volume without distortion, and by the provision of greater amplification per tube; it is also due in part to improvements in other instruments used in the audio-frequency amplifier portion of the receiver, and in the use of a really good loudspeaker.

The Fada "8" employs eight vacuum tubes in all. Four of these tubes are used as radio-frequency amplifiers, one as a detector, and three as audio-frequency amplifiers. All of these tubes are of the UX-201-a type with the exception of the one used in the last stage of audio amplification and this is a UX-171 type power tube.

The four stages of radio-frequency amplification are perfectly neutralized so that it is impossible to make the amplifier oscillate anywhere within the broadcasting waveband. Moreover, the degree of amplification is practically equal for all wavelengths covered by the receiver. Another consideration—and an extremely important one from the standpoint of the ultimate owner of a set—is that the amount of radio-frequency amplification per stage is the same as is found in other non-oscillating receivers using fewer stages. In other words, stage for stage, the radio-frequency amplification is equal or better than that of most good receivers of a year or so ago. The total radio-frequency amplification of this new receiver is therefore, greatly increased.

The amount of radio-frequency amplification, of course, determines the sensitivity of the receiver and this new model provides surprisingly good reception from stations at extreme distances. The high sensitivity permits the elimination of the outside antenna (or the indoor antennas) and the ground connection. The pick-up device used is a small loop antenna that is hinged directly onto the receiver cabinet and measures approximately two feet in height by one foot wide by three inches deep. For local reception, in the case of the table type receiver, the loop is dropped down flat inside of the receiver cabinet and is entirely concealed. For greater sensitivity it is swung to an upright position. In either position the cover of the receiver cabinet may be closed as the loop does not interfere.

(Continued on page 462)
AN ACTUAL HOME THAT IS WIRED FOR WIRELESS
Every room of this "radio house," (which is located on Staten Island, N. Y.) is served by radio, either in the shape of a complete receiver and loudspeaker installation or an extension loudspeaker unit with its own power amplifier. The wiring is as complete and as inconspicuous as the ordinary electric light wiring.

HOW TO Wire Your House for Radio

NOW comes the next step in the establishment of radio as an integral part of the home "the radio-wired house"—some practical types of which are described in this article by—

AUSTIN C. LESCABOURA

AND now the radio wired home! Of course it was to be expected that radio, sooner or later, would join the central heating plant and the sanitary plumbing and the electric light as an integral feature of residential building construction.

Today, after five short but eventful years of development, radio broadcasting has become such an indispensable element in the home life of the typical American family that it has outgrown the narrow confines of the living room: radio now has something to say to the housewife while she is about her daily work in various parts of the house; radio has entertainment for the family and friends during the summer evenings spent on the porch; radio has entertainment for the servants in their quarters; radio has dinner music to make the meals all the more enjoyable; radio has setting-up exercises for the more ambitious members of the family to follow in the privacy of their bedroom; radio has bedtime stories and lullabies for the kiddies; radio has plenty to do in helping to pass away the long hours of the sick member confined to his bed.

Radio is no longer a parlor variety of entertainment; its place in the household is everywhere, from morning till night, to be heard by anyone at will. All of which creates problems in radio wiring and in providing radio service in all parts of the household. It is manifest that the radio facilities in the average home today are little more than crude improvisations, intended more as a means of becoming acquainted with the possibilities of radio. A parallel might be found in the early introduction of electric service in the home, when electric wiring did not go beyond plain moulding to bring the current to a single ceiling fixture in each room. Just as electric wiring has been extended to a complete system of convenient outlets and switches, together with all manner of electrical appliances, so must radio become a complete wiring system with ample equipment for a complete utilization of broadcasting service.

To begin with, the living-room radio
installation presents an inflexible sys-

tem. The radio programs must be

heard in that part of the house, al-

though, so far as the apartment or small

house is concerned, there may be suf-

ficient loudspeaker volume to bring the

music at least to other rooms. Still,

it is annoying to strain one's ears to

listen to a remote musical selection or

speech; at best, this plan is a poor one.

It means maximum loudspeaker volume,

with everyone in the household—and in

the neighborhood—for that matter—

compelled to listen to that one particular

program.

So the usual living-room installation

lacks in two important particulars:

First, the loudspeaker is located in one

part of the house to which the house-

hold members must go for best results;

secondly, all members of the household

are compelled to accept a given radio

program, as but one program can be

received at a time.

There is no choice—but there may be

many disputes—with this arrangement.

Its one redeeming feature is, namely,

low first cost and minimum operating

cost.

That the evolution of radio in the

home cannot stop at this stage is not

only sound logic but a certainty as well.

There must be ways and means devised

whereby home radio becomes a more

flexible means of serving the entire

household.

Separating the Loudspeaker from

the Receiver

Radio wiring, which answers the

problem of making radio broadcasting

service available in all parts of the

house, may be as simple or as elab-

orate as the pocketbook and taste may

dictate. It may be a temporary propo-

sition, using exposed wiring of the

home-made category, or it may be a

permanent, concealed wiring job. Again,

it may be applied in the home under

construction, virtually side by side with

the usual electric wiring, or it may be

installed in the house already built.

However, the radio wiring investment

will return many times its cost and will

immeasurably increase the pleasure

derived from a given radio set.

Radio wiring had its start, no doubt,

when some enterprising radio listener

decided to bring the loudspeaker to

another room without disturbing the

receiver installation. Temporary wires

were employed. Today there are special

dition cords available for this very

purpose. Simple as this method is, it

affords a surprising extension of the

broadcast service. Especially is this

true in summer time, when the loud-

speaker may be moved out on the

porch or even on the lawn. Even as a

regular thing it is desirable to have the

loudspeaker some distance away from

the receiver, for the reason that the

adjustments may be made more effect-

ively if the operator is listening under

the normal conditions of enjoying a

radio program, instead of under the

false conditions of having an ear virtu-

ally up against the loudspeaker.

The loudspeaker extension cord is a

step in the right direction, even though

allowing that it is an improvisation or

makeshift.

So far as actual radio wiring is con-

cerned, there are no fixed rules or spe-

ifications for radio wiring and radio

installations. No universal prescrip-

tion can be issued. Each case must be

handled individually, with such factors

as personal taste, expense and judg-

ment influencing the final plans. The

home owner should decide just to what

extent radio service is desired through-

out the home; then he should consult

the radio dealer and the electrical con-

tractor for a corresponding installa-

— or undertake the work himself.

The nature of the wiring is again a

matter of choice. With low-powered

receiving equipment, using batteries

troughout, the wiring may be of the

ordinary bell-wiring variety; however,

when it comes to high-power radio re-

ceivers that employ battery elimin-

ators and appreciable voltages in the

output connections, the wiring should

follow the usual standard electric wiring

for permanent and safe service.

Any home owner who can afford a

good radio set should also secure a neat-

ly wired installation, with protected

wires and neat outlets. It should be a

permanent job and not a sloppy one of

temporary character, which is not only

a menace to property but a constant

source of radio trouble due to broken

wires and faulty connections and leak-

age of current. Furthermore, the radio

wiring should be in accordance with the

rulings of the fire underwriters, especi-

ally now that considerable energy is

being handled by high-power receiving

sets, so as not to jeopardize the fire in-

surance protection.

If the radio wiring is installed in a

home under construction, it may be run

in flexible armored cable or BX, side by

side with

THE WIRING IS BUILT INTO THE WALLS

The wiring for the outlet box for the switches may be done before the

plaster has been put on the wall, as shown here, or it may be threaded

through the wall partitions by a competent electrician.
The Single Receiver with Multiple Loudspeakers

The simplest form of radio installation is the single receiver in the living room or other convenient part of the household, in conjunction with radio wiring to various rooms where plug-in outlets are provided to accommodate a loudspeaker.

With such an installation the "master receiver," as it is now termed, is tuned for the desired program, after which a loudspeaker may be placed in any part of the house reached by the "feeder" wiring. Better still, two or more loudspeakers may be employed, provided the receiver is equipped with a power tube and ample energy to supply the necessary output.

Simplicity and low cost are the prime advantages of this form of radio installation. There are certain drawbacks, however, which should be considered in advance.

First of all, if several loudspeakers are in use at one time, the volume from each loudspeaker will be considerably reduced because of the multiple drain on the master receiver. Again, the delicate balance of receiver output to loudspeaker input must necessarily be upset when using two or more loudspeakers.

Then there is the inconvenience of operation; each time there is need of re-tuning the receiver or turning it on or off, a trip must be made to the living room or wherever the receiver may be located.

A variation of the foregoing plan is to be found in the radio service supplied by hotels and large apartment houses, where one or more master radio receivers are wired to loudspeaker outlets in the rooms or apartments. A multiplicity of receivers and corresponding outlets permit of some choice of programs. This system, however, is hardly feasible for home use because of the elaborate installation, the constant services of a skilled operator attending to the several receivers, and the very considerable cost. It is intended primarily for larger institutions with listeners numbered by the dozens, than for the average household.

A Receiver for Each Member of the Household

The second form of radio installation for the home provides an individual receiver and loudspeaker in each room.

The obvious advantage of this plan is that individual radio tastes may be met at all times, with the receiver at hand for service as well as silence, for changing from one program to another, and for re-tuning and adjustment of loudspeaker volume.

This multiple receiver plan certainly provides ultra-flexible radio service; it is especially applicable in households where there are several strong-willed individuals. This plan requires practically no radio wiring; each receiver is complete in itself, including batteries or electric light current supply, and loudspeaker connection.

The obvious drawback to this scheme lies in the multiplicity of radio receivers, which represent a considerable investment and high upkeep; furthermore, a number of antennas are necessary, spreading out in various directions so as to minimize troublesome interplay, unless loop receivers are employed.

(Continued on page 450)
What the owner of station 9 DOZ did to win the Popular Radio Medal for Conspicuous Service

"S. O. S."

The True Narrative of the Dramatic Part Played by a Radio Amateur at the Time of the Tornado in Murphysboro

By J. ANDREW WHITE

S U P P O S E that you were a licensed radio amateur who owned the only transmitting set in your town, and that because of some minor infraction of one of the regulations of the Department of Commerce you were not permitted to operate your set for three months.

And then suppose that a tornado should whirl down into a neighboring town during your period of suspension, carrying death, destruction and widespread suffering to your fellow men, and that the only medium of contact between the stricken area and the outside world should suddenly become your banned transmitter!

That is exactly the dramatic situation that faced C. B. Harrison, amateur operator of station 9 DOZ at Belleville, Illinois, when the historic tornado of March, 1925 laid waste the neighboring town of Murphysboro with dirg results.

Harrison promptly decided that his duty lay with suffering humanity—and he acted on this decision without regard to the penalty thus invoked under the man-made law.

And in doing so he rendered the type of conspicuous service which has won for him the award of the Popular Radio Medal—fulfilling the condition that "prompt and efficient action was utilized to perform an essential part in the alleviation of human suffering or in the saving of human life."

(Continued on page 439)
Adding Radio-frequency Amplification to the Four-circuit Tuner

While the fine qualities of the Four-circuit Tuner are indisputable, the fact that a large antenna is needed to get best results is undoubtedly a drawback. For this reason, many requests have been received for instructions upon the addition of radio-frequency amplification, which would eliminate this requirement.

After considerable experimentation it has been found that the most practical plan is the conversion of the receiver to the LC-26 type. When this change has been made, only three stages of audio amplification are necessary; therefore, the converted receiver does not require an extra tube.

The circuit that is used in the converted receiver is the same as that of the LC-26 receiver, which was described in the December, 1925, issue of Popular Radio except that phone jacks are used after the third, fourth, and fifth tubes as in the Four-circuit Tuner and a "C" battery has been added. The circuit diagrams of the Four-circuit, the LC-26, and the revised receiver are shown in Figures 2, 3 and 4.

Figure 1 shows a rear view of the Four-circuit Tuner after conversion. The number of changes to be made in the receiver will depend largely upon the desires and pocketbook of the individual builder. At a cost, for new parts, of about seven dollars a change may be made which will result in a receiver that has the tone quality of the original Four-circuit Tuner with the added sensitivity of the LC-26 receiver.

In other words, for this amount a receiver may be obtained which is capable of providing excellent quality and plenty of volume, even when used with a short antenna. In tests made in New York City, loudspeaker volume was obtained from stations 30 and 40 miles away with a fifteen-foot wire lying on the floor as the antenna.

The New Apparatus Necessary for the Change

To make these essential changes it is necessary to obtain a variometer, a primary coil for the old precision four-circuit tuner coil, a .00015 mfd. capacitity fixed condenser for use as an antenna series condenser, and a battery switch to cut this condenser in or out as desired. The variometer should be one of the smaller type, such as the General Radio instrument.

The primary coil may be purchased from the manufacturer of the Precision coil, or it may be made at home. This coil consists of 10 1/2 turns of No. 18 DSC wire, wound on a tube 2 1/2 inches in diameter. The winding should run in the same direction as that of the large coil.

It goes without saying that the old four-circuit coil should not be used unless it is in first class condition. If there is any doubt on this score it would be better to play safe and purchase a whole new coil, such as the "Octofon" coil which is made especially for the LC-26 circuit.

The old four-circuit coil is used the bank-wound portion, D, must be discarded. The inner ends of the two coils B and C are joined together and a tap is brought out from this connection to serve as the midtap, shown in the LC-26 diagram.

To assemble the coil, stand this large tube upright with the smaller winding, C, uppermost. Then slip the new primary coil into the other in such a position that its top turn is on a level with the top turn of coil C and fasten it in that position by means of a small brass bolt running through one side of the ends of the two tubes. Later, when the primary coil is connected into the circuit, its top turn should connect to the plate of the first tube socket, and its bottom turn to the "B" battery.

Changes in the Layout of the Receiver

The physical changes in the receiver are not extensive. The four-circuit coil is of course removed from its original position, together with all of the wires which were connected to the coil. The switch lever, R, and the taps, S, are also removed from the panel.

The variometer is then mounted with its shaft through the hole from which the switch lever was removed.

The coil is fastened to the baseboard in an upright position by means of two small, brass angle brackets. It should be placed with its center 6 1/2 inches from the left end of the baseboard and 1 3/4 inches from the rear of the base.

Socket J1 is moved toward the left to a position where its center is 4 3/4 inches from the left end of the baseboard. The amperite, L1, is placed directly in front of this socket, close to the panel.

The condenser, Q1, and the resistance, P1, are removed and the transformer, N, is moved to the right to the position previously occupied by these instruments.

(Abstarcted from page 490)
THE FOUR-CIRCUIT TUNER CIRCUIT DIAGRAM
Figure 2: The diagram of the original set before any of the changes have been made.

THE LC-26 CIRCUIT DIAGRAM
Figure 3: Before undertaking the changes which are outlined in the text, the reader should compare this diagram with that in Figure 2.

THE CIRCUIT DIAGRAM OF THE CONVERTED RECEIVER
Figure 4: The circuit to the left of the broken line is identical with that of the LC-26; to the right of this line it is similar to that of the Four-circuit Tuner.
IN THE WORLD'S LABORATORIES
Conducted by Dr. E. E. Free

Hope of Radio Enjoyment for the Deaf

There were mentioned in this Department, several months ago, the experiments of Mr. Jakosky and Dr. McConnell, of the United States Bureau of Mines, in teaching deaf persons to read radio or telegraph code by the feel of the vibrations on their skin, some form of vibrator sensitive to the incoming signals being pressed against the forehead or held in the fingers. This interesting effort has now received a remarkable extension in the quite independent experiments of Professor Robert H. Gault, of Northwestern University, on the possibility of teaching deaf persons—normal persons, for that matter—actually to "hear" sounds through the finger tips in the same way.

The vibrator against which the finger of the "listener" is pressed consists of a telephone receiver the face plate of which has been cut out, so that a wide hole is left through which the tip of the thumb or finger can be pressed against the diaphragm. In teaching students to "hear" by this method Professor Gault speaks vowel sounds, syllables or short, simple sentences into a telephone transmitter. This transmitter is connected to an audio-frequency amplifier. The output of this amplifier goes, in turn, to the receiver carrying the vibrating diaphragm touched by the finger of the learner. Care is taken to have the entire apparatus substantially distortionless, special telephones and amplifiers having been loaned for this purpose by the Bell Telephone Laboratories.

Professor Gault has been experimenting with this method for about three years, the last year under the auspices, and with the aid, of the National Research Council, at Washington, D. C. His success has been remarkable. With a comparatively short series of lessons, the average person, whether deaf or not, learns to recognize selected syllables with a high degree of accuracy. Some of Professor Gault's pupils have learned to recognize sentences quite well. Two of them are now able to catch the drift of a totally unfamiliar story by finger-tip hearing alone. When one remembers that these results have been accomplished by a relatively small amount of training, far less than a child needs to learn to recognize speech for the first time, the outlook for help to deaf persons is extremely favorable.

These experiments have radio interest not only because it is the development of radio amplifiers which has made them possible, but because they hold out promise of radio enjoyment to persons hitherto shut out from it by total, or nearly total, deafness. It is already well-known that deaf persons can sense the rhythm of music by its vibration. They are able to dance, for example, by aid of the vibration of the floor. Professor Gault's results promise them a chance to recognize tones as well. It is perhaps too much to hope that their appreciation would ever be as keen as that of persons with normal ears but even something far short of this would be a priceless boon to many of the afflicted.

Professor Gault is not primarily interested in this feature of his work, but in the help which it promises to supply in teaching deaf persons to recognize speech and to speak themselves. Many deaf persons are also mute solely because his deafness prevents his hearing the sounds which he must imitate in order to speak. Those who do learn to speak, by the help of the truly marvelous methods which the experts in such matters have developed, usually possess a peculiarly flat and unpleasing voice, again for the reason that they do not hear either their own voice or that of others and cannot make the proper corrections of mistakes. Professor Gault has found that the touch sensations which his subjects experience through their fingers are of great assistance in improving their speaking abilities. It is expected, too, that similar methods will help greatly in teaching deaf persons the art of lip reading.

From the viewpoint of pure science, (Continued on page 438)
All apparatus advertised in this magazine has been tested and approved by Popular Radio Laboratory

So easy... plug in battery charging

Plug in the Tungar. Turn a switch to the right—and your "A" batteries are charged. To the left for your "B" batteries. Yes, it's as simple as that—with a Tungar.

An easy installation connects your Tungar permanently. Then you can conceal batteries in a cabinet, or down cellar—and just have a convenient switch to close when you sign off for the night.

In the morning your batteries are at their best, and you've only used about a dime's worth of current.

Tungar charges 2, 4 and 6 volt "A" batteries, 24 to 96 volt "B" batteries, in series; and auto batteries, too. No extra attachments needed.

It causes no radio interference.
It will not blow out Radiotrons.

Merchandise Department
General Electric Company
Bridgeport, Connecticut

Tungar—A registered trademark—is found only on the genuine. Look for it on the name plate.
In the World's Laboratories
(Continued from page 436)

also, the experiments have great interest. They indicate that the touch nerves of the fingers may be highly educated for the perception of tones and sound vibrations, just as they can, we already know, in reading the raised letter of the print used for the blind or in such commercial matters as the feel of fabrics. The nerves of our ear, with which we now do our hearing, were originally touch nerves, as, indeed, were all the nerves of our body. The entire nervous system, the brain included, is a mere in-growth of the skin, developed in the course of ages of evolution out of the primitive touch sensation which was possessed by the skins of our ancient ancestors, the small worm-like creatures who lived along the sea shore when the world was very young. Having special ear nerves, which hear better than our touch nerves can, we have lost the power of perceiving sounds by the skin, which power our remote animal ancestors undoubtedly possessed. Professor Gault's experiments suggest, quite definitely, that we may be able, by training, to recover a large part of this lost ability of our nerves of touch.

Radio Does Not Cause Bad Weather

The delusion, so prevalent three years ago, that "radio was spoiling the weather" and ruining the crops broke out again in Europe the past summer, largely as the result of a widely quoted statement by Dr. Paul Painlevé, then French Minister of War and a mathematician of international distinction. M. Painlevé remarked that he saw no reason why radio might not influence the weather and that he thought the matter ought to be looked into. The weather of 1926 all over the world has been unusual; in many places it has been marked by rainless rains and floods. The peasants of several countries became excited by the discussion to the point of demanding that radio transmissions cease and that antennas be removed.

M. Painlevé seems to have spoken in this instance with the carelessness expected of a politician, rather than the caution demanded of a scientist. There is one simple consideration which makes obvious the virtual impossibility of radio having the slightest effect on the weather; this is the fact that the electromagnetic waves originating in natural electric disturbances, like thunderstorms, are thousands of times more energetic than the strongest radio waves. The earth's atmosphere has been in continual electric oscillation, owing to these natural discharges, for millions of years. It is exceedingly improbable that the tiny additions due to radio should have any perceptible effect on any atmospheric conditions.

The real reasons for the abnormal weather of this year probably lie in the deficiency of sunlight which existed for some three years and which has only recently been equalized. The waters of the North Atlantic and the North Pacific Oceans apparently have some what abnormal temperatures.

It is not possible to say that the weather is either colder or warmer, but that it is unusual and vastly disturbed. The fundamental causes, as of all such changes, are in the sun, not on earth.

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TESTING THE TRUTH OF TOUCH-HEARING

In order to be fully certain that his experiments were not explainable by traces of sound reaching the ears of his pupils and helping them to distinguish, unconsciously, the sounds causing vibrations under the finger tips, Professor Gault carried out some tests with the vibrating diaphragm inside this sound-proof bag.

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There's a golden tinkle in the air—

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No noise as it charges—not a bit of fuss. Not even a murmur that would disturb the mildest slumber.

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Snaps on in an instant—just plug into the light socket, snap on the terminals. Saves service station bother. Spares interruptions caused by absent batteries.

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No Storage Battery Radio is Complete Without a Rectigon

The Rectigon is a superb Westinghouse product. Things you can't see, like extra heavy insulation, things you can see, like the durably enameled case—all are of highest quality. Westinghouse manufactures also a complete line of radio instruments, and Micarta panels and tubes.

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The Durham Metallized Resistor is the supreme grid-resistor, because it embodies improvements that lift it above most competition. Noiseless, unaffected by atmospheric changes, and permanent in resistance value.

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Made of moulded insulation of exceptionally high resistance. Has best quality, tension-spring, bronze contacts. The only upright mounting made. Occupies but little space in set.

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DEPARTMENT

IN THIS TUBE ELECTRONS WERE DISCOVERED

shown at the Wembley Science Exhibit, and reproduced here by special permission of the Exhibition Committee of the Royal Society, this vacuum tube is the one used by Sir Joseph J. Thomson, in 1897, to explore the mysterious "cathode rays," now known to be streams of electrons.

All Electrons Are Alike

Once of the basic conceptions of radio theory, as of many other branches of physics, is that all electrons carry the same electric charge, have the same mass and are otherwise identical. As Lord Kelvin said long ago about atoms, electrons are as uniform as though they were "manufactured articles," in which they differ sharply from most ordinary objects. No two leaves from a tree, for example, will ever be exactly identical. Not even any two crystals of rock salt or of galena are ever exactly the same.

This basic idea of the identity of any two electrons, no matter where found, was attacked some years ago by Professor Felix Ehrenhaft, of Vienna, who believed that he and his pupils had found evidence that under certain conditions there could exist what he called a "sub-electron," that is an electric charge less in amount than the supposedly uniform charge of 4.774 billion of an electro-static unit which all ordinary electrons are found to possess.

Although this contention of Professor Ehrenhaft has had little acceptance from other physicists it has attracted much attention. It is important to record, therefore, that Mr. R. Sanzenbacher, a student of Professor Erich Regener, of the University of Stuttgart, in Germany, has repeated the experiments of Professor Ehrenhaft, has failed to confirm them and has apparently located the reason for Professor Ehrenhaft's mistaken conclusion.

All of the experiments, Ehrenhaft's and Sanzenbacher's alike, are carried out according to the method originally devised by Millikan and used by him to obtain the modern measure of the electric charge of the electron. Tiny globules of mercury or of some other substance are floated in air. These globules are allowed to pick up an electric charge of one or more electrons. The rate of movement of the charged globule is then measured, under the action of a known electrostatic attraction. The rate of fall of the globule, when uncharged, gives its mass. The rate of movement under the electrostatic attraction gives its electric charge.

In the original performance of this experiment, and in all his repetitions of it, Millikan found the same value for the electronic charge. Ehrenhaft did not. In some instances, especially with very small floating globules of mercury, he found indicated values a little smaller than Millikan's figures, although not small enough to be assigned to one whole electron less. Thus arose the idea that an electron might be divisible into "sub-electrons." In the new experiments, Mr. Sanzenbacher has studied tiny globules of mercury which altered in size, either by condensation (increase) or by evaporation (decrease) during the course of the experiment.

The results show no indication whatsoever of the existence of a fractional electron. Mr. Sanzenbacher did find, however, that when the globules of mercury were floating in hydrogen gas instead of in air there occurred, in some instances, a decrease in the rate of movement, thus furnishing an apparent indication of a decrease in the charge of one electron. The same decrease was observed occasionally in mercury globules which had stood long in air without changing in size, and provided that the globules were small.

Without pursuing the details, it may be said that all of Mr. Sanzenbacher's data indicate that Professor Ehrenhaft's mistake was due to some change in the surface of the small globules. Possibly these affix themselves a thin layer of tightly-held air molecules; possibly their surface alters in some other way. However this may be, something happens to the surface of the globule which makes it move more slowly through the gas than it should. Thus arises an apparent, although false, indication that the charge on the globule is smaller than would correspond to one electron.
Radio batteries
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There is one safe guide to follow in buying radio storage "A" and "B" batteries—the name of the battery and the reputation of the manufacturer.

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A Radio Method for Geologists

AMONG possible applications of radio to the study of rocks and ore deposits, a subject which Popular Radio has already discussed on several occasions,* is a simple method described in a recent article by Professor Courant, of the University of Gottingen, Germany.† During the war Professor Courant was engaged in some studies of the ground-conduction telephone system—the so-called T. P. S. system—for the German Army.§ His present paper is a belated result.

The method which he suggests consists in determining the paths of flow of the alternating, ground-conducted field which goes out from a doubly-grounded transmitter. The transmitter may be merely a buzzer circuit, with both ends grounded. The detector is a combination of two coils, one oriented in a north-south plane, the other in an east-west plane. The coils are on wooden frames about one yard square. Both ends of each coil are grounded. The north-south coil has one end grounded to the north, the other to the south. The east-west coil is similarly grounded; one end to the east, the other to the west. Mounted on the same axis as these two coils is a third coil, which can be rotated, like the coil of a radio-compass. In the circuit of this coil is a telephone. When thus arranged, the position of this inner coil which gives the minimum sound in the telephone indicates the direction of the audio-frequency field moving through the ground.

Professor Courant moves this receiver and the transmitter from place to place in the area to be examined, or, more conveniently, he uses a number of transmitters and a number of receivers. Thus he plots the paths of the lines of force through the surface soil of the area. These paths are not affected, he reports, by the superficial conductivity of the ground (as altered, for example, by rain). On the other hand, they are controlled largely by the geological nature of the country, the underlying rocks, the presence of faults and folds, and the like. He believes that methods along this line might be of service in geological surveys. Service in agricultural soil surveys is equally possible.
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Measuring the Energy in Ether Waves

A physical instrument which is likely to be added, soon, to the armament of the well-equipped radio experimenter, is that known as the radionometer. It is one of the few instruments with which one can measure the energy in a ray of light, in a beam of infra-red or heat rays, or in a radio wave in the very short wavelength region now beginning to be explored.

The simplest variety of radionometer may be seen any day in the windows of the optical stores. It consists of a windmill-like arrangement of little metal vanes, black on one side and silvered on the other, the whole contained inside a glass bulb. When strong light falls on these vanes they move, the whole arrangement spinning around merrily inside its sealed glass bulb. This display radionometer is a toy, not a scientific instrument. It is possible, however, to build a similar device which will have extreme sensitivity in the measurement of radiant energy, as well as the great advantage of being suitable for a wide range of wavelengths.

The movement of the vanes of the radionometer does not depend, as many persons think it does, upon the pressure of light. Such a pressure exists, but it is far too small to move bodies as large as the vanes in the radionometer.† What happens in this instrument is that the radiation, whether of light or heat rays or radio waves, is absorbed by the blackened side of each vane. This blackened side becomes a little hotter than the bright, reverse side. This heating, by interaction with a little gas which purposely is left inside the bulb with the vanes, produces the motion of the vanes. The theory is complicated, but known,‡ and when the constants are known, the energy of the radiation may be determined.

In the delicate forms of the instrument the vane system does not rotate, but is merely allowed to twist around against the resistance of a fiber of glass or of quartz. The amount of this twist measures the energy of the radiation.

† The most sensitive form of radionometer, devised by the late Dr. F. F. Nichols and called by his name, is described in a recent paper by Dr. Nichols' former associate, Dr. J. D. Tear: "The Nichols Radionometer," Journal of the Optical Society of America (Menasha, Wisconsin), volume 11, pages 81-88 (July, 1925). Another form of radionometer, slightly less sensitive but easier to construct, is described in "A New Form of Radionometer," by R. I. Hansen, in the same Journal, volume 11, pages 283-288 (September, 1925).

‡ I another instrument, capable of measuring the actual pressure of light, is described by Dr. Tear in "A Torsion Balance for Measuring Radiation Pressure," Journal of the Optical Society of America (Menasha, Wisconsin), volume 11, pages 135-145 (August, 1925).

§ The accepted theory is due to the famous Dr. Albert Einstein. "The Radiometer" (in German), Zeitschrift für Physik (Berlin), volume 27, pages 1-6 (1924). See also, "Further Experiments on the Theory of the Vane Radiometer," by R. E. Marsh, Journal of the Optical Society of America (Menasha, Wisconsin), volume 12, pages 135-146 (February, 1926).
Hammarlund's New Creation
The "MIDLINE" Condenser

The new Hammarlund "MIDLINE" condenser makes its bow with the claim of superiority over any other type ever produced.

Experience (yours and ours) is responsible for its many excellent features. "Straight-line-capacity" crowded the low waves; "Straight-line-frequency" crowded the high waves; "Straight-line-wave-length" merely compromised between the two. But the Hammarlund "Midline" retains the important advantages of these earlier types without any of their disadvantages.

All of the tried and true Hammarlund features are included: soldered, non-corrosive, brass plates with tie bars; rib-reinforced aluminum alloy frame; minimum dielectric; one-hole mounting, with anchoring screw; bronze clockspring pigtail; friction brake. In addition, there have been added ball and cone bearings, and a full-floating rotor shaft, the only function of which is to turn the rotor plates. It supports no weight; it may be entirely removed, or it may be adjusted for coupling to other condensers for tandem operation, or for mounting a variable primary coil.

The "MIDLINE" is much more compact and even stronger and more beautiful than previous Hammarlund models.

The better dealers will have it soon.

HAMMARLUND MANUFACTURING CO.
424-438 W. 33d Street, New York

Hammarlund "MIDLINE" Condensers will be available in all standard capacities: single, dual, and triple.

For Better Radio
Hammarlund PRECISION PRODUCTS

Watch for the beautiful new Hammarlund "VERNI-TUNE" DIAL, a revelation in accurate, effortless tuning.

www.americanradiohistory.com
**LISTENING IN**

**Practical pointers from experimenters and broadcast listeners. What helpful hints can YOU offer to your fellow fan? Readers are invited to address their letters to the Editor of this Department.**

**Conducted By Lloyd Jacquet**

**How I Picked Up Peru on My Four-circuit Tuner**

In the recent international tests, I tuned in Lima, Peru, using the old type Cockaday set, with an "Effassee" Antenna and about 35 feet of lead-in wire. The antenna was installed in the attic. While I believe I could have heard European stations, there was so much interference from "bloopers" that I could not clear any of the carrier waves sufficiently to hear them satisfactorily.

I have retained this old model Cockaday set, that was originally built from the design published in the October, 1924, issue of Popular Radio, because of its sweet tone. When I want DX I still have no difficulty. The Cuban stations, for instance, have been coming in loud enough to dance to the music.

This is really good, persistent performance for this receiver, as it has been without a cabinet for over a year, and I have been rather negligent in keeping it clean. And I am also using the same soft detector tube that I purchased over a year ago for this set.

—ALBERT B. FISHWICH, CINCINNATI, O.

**How I Made a Terminal Board for My Power-pack**

When I constructed my Power-pack from the article in the May, 1926, issue of Popular Radio, I wanted to have all of the controls easily accessible, as I wanted to place the unit in a cabinet together with the receiver. The necessity for a small panel board upon which all of the connections as well as the rheostats and other knobs are available can be appreciated.

I secured a piece of bakelite about eight inches long by four inches high, and located the necessary binding-posts and holes for the rheostats. I provided an extra connection for a "ground," although this is actually not needed.

The panel is secured to the baseboard by means of brass angles and wood screws held it in place. Brass machine screws hold the panel to the brass angles.

All of the controls are now available together, and in the same plane. It may be placed along any edge of the baseboard and in the most convenient place for the purpose.

—HARRIS CUMBLETON, PORT WASHINGTON, N. Y.

**How to Get Rid of Home-made Static**

Many listeners-in may find that they can discover the source of many of their so-called "static" troubles right at home.

In my case, I was badly bothered with a noise that I finally traced to a small fan motor.

I found this small series motor sparking badly at the brushes. After trying to reduce the sparking to a minimum, I reversed the leads of the electric wire.

As one of the wires was grounded through the wiring of the system one of the brushes was connected to the ground side of the line through this change. The field coil was then on the "live" side of the line, and acted as a choke coil in the circuit.

I also found that if a two microfarad condenser is placed across the brushes, still better elimination of the sparking and interference will result. This condenser should be placed as near to the motor as possible.

If other listeners-in are bothered with similar difficulties, but find that the line is not grounded, the same methods may be used.

—A. M. FERGUSSON, PORTLAND, ME.

**The New "D" Battery**

A woman entered an electrical shop and asked for a "D" battery. When the clerk informed her that there was no such thing she exclaimed:

"Well, that's queer. Last evening my husband couldn't even get a whistle on the radio, and when I asked what the matter was, I distinctly heard him say it was that D— battery."
Foretelling Radio Reception from the Weather Map

(Continued from page 417)

When a receiving set is located at a point within the same pressure area as the transmitting station, and especially if this area is a "low" of great extent, reception will be poor, with much static and fading. This same condition will exist when the two stations are along the same trough of low air pressure, also when a line connecting the two stations is parallel to the isobars, unless this line be north and south. In the latter case reception will be nearly as good as when it is across the isobars in an east and west direction. When reception is across the isobars in a north and south direction, it is a little better than when the direction is parallel to them.

A transmitting station, when located within the same pressure area with the receiving station, should increase its power in order to get its signals through. When the transmitting station is within a "high" and the receiving station is in another "high," but with a "low" or a storm area between the two, reception will usually be very poor, often impossible. Static from an advancing "low" will be severe and it is generally useless to attempt reception from a broadcaster located to encounter this. Even superpower often fails to get through. It cannot be said that high power is a panacea for all radio evils.

During the fall and winter months it is high pressure areas of great magnitude so often cause phenomenally good reception. After a low pressure area has moved off toward the east of the observer and when practically no air pressure difference exists between the transmitting and receiving stations, phenomenal reception may diminish. Due to the clear and cold atmosphere, however, static is virtually eliminated and irregular fading will seldom be observed.

Temperature alone does not appear to affect radio transmission or reception, except for such relationship as it has to the pressure of the atmosphere. Low temperatures nearly always indicate high air pressures and clear weather, and are usually accompanied, therefore, by a greater or lesser freedom from static. Falling temperatures usually indicate the arrival of a "high" and a sharp increase in good reception may be expected. Rising temperatures usually indicate a fall in air pressure, with high percentages of humidity. This frequently means a decrease in good reception, with trouble from static and fading. In winter, with relatively low temperatures existing, static interference may be high during a snowstorm, yet excellent directional reception will be obtained.

Thus the conditions of reception may be readily deduced from the weather forecast.

THERE are three elements in a radio tube—The slightest movement in relation to each other causes a characteristic change, invariably disqualifying the tube.

THE NEW SUPERTRONS HAVE SUPPORTS THAT TIE THE THREE ELEMENTS INTO ONE UNIT

The BASE and SUPPORTS are ISOLANTITE

ALL TYPES—AT PUBLIC DEMAND PRICES

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SX 201 A</td>
<td>$2.00</td>
</tr>
<tr>
<td>SX 199</td>
<td>$2.25</td>
</tr>
<tr>
<td>SV 199 small</td>
<td>$2.25</td>
</tr>
<tr>
<td>SV 199 large</td>
<td>$2.25</td>
</tr>
<tr>
<td>SX 112</td>
<td>$5.00</td>
</tr>
<tr>
<td>SX 120</td>
<td>$2.50</td>
</tr>
<tr>
<td>SX HiMu</td>
<td>$3.00</td>
</tr>
<tr>
<td>Supertheon Half</td>
<td>$4.00</td>
</tr>
<tr>
<td>Supertheon Full</td>
<td>$5.00</td>
</tr>
</tbody>
</table>

In Canada slightly higher.

SUPERTRON MFG. CO., Inc.
HOBOKEN, N. J.

SUPERTRON
A SERIAL NUMBER GUARANTEE
The Foremost Independent Tube In America
How to Build an Impedance-coupled Amplifier.

(Continued from page 420)

How to Install the Amplifier

After checking all connections, the unit may be placed in a convenient position near the tuner and the two wires running from the phone jack in the plate circuit of the detector tube on the tuner should be attached to the binding posts marked 1 and 2 in Figure 5. Next connect the "A," "B" and "C" batteries, as shown in Figure 3.

Then, insert two 201-a tubes or two high-Mu tubes in sockets M1 and M2. If high-Mu tubes are used, a "C" battery of less than 71/2 volts should be used; this may be determined by experiment.

Place a UX-171 tube in the socket, M3. Then, place a 1-ampere Amperite in the holder, N. The tubes should immediately light to the correct brilliance. The amplifier should now function properly, if the loudspeaker plug is inserted directly into the jack, O, and the set is tuned to a station. The volume control potentiometer, E, should be rotated in a clockwise direction for decreasing the volume and in an anticlockwise direction for bringing the signals up to more volume.

The amplifier will work with any single-tube or crystal set or it may be used with a tuned-radio-frequency receiver or superheterodyne with really astonishing results in reproduction quality. It will produce signals truthfully with a range from a mere whisper to enough volume to fill a whole house with dance music.

The unit is so simple to build and so economical to operate that it should fit the needs of those radio enthusiasts who want to get quality reproduction with an economical outfit.

A Radiant Crystal Pilot

(Continued from page 421)

...the frequency of the station that is transmitting. The two next crystals (one on either side of this tube), are ground to a frequency of only a few kilocycles higher and lower than the one in the middle tube; and the two end ones are ground to frequencies slightly higher and lower respectively than the two preceding crystals.

In operation, therefore, when the station is exactly on its correct wavelength, the crystal in the middle tube will glow brightly and the gas in the four remaining tubes will glow faintly. The four crystals in these tubes will be dark.

If the frequency of the station varies up or down, the crystal in the middle tube will become dark and its gas will glow faintly, whereas the crystal in one of the side tubes will take on the bright glow according to whether the frequency becomes higher or lower.
Impedance coupling is universally accepted as the most perfect form of amplification from a reproductive standpoint—But the amplification increase of the straight impedance is low.

The Thordarson Autoformer is an impedance with a step-up ratio—It combines the faithful reproduction of the impedance with the amplification increase of the transformer, paving the way for the release of the deeper tones with increased volume and unrestrained quality.

Price each $5.00

Note: Only Thordarson makes the Autoformer

THORDARSON ELECTRIC MANUFACTURING CO.
Transformer specialists since 1895
WORLD'S OLDEST AND LARGEST EXCLUSIVE TRANSFORMER MAKERS
Chicago, U.S.A.
How to Wire Your House for Radio
(Continued from page 438)

Perhaps, after all, the ultra-flexibility of this system may likewise prove a serious drawback, for the reason that there is no master control. Thus an indiscreet guest might operate his individual radio receiver long into the night, whereas with the master control, politely flipped at the desired time, Mr. Indiscreet Guest is notified in simple terms that the time for radio entertainment is at an end for the night, at least.

With Master Receivers and Feeder Wiring for Real Service

The third form of radio wiring installation for the home is a combination of the two preceding plans; in other words, there are several radio receivers employed so as to provide some measure of program diversity with master control, together with a multiplicity of loudspeakers so as to bring the radio programs to all parts of the household.

The household is divided into natural divisions according to radio service, and a master receiver together with a system of feeder wiring and the necessary loudspeakers, is provided for each division. The various divisions are, to all intents and purposes, separate radio installations and operate quite independently of each other.

Typical of this plan is the unique “Model Radio House” recently completed at St. George, Staten Island, overlooking busy New York harbor. This home, with its radio wiring and radio equipment, has been sponsored by the Radio Corporation of America and marks the dawn of a new day in broadcast reception. It represents the first attempt to realize to the utmost the benefits of broadcasting service; hence it offers an excellent model in discussing the possibilities of radio wiring.

Permanent radio wiring, installed at the same time as the usual electric wiring, provides the foundation for the radio installation of the Model Radio House. Outlets are provided for furnishing alternating current to the radio equipment and also to the loudspeakers, while gang switches provide the necessary means of local and remote control. An eight-tube super-heterodyne loop receiver is placed in the living room, and serves to operate a cabinet-type AC, drive cone on the opposite side of the room, or a similar cone in the dining room, through concealed wiring and gang control switches. Either loudspeaker may be turned on at will, either from the living room or dining room.

In the kitchen is a five-tube tuned-radio-frequency type receiver, operated by batteries and employing an aerial, with its own cone speaker; this set serves to supply radio entertainment and service for the housewife while about her kitchen duties.

Upstairs is located a master six-tube super-heterodyne loop receiver in the master bedroom, operating a power cone in that room and another power cone in the guest room, through a system of switches and concealed wiring. Radio service is available in either room at will, but the choice of programs obviously rests with the occupants of the master bedroom who may tune the receiver as desired.

As a further touch, the radio receivers are controlled by a time switch, set to turn on the service in the morning so that the cheery voice of the physical training director may serve to awake the sleepers and invite them to their daily dozen.

The plan here carried out seems to provide a happy combination of the advantages to be gained by both of the fundamental plans already outlined, with virtually none of the disadvan-

A TYPICAL RADIO INSTALLATION FOR A SIX-ROOM HOME*

<table>
<thead>
<tr>
<th>Room</th>
<th>Set</th>
<th>Current Supply</th>
<th>Power Consumed in Watts</th>
<th>Outlets Required</th>
<th>Cost of Electric Installation</th>
<th>Cost of Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living Room</td>
<td>8-tube super-heterodyne power cone</td>
<td>Full house current operation</td>
<td>200</td>
<td>7</td>
<td>$35.00</td>
<td>1 cent per hour</td>
</tr>
<tr>
<td>Dining Room</td>
<td>Power cone</td>
<td></td>
<td></td>
<td>200</td>
<td>4</td>
<td>$20.00</td>
</tr>
<tr>
<td>Parlor</td>
<td>(Served by above)</td>
<td></td>
<td></td>
<td>200</td>
<td>4</td>
<td>$20.00</td>
</tr>
<tr>
<td>Master Bedroom</td>
<td>6-tube super-heterodyne power cone</td>
<td>“A” and “C” Battery</td>
<td>100</td>
<td>8</td>
<td>$40.00</td>
<td>1/2 cent per hour plus “A” battery cost</td>
</tr>
<tr>
<td>Guest Bedroom</td>
<td>Power cone</td>
<td>“A” battery</td>
<td>100</td>
<td>4</td>
<td>$20.00</td>
<td>*</td>
</tr>
<tr>
<td>Kiddies Room</td>
<td>(Served by above)</td>
<td></td>
<td></td>
<td>100</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>Kitchen</td>
<td>5-tube r.f. receiver battery</td>
<td>Full battery operation</td>
<td>—</td>
<td>2</td>
<td>$10.00</td>
<td>Battery costs</td>
</tr>
</tbody>
</table>

*Based on the “Model Radio House” installation, sponsored by Radio Corporation of America.
Not "How Far?"
Not "How Many Stations?"
But "HOW REALISTIC?"
is now the pertinent question of radio

The spell of magic in radio is over. No longer are we mystified by programs from far off cities. No longer do we spend whole evenings in dial-fishing for all the stations we can get—just for the sake of boasting a long list of call letters.

Today we are in a new era of radio—one of quality reproduction. Broadcast listeners everywhere are demanding above all else reception that is natural.

If your radio set has not been modernized by the improved type of loudspeaker, better transformers, "B" voltage supply units and power amplifiers, you can not appreciate what clear, sweet-toned music athrob with human expression is in store for you.

Ask your dealer to show you the new General Radio Rectron and Raytheon "B" Eliminator and Power Amplifier kits which you can easily assemble in a single evening. Ask him about the new type 387 Speaker Filter and the type 285-D transformer for use with the new 200A detector tube. If he is not prepared to supply you with the equipment or information write us for whatever details you require.

GENERAL RADIO CO. Cambridge, Mass.

The Type 285-D Audio Transformer has a high impedance to match the output of the new 200-A detector tube. When used in the first stage of audio amplification following the 200-A the 285-D produces a very marked improvement in tone quality.

Price $6.00

The Type 387 Speaker Filter adapts the impedance of the amplifier to the Western Electric and other cone speakers of similar design and quality so that unusual purity of tone is produced. It has a very wide frequency range.

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Price $6.00
IN THE HOME WIRED FOR RADIO

Programs may be switched from one room to another as easily as you switch on and off the electric light.

tages. In actual practice it has proved by far the most desirable.

Balancing the "Wiring Costs" Against "Receiver Costs"

The question of radio installation resolves itself largely into a matter of balancing wiring costs against receiver costs.

Thus if the entire house is wired for radio service from a single receiver, the wiring cost is certain to be high in proportion to the receiver cost. If, on the other hand, individual radio receivers are employed throughout the house, the receiver cost will be very high while the wiring cost will be practically nil.

Somewhere between these two extremes, then, lies the economical and practical solution of any radio installation plan.

Conditions go far to decide the choice between radio wiring and individual radio receivers. For instance, with neighboring rooms not separated by sound-proof partitions, the logical choice should be a master receiver in one room, with loudspeakers in both rooms, together with the necessary extension wiring. Separate groups in the household, such as the family and the help, should be served by separate master receivers with individual loudspeaker wiring.

Again, two widely separated parts of the house, such as the living room and the den in the attic or the workshop in the basement, should not be placed on the same receiver due to the inconvenience of control, as well as the excessive wiring costs.

There are two fundamental principles to follow in planning the radio installation and wiring:

First, a single or master receiver for rooms quite close together, not separated by sound-proof partitions, and serving persons of more or less similar tastes.

Second, separate or individual receivers for widely separated parts of the house and for groups of widely divergent tastes.

These two fundamental principles, together with due consideration of the cost of wiring balanced against the cost of receivers, should prove a safe guide in planning a real radio home.
How to Simplify Your Set With Automatic Filament Controls

(Continued from page 426)

make his own set this is a decided advantage. First let us compare the results obtained by the use of different types of resistances. To do this a circuit was arranged as shown in Figure 2.

Only one tube was used to make the test and one was chosen which had standard characteristics, that is, when 5 volts was applied to the filament there was a flow of .25 amperes of current. A voltmeter with a range of 0-8 volts was used to measure the voltage of the battery and of the tube. Flexible leads were provided so that voltages across the resistance or across the filament could be read. A standard ammeter was used which provided an accurate reading of the current taken. An ordinary rheostat was used to vary the impressed voltage on the circuit and a high-resistance volt-ohmmeter was used so that there would be no misleading readings of current value due to the current consumed in the voltmeter. Several tests were run on various types of filament control devices which are on the market on the apparatus shown in Figure 1.

Only two characteristic curves are shown. They are numbered 1 and 2 in the accompanying curve sheet shown in Figure 3.

The voltage on the tube was plotted in a vertical direction and the battery voltage laid along the horizontal line. It will be noticed that they are practically straight lines. The ideal regulation of course would be a straight line running horizontally through the chart at 5 volts, thus indicating that no matter what the battery voltage happened to be the filament voltage would be 5 volts. This is practically impossible to obtain, however. But the closer the curve approaches the horizontal the better the regulation. Curve No. 3 shows the characteristics for an ordinary piece of resistance wire of an adequate size so that there could be no heating action, consequently the resistance remained constant at all voltages. This curve is not as close to the horizontal, or to the ideal conditions as the others. Using the simple resistance the storage battery must be recharged before it is down to as low a point as could be reached by the use of an automatic control.

A set capable of receiving a thousand miles in the United States is not effective for more than 500 miles in India, due to peculiar atmospheric conditions there.

Weather and meteorological data supplied by the Weather Bureau are broadcast today from 138 broadcasting stations in the United States.

PERFECTION is never attained. Each year sees improvements in what was thought "the ideal" the year before. —Thousands of persons have bought MU-RAD receivers in the past five years—thousands of others will buy MU-RAD Super-Sixes this year. And the MU-RAD Company now provides an exchange plan on old for new model receivers, so that owners of last year's sets can secure a liberal allowance toward the purchase of a new

MU-RAD SUPER-SIX RECEIVER

1. Perfection of tone quality
2. Selectivity
3. Long range
4. Thunderous volume controllable to a whisper
5. Fine appearance

There is a pride in possessing fine things.

MU-RAD RADIO CORP.
DEPT. P, ASBURY PARK, N. J.
BOSCH
Announcing the New

Manufactured under patent applications of the American Bosch Magneto Corporation and licensed also under applications of the Radio Frequency Laboratories, Inc.

The Cruiser 5 Tubes—$100.

AMERICAN BOSCH
BRANCHES: NEW YORK CHICAGO DETROIT SAN FRANCISCO
Fully demonstrating its leadership Bosch presents two new Bosch Radio Models—the Amborada and the Cruiser—receiving sets which show a most remarkable advance in home entertainment. The Amborada is the embodiment of perfect radio and quality in furniture. It is a completely armored and shielded seven tube receiver with utmost simplicity of operation. There are but two controls—a Station Selector and a Volume Control. Never was radio made so simple or more enjoyable. The early American period cabinet presents a new and beautiful setting to radio in the home. Ample space is provided for all batteries, charges or power units with no evidence of its being a radio receiver. No antenna is necessary with this new model. The Amborada will be welcomed by those who have waited for just this development. The Cruiser is a compact perfectly armored and shielded five tube receiver. Its simplicity is expressed in the Unified Control which gives the advantages of a single station selector for most tuning but when “Cruising the Air” two dial tuning advantages are always present. The Bosch Radio Dealer near you—usually the leader in his community—will explain the great advances Bosch has contributed to Radio. He also sells the Bosch Ambotone Reproducer and the Bosch NoBattery power unit, as well as the many other Bosch accessories. We invite your inquiry if you wish his address. Be sure to hear Bosch Radio before buying any radio equipment.
SOFRUBBA

And Now!
The Ultimate Achievement
A Soft Rubber Socket

This new live rubber socket is the latest development in a perfected socket that really absorbs shock and eliminates all microphonic noises. This is a revolutionary achievement that has solved V. T. socket problems and has caused great comment throughout the radio field.

Here are some of the remarkable features of the Sofrubba socket. Ask your dealer about them or write us direct.

1. It is a perfect shock-absorber.
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10. It is good-looking—practical—efficient. Its low price, alone, makes it distinctive.

It is surprising the difference this socket will make in your set.

Dept. B

Moulded Products Corporation
549 & 551 West 52nd Street, New York City

The
YE5 and NO MAN

APW.—Aage Sorensen of the WEAF "Viking" is a real Norwegian, although he has been in this country for many years. * * * He is thirty-seven years old and lives in New York City.

On this page, you will find a picture of him in costume—which we have dug up at enormous trouble, just for you.

A MERE WIFE.—Yes my dear, WRNY took the Edison hour away from WJZ—months ago. * * * Joseph Plunkett (WEAF) and his "Plunketeers" left the microphone nearly a year ago. * * * Glad to hear one woman voice her opinion concerning the morning "woman's hour." * * * Granlund is still clowning at WHN and Wendell Hall is still being funny and original somewhere in the United States. * * * What Wendell needs is another "Ain't Gonna Rain No Mo" song; he's been living on the old one long enough.

LOUIS W. B.—Clyde Hager left WMBB and is now the director of KFOZ. * * * There is an appropriation to finish out the year for WNYC; what will happen to it in 1927 we do not know. * * * We think Larnind Kay is still in business at Atlanta, Georgia. * * * Yes, he does personally the South just as Mr. Granlund personifies the Orpheum Circuit. * * * We can't keep track of Burr McIntosh; he's here and there; largely there. * * * His philosophy is too Dr. Crane-ish to suit this toughy.

JAKE.—Please don't write in here with a feminine hand and sign your letter Jake; you can't fool this sly old weasel! * * * If you're looking for the "Kansas City Jay Bird," his real name is Carson Robinson. * * * We don't know where he is appearing regularly; last time we saw him it was 3 A.M. and he was bent on writing "an ode to mother." * * * There's only one thing that makes a man want to write an ode to mother at 3 A.M.

ELMER D.—You will find Harold Iabell broadcasting from KFI.

ZANDER THE GREAT.—Arthur Clifton is the organist from WBZ during the "Dreamland Recitals." * * * He does play nicely, but we would not yet accuse him of being a master; he was discovered by one of the WBZ announcers while sum-mering at Ocean Park, Maine. * * * Keith McLeod is still with WJZ. * * * Yes, he's Scotch and also the musical director of WSS. * * * Now don't get nasty about Milton Cross! We eat people who don't agree with us about Cross.

T.D.F.—You are sure an industrious letter writer! * * * We don't know the true identity of WGN's "Phantom Violin," as a matter of fact, we have never been intrigued by mysteries of this sort and we care not a tinker's hellahaluhe whether Mr. Phantom is man, woman or announcer.

A.B.N.—Glady you like this new department—but never mind sending us that dozen of fresh eggs. Thanks just the same. * * * Thomas Cowan (ACN) was one of the pioneer announcers at old WJZ; he was born three blocks from the site of the old studio. * * * In a recent letter to us Tommy said that Ouida said that somebody else said that a "young Hurrah man is a young man married." * * * He is not married and says very emphatically that he "never will be." * * * Mr. Cowan now lives in Greenwich Village; he is the first announcer that we know of who has displayed this marked aesthetic taste. * * * His habitat is in one of those cellar where you inhale the "new freedom" and other odors.
Only the Best Radio Parts are good enough for a Good Set
An All Benjamin Radio Product

Quality in every part of a radio set is depended upon for true-to-life reproduction of radio. There dare not be a flaw anywhere. And all the parts must synchronize. Each Benjamin Radio Product fits in perfectly with the power and conditions of the set and contributes greatly to its sensitivity, selectivity, volume and quietness. The use of Benjamin Radio Products in every part of the world—by authorities and amateurs—endorses the quality and effort that the Benjamin Electric Mfg. Co., has put into each product.

Improved Tuned Radio Frequency Transformers
Proved through exhaustive and comparative tests to be the most efficient coil for modern radio sets. Better in all important features and characteristics. Space wound. Basket weave. Cylindrical. Highest practical air dielectric. Gives wonderful sharpness in tuning, better volume and purer tone quality.

2½" Diameter Transformer

3" Diameter Transformer
Capacity coupling reduced to lowest degree. For use with 00035 Mfd. Condensers. Set of three, $6.00—Single Transformer, $2.25.

"Leekless" Transformers
Uniform high inductance, low distributed capacity and low resistance. The external field is so slight that it permits placing coils close together without appreciable interaction. Single Transformer, $2.50.

Push Type Cle-Ra-Tone Sockets

Battery Switch
Quick, positive, clean-cut make and break. When it's "on" it's "off," eliminating danger of wasteful use of battery. 30 cents each.

Straight Line Frequency Condensers
No crowding of Stations. The broadcast range is spread evenly over the complete dial. Stations come in without interference, and tuning is much easier. An instrument made with the precision and compactness of a watch. Adjustable turning tension.

If your dealer cannot supply you send amount direct to our nearest sales office with his name

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Manufactured in Canada by the Benjamin Electric Mfg. Co. of Canada, Ltd., Toronto, Ontario.

F.W.P., Jr.—ACN (Thomas Cowan) moved from WJZ to WNYG over a year ago. "* * * That is the most gnostic Duke of Cogin is news to us. "* * * As a matter of fact, this sounds like gross exaggeration, but you never can tell. "* * * We once met a young man at a summer boarding house who was resting gnostic, he said he was a member of the House of Bourona, but we later found him on the floor at Macy's Department Store.

Robert,—Roseline Green is the young lady who takes leading parts in WGY's radio drama's. "* * * She has also appeared in the Little Theater Productions of New York University at Washington Square, New York. "* * * Write to her care of WGY, Schenectady, N. Y. "* * * She does not pass on radio plays however.

Mrs. A. H.—Yes, "Gambie" will probably be back on the air with "Roxy" after the new Roxy Theatre opens.

Harrriet.—The café you mention is one of those places where you pay no cover charge—but you have to drink your way out. "* * * However, if you think the orchestra should be broadcast, write to one of the New York stations and suggest it.

No—NAME.—That was Madame Feby Clement you heard at WTIC. The madame was formerly with the Boston Grand Opera Company. "* * * Did we ever sing over the radio? "* * * Oh, mister, what ever put such a thought in your mind?

A.A.M.—The WEAF Opera Company is under the direction of Cesare Sodero and not Graham McNamee, as you seem to suspect.

Donald Lacy.—"Biggest Little City In The World" was the slogan of WDAY, Fargo, N. D. "* * * This is another Bab-bittoman conception. "* * * Daily Paskman is the director of WGBS and it was Allen McDougal, one of 387,522 "famous and popular" Irish tenors that we have in America who sung from WEAF for Mr. Atwater Kent on Sunday, June 27th. "* * * Yes, WFBH (NYC) still has halftime.

Dwight O.—So you’re a tenor and you want a list of stations in your vicinity! Why not WGR? "* * * That's really the only good microphone in Western New York. "* * * Aw, please don’t sing "Mother McCrea."

Pollard, Jr.—So you’re going to study psychology and "knock 'em dead" on the air? "* * * Well, good luck to you; if you can master a psychology of broadcasting you’re a good man. "* * * Try your stuff on WHN. "* * * If you can "psycho-lize" this audience into appreciating something more aesthetic than entertainment that is the equivalent of a 12th Street burlesque show, you will deserve high honor.
A Chorus with no Bass Voices?

What would it sound like? What does it sound like? Anyone with an ordinary radio set can tell you. The Daven Bass Note Circuit, which creating such a sensation among the fans, embodies everything that a good circuit should have: Quality—Volume—Sensitivity—Selectivity and Ease of Tuning. The Daven Amplifier assures perfect reproduction; the DRF Coils, designed as a companion of the Daven Super Amplifier, function as perfectly in the Radio end.

Six tubes, tuned radio frequency, volume controlled from the faintest whisper to enough to blast the speaker, straight line construction, simple to build. Any Authorized Daven Service Dealer can supply you with all of the parts with full instructions. For full information and address of nearest Daven Dealer, write us direct. Catalog free.

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Embodying These Standard Daven Radio Parts
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3. Daven Mu-28 tubes
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This book, 25c at dealers, describes Daven Resistance Coupled Amplification in full detail. 30c by mail.

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Elkay Equalizers require variable rheostats, delivering correct voltage to any type of tubes automatically. To use any combination of tubes in same set, merely insert correct value of Equalizer: there is one for every tube made. Before building your set, write for folder, to The Langbein-Kaufman Radio Co. (Dept. P) 511 Chapel St. New Haven, Conn.

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Silent "B" Power with World Radio Storage "B" Battery

Lasts Indefinitely—Pays for Itself


Extra Offer: 4 Batteries in series (96 Volts) $10.50.

SEND NO MONEY! just state number of batteries wanted and we will ship same day order is received. Pay expressman after examining batteries. 5 per cent discount for cash with order. Send your order today—NOW!

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Makers of the Famous World Radio "A", "C", "B" Storage Batteries
Prices: 6-volt, 100 Amp. $10.50; 120 Amp. $12.50; 150 Amp. $16.25; 225 Amp. $25.00

All equipped with Solid Rubber case.

K.K.K.—Stanley W. Barnett is a WBAL announcer and studio manager. He is young and handsome, as you will see from his photograph. No, he has never been in the movies.

Lillian C.—Lotta Madden is the soprano who sings for the Federation Mixed Quartette from WFEA; Bruce Muir is the tenor. Thanks for the kind thoughts; you write a very chummy letter. My, we wish we were young again!

Harby H.D.—At the time this note is written, it is rumored that Lewis Reed is leaving the announcing staff of WJZ. This is a blow to good announcing in New York; Reed is anything but a blah-blah boy.

D.B.C.—Marcel Dupré, my dear, is the man who plays the organ at Notre Dame, Paris; it was on his last visit to this country that he played the Wanamaker organ over WJZ. Charles Popenoe is the director of WJZ; he is a captain in the Signal Corps Reserve. Can't tell you what happened to Jolly Bill Stenke.

Charles II.—Don't ask this department to tell you why Uncle Walt (WGN) talks like the father of 18 children. Charlie Eckstein, the wildly "gangster" of WLB, is a really famous criminal lawyer. He seems to be the type of announcer who thinks that Service's "Creation of Dan McGee" is a whale of a dramatic piece. That puts him definitely in the class of that master of poetic combustion, Mr. Granland of WGN.
“S. O. S.”

(Continued from page 433)

Wonder if I have forgotten how to pound brass?”

A week went by; ten days; two weeks. Entries such as these appeared:

“Have been copying press for two hours. I know every word of tomorrow’s newspapers. . . . Got the time from Annapolis and Arlington; might as well stay up and get it from Paris and Pearl Harbor. . . . A ship wants a bearing from Hatteras; wonder if rum runners ever want a bearing.”

And so they continue, lazy and dull in a drab world. Then on the night of March 14th, this significant entry:

“The reception conditions are very peculiar tonight. Unexplainable.”

Similar entries covered the three succeeding days, with “terrible static” noted, and “fading beyond description; distance comes in like a local and is gone, later to be found on a change of wave.”

Nature’s warnings these, of the impending catastrophe, hidden from the faculties of humans but registered in the coils and condensers of the manufactured radio circuit.

The early evening of March 18th finds Harrison again at his receiver. He is unmindful of the possible upheaval of nature foretold in the freak conditions of the past few days; he realizes only that the period of queer and inexplicable air doings seem to be at an end.

For in the log is this entry:

“Good chance for decent radio weather now. There has been a storm south of here and it is clear again.”

Hardly had this entry been jotted down when the startling news broke—a cyclone at Murphysboro!

A tourist passing by gave the grim report; the railroad people verified it.

That Harrison realized instantly the direful import of the news and immediately sensed it in a call to duty for him; and that, too, he was painfully aware of his impotence to aid through the air channels, appears in the next log entry, written fifteen minutes after the optimistic notation quoted above:

“Cyclone at Murphysboro. 105 miles by auto. All wires down. Guess I’ll drive down. Violent cyclone and damage to Murphysboro and nearby towns, Illinois Central Railroad reports. Wonder if any hams are on the air?”

A space, and below, the single despairing word:

“None—”

The dash is scrawled across the log sheet. An interruption; the telephone rang just then.

The log continues:

“Just called on phone by L. C. R. R. and St. Clair County Medical Association, asking me to broadcast for aid.”

Then the pencil rapidly and automatically scribbling down the bewildered sequence of unspoken thought:

“How in hell can I? I’m suspended. . . . Two other stations here, 9 CHM—but he...
Separates All Stations On All Wavelengths

METRALIGN SLT is the only condenser combining Straight Line Capacity, Straight Line Wavelength and Straight Line Frequency, eliminating the faults and retaining the advantages of each type—the result is a perfect tuning unit.

METRALIGN SLT spreads stations so evenly over the dial that all stations on all wavelengths can be quickly and easily tuned in or out and accurately logged.

FREE
We have prepared a most comprehensive booklet on tuning. It is written in simple language and tells all you want to know about condensers. Write for a copy today.

General Instrument Corporation
477 Broadway, New York City

can’t work code. 9 AYX, but he is torn down. Nothing doing.”

Another summons away from the radio set, and the return to jot down this entry:

“Phone again, saying a special train is being made up. Wants all surgeons and nurses along the line to make every effort to meet that train, which leaves at 10:30. Want bandages, antitoxin, caskets, clothing, food.”

Only five hours to get together the relief expedition! Radio broadcasting was clearly the only way to get the message out in time to assemble the needed workers and supplies. The strain of the mental tussle going on within Harrison’s consciousness is seen in the next entry:

“This is one bell of a predicament. Suppose I was in a fix like that? But there is a heavy penalty for breaking a suspension.”

Ten minutes of harrowing indecision. Then this:

“I have adjusted my phone for 280 and 360 meters.”

Picture the dramatic situation disclosed in that entry—the broadcasting band of wavelengths, forbidden channels to the amateur! But there the great audience would be found, listening to jazz and what-not in quiet serenity. Thousands could be reached instantly that way! That entry was made exactly at six o’clock. The next one is marked, 6:15—

“To hell with all rules, regulations and suspensions! Those poor devils need help now, or never.”

With which final observation out went the call for aid. Alternately on 280 and 360 meters, the summons was broadcast a dozen times, each twenty minutes up until the relief train pulled out from the station.

In the log is found, opposite the notation 10:40 p.m., this entry:

“Wonder how many got that Q.S.T.?”

By midnight the answer was known. The news had reached Chicago and St. Louis and collections for the sufferers were being taken up. A Red Cross portable radio set was en route to the scene of action. An army radio truck had left from Scott Field. The relief train, jammed to capacity, wended its way with workers who were miles away from the railroad having responded to the call through the air.

The rest of the story is in the log. Over the shoulder of the operator Harrison let us read some of the things he jotted down:

“I A.M. to 3 A.M.—Starting list of those who want information of relatives in the cyclone district. Fifty-one so far. Calling the boys in that district, but no answer. Perhaps they were blown away.”

Then, at two o’clock in the afternoon of the following day:

“My, how time does fly! Thought it was still yesterday. Nineteen messages gone out. Not bad. Wonder what the district inspector will say or do when he finds out I made my own laws? Hope I’ll

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Your set switch or rheostat ALONE can now control "B" Battery Substitute and "A" Trickle Charger automatically.

Merely adding a BRACH CONTROLIT makes any set a light power-operated set, eliminating all switches from "B" Battery Substitute and Trickle Charger. No added wiring. No alterations to set required.

Anyone can install CONTROLIT, and the power plant can be placed anywhere—in cellar, or closet, or shelf. No radio user will be without it. Ask Your Dealer. Price Only $6 U.S.

See How CONTROLIT Operates—
Inside Information on New Radio Receivers

(Continued from page 429)

With the loop in its upright position the receiver is capable of bringing in practically everything, so far as distance is concerned. On one of the first models of this receiver, operated in the suburbs of New York City, American broadcasting stations from all parts of the country were heard, including KOA in Denver and KGO in California; in addition the receiver brought in stations in Havana, Mexico City, Buenos Aires and Peru. This test took place during favorable weather conditions, of course (January 20th). But the remarkable consideration is the fact that all these stations were tuned in on the loudspeaker, and using only the loop antenna.

The fine tone quality of the receiver is obtained through the use of three stages of low-ratio transformer-coupled audio-frequency amplification rather than the more usual two stages of high-ratio coupling.

A UX-171 power tube is used in the last stage of audio-frequency amplification to prevent overloading and the distortion which would result if an ordinary tube were used. Another advantage of this arrangement is that a UX-171 tube is better matched to the loudspeaker than are tubes of the UX-201-a type; this enables the loudspeaker to function to better advantage.

To provide for greater flexibility of volume, a switch is provided on the front of the receiver which permits the operator to cut out one or two of the audio-frequency amplifier tubes at will. When it is desired to tone the reception down to extreme softness, this switch may be set at six. In that event the first and second audio-frequency amplifier tubes are cut out of the circuit, leaving only six in operation. An important innovation in the design of this switching circuit lies in the fact that the stage of amplification which includes the power tube is always in the circuit. Whether six, seven or eight tubes are in use, this power stage is always the one preceding the loudspeaker and the amplifier output is therefore always properly matched to the loudspeaker.

The Fada 415A cone-type loudspeaker was used during Popular Radio's tests of this receiver. This instrument has a larger cone than the usual cone-type speaker; this may account in part for the natural reproduction, especially on the extremely low notes. It is a speaker well worthy of use with this fine receiver.

The 415A cone is supplied in three types; table, floor or wall mounting; the cone is identical in every case. Regardless of the type of mounting, the cone itself is supported on the mounting in such a way as to provide absolute flexibility. Inasmuch as sound production...
The tuning and operation of the receiver does not require technical knowledge of any kind. There are only two tuning controls, one for tuning the antenna circuit, and the other for tuning the four radio-frequency amplifier stages simultaneously. The method of mechanical coupling between this latter control knob and the shaft that operates the four tuning units is such that backlash is eliminated and the action is positive and smooth. The tuning knobs are of a novel shape which furnishes an excellent hand hold.

The calibration of the radio-frequency tuning control is carried on a drum which revolves behind a window set into the panel. This drum is calibrated directly in wavelengths. The antenna tuning indicator takes the same form, except that it is calibrated in degrees instead of wavelengths. This is made necessary by the fact that the setting of this control for a given station will vary with different antennas, therefore a wavelength calibration is not possible until after the receiver has been installed in the home of the owner. To enable the owner to calibrate the antenna tuning indicator, space has been provided on the drum to permit writing wavelengths or call letters in pencil. Thus the owner may readily calibrate this indicator himself. The indicator drums are mounted in such a way as to provide unusually wide visibility. Whether one is sitting or standing in front of the receiver the indicator settings are easily seen without any stooping or "squinting." The calibration scale figures are large and easily read.

In addition to these two tuning controls three other knobs are provided at the lower edge of the panel. One is used to control the volume and permits a gradual variation from zero to maximum. This control functions by increasing or reducing the current to the filament of the radio-frequency-amplifier tubes, and thus varying the effectiveness of these tubes. Another volume control knob is provided in the form of the audio-frequency amplifier switch described above. This latter control is provided so that if a distant station is tuned in with more than ample volume it may be toned down by cutting out one of the audio amplifier tubes. Thus maximum sensitivity is maintained but the volume may be reduced as desired.

A third control is provided to permit the operator to determine the condition of all batteries at a glance. The voltmeter provided on the panel has a double scale. A low-voltage scale shows the voltage of the filament supply ("A" battery) all the time the receiver is in operation. A high-voltage scale is used to show the "B" battery voltages. This control is a small knob and operates a

---

**Browning Drake RECEIVER**

**By ARTHUR H. LYNNCH**

- Coil and variable condenser, respectively, of the National Co. Antenna Tuning Unit $10.25
- Coupling coils and variable condenser, respectively, of the National Co. detector tuning unit $13.75
- Jefferson "Concertone" sealed audio-frequency transformer $6.00
- Throasher filter choice (same as that used for B eliminator work) $7.00
- Tope paper filter condenser, 1 md $1.75
- Nangamino fixed condenser, .002 md $4.00
- Nangamino fixed condenser, .006 md $8.35
- X-1, variometer, type N $1.60
- 3-Lynch double-resistance mountings $1.50
- 2-Tope paper filter condensers, .1 md $1.40
- 1-Lynch metalized resistors, 1 meg $2.25
- 1-Lynch metalized resistor, .5 meg $5.00
- 5-Benjamin vibrationless sockets for UX tubes $4.75
- Lynch metalized resistor, .060 meg $5.00
- 2-Lynch metalized resistors, .025 meg $5.00
- 2-Lynch metalized resistors, .006 meg $5.00
- 2-Beardslake coupling condensers, 12 meg $5.00
- 2-Tope coupling condensers, 12 meg $5.00
- 2-Conway coupling condensers, 12 meg $5.00
- Silicone rubber condenser, .005 md $7.50
- 2-Tail brackets $2.00
- Nangamino fixed condenser, .005 md equipped with gridless clips $5.00
- Small brass brackets for mounting connection blocks $5.00
- Antenna connection block $5.00
- Battery connection block $5.00
- Decorated bakelite panel, 8 x 22 inches $7.50

**Complete Parts $65.00**

Corbitt Cabinet 822 for the above receiver made of genuine mahogany, including backboard $15.00

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Are specified wherever quality sets are described for home construction. It is possible to get something resembling speech and music from a Radio set not equipped with good condensers,—but truthful reproduction is impossible without them.

And in B-Eliminator filters, the TOBE Filter Condensers and the TOBE B BLOCKS have come to represent a definite standard of high quality. TOBE means good condensers. If you build a B-Eliminator use the TOBE B BLOCK. It saves you much time and wiring and saves you money, too.

We have tried to make it possible for you to obtain TOBE technical apparatus at your dealer's. If he is not yet stocked, we shall be glad to fill your order, postage paid, on receipt of your check or money order.

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Many careful buyers choose a policy of "watchful waiting." This is often true in the purchase of generally better, but yet-to-be-proved, automobiles. The same holds good for many other commodities. And Radio. With the original announcement of the good *FERNB* "B" Eliminator and its amazing low price of $12.50, many there were who chose to wait. They wanted to be convinced. True, thousands bought at the start and they are the men who now tell you what to expect. Lack of space alone prevents us from publishing the hundreds of fine testimonials from satisfied users. They are all in our files open to public inspection at all times. One reproduced above. The *FERNB* "B" Eliminator successfully passed the rigid Laboratory tests of Radio News, Popular Radio and Radio Broadcast. It is a Proved Radio necessity, and a great one.

**Ask Your Dealer—or Send Direct**

If you prefer, we will make shipment direct to you upon receipt of price, or C. O. D., if desired. Use for 10 days to convince yourself—if unsatisfactory, write us within this time and purchase price will be refunded. Send your order now.

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**COMPLETE nothing else to buy**

Replies "FERNB" Batteries Operate Direct from Panel, and binding post, to "B" Socket, A. C. Power.

---

**five point switch.** By turning the knob to the second point, for instance, the voltage of the detector "B" battery immediately appears on the voltmeter. The third point shows the voltage of the radio-frequency-amplifier "B" battery, the fourth point the audio-frequency-amplifier "B" battery and the last point the voltage of the power-amplifier battery. There is a spring arrangement on the switch so that when the hand is removed from the knob the switch immediately throws back to point one where the voltage of the "A" battery is continuously given.

The loudspeaker may be plugged into a jack provided on the panel, or into another jack on the terminal board inside of the receiver. If the listener wants to use headphones at any time, he may plug into either of these jacks, after first making sure that the audio amplifier control switch is set at 6. The unusual plan is to connect the speaker to one jack inside of the receiver; then the headphones may be plugged into the jack on the front of the panel. Insertion of the phone in the front jack automatically cuts out the loudspeaker.

The terminal board inside of the receiver contains binding posts for connecting an external antenna and ground if they are desired. There are also two jacks into which the plugs attached to the terminals of the loop antenna may be inserted. When the loop is plugged in the antenna coil is automatically cut out of the circuit and is replaced by the loop. Thus the antenna and ground may be left connected to the receiver all the time, if preferred because they are disconnected inside of the receiver by the action of plugging in the loop. When antenna and ground are used the loop folds inside of the receiver, out of sight.

The Fada "8" receiver is housed in two types of cabinet. The table mounting type is designed to be placed on a table, or mounted on a battery cabinet. It is of solid walnut, richly finished in two tones. An ornamental brome plate is set in the front of the cabinet to carry the tuning controls, voltmeter and tuning indicator windows. The other model is a console type, as illustrated in Figure 2. This is of walnut and contains a compartment for batteries or power-supply units.

These two cabinets are fine examples of the cabinet-maker's art and either would grace any surroundings in which it might be placed.

The receiver itself is the same in both models. The instruments and panel are all mounted on a solid steel chassis for the sake of greater rigidity and to preserve the proper alignment of the instruments. All the parts for the receiver were designed by the manufacturer for this particular receiver and every one of them give evidence of careful thought and good engineering pract-
tice. The coils and variable condensers are so designed and constructed as to permanently maintain their original electrical characteristics so that once the assembled receiver has been tested, balanced and calibrated at the factory it will remain so throughout its life.

All the stages of radio-frequency amplification, as well as the detector stage are individually and completely shielded in metal boxes or "cans," to prevent electrical interaction. The stages of audio-frequency amplifier are included in a single "can."

The receiver may be operated from batteries, or direct from the alternating current house lighting lines in conjunction with a suitable rectifier and filter (power supply) unit. It is suggested that before any power supply unit is purchased for use with this receiver that it first be tried out with the receiver.

The New Model Stromberg-Carlson Receiver

THE first impression that one gets of the latest models of the new season's receivers is that of marred improvement in the appearance of the cabinets that house the sets.

The new Stromberg-Carlson "Treasure Chest" receiver, shown in Figures 5, 6 and 7, is no exception. It is a thing of real beauty, harmonizing with the furniture of the finest drawing room. Dull-brown, natural finish of the wood and the simple beauty of the design convey an impression of aristocracy that is fulfilled by the genuine quality of the workmanship.

The panel of this new receiver is of beautifully grained mahogany; the controls, indicators and other exterior items have been worked out in old bronze.

This model is designed to be placed on any table, or on the special stand, designed by the same maker, which matches the receiver and conceals the batteries. The same receiver may be obtained in an "Art Console" model. The solid walnut console cabinet rests on the floor and has concealed compartments for the batteries or other power supply units. The difference between the two models lies in the cabinets, as the receiver proper is exactly the same in both.

When the cover of the receiver cabinet is raised all that can be seen is a neat arrangement of shields that completely hide the working parts from view and protect them from dust and conducive fingers. When these shields are removed, as in the special laboratory tests, the exposed working parts of the receiver give a justified sense of splendid workmanship, precision and exactness. Even the connection work, ordinarily hidden from view, is perfectly finished.

The present-day purchaser of a receiver is not apt to be as much interested in the technical details of the set as with the quality of reception, with its sim-

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If you are in the market for any set or hook-up offer direct from us, including estimated list price and goods will be shipped at once. All merchandise guaranteed. Any difference in price will be refunded or corrected. C.O.D. will be shipped at our price. Radio Catalog and Builders' Guide, showing radio's nearest creations. Also should include name of another radio fan when writing.

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ALL THE APPARATUS IS SUPPORTED ON A RIGID METAL BASE FRAME

FIGURE 7: The quality of workmanship is obvious both in the assembly and in the instruments of this new model of the Stromberg-Carlson "Treasure Chest" receiver.

Complicity and accuracy of operation and with the distinctive appearance of the receiver. He wants a set that will give a sufficiently full quality of tone to allow him to close his eyes and feel that he is in the same room with the artists to whom he is listening. He also wants to be able to pick out one station without interference from another. In addition, it is essential that the receiver require no special skill in tuning.

These are all noteworthy features of the Stromberg-Carlson receiver.

Tuning is accomplished by means of two station-selector controls, one of which is calibrated so that it may be set to the desired wavelength merely by reference to the chart which accompanies each receiver. The other selector should then be turned up until the signals are brought in with the desired strength. This completes the entire tuning operation, except for the volume control knob.

Another important feature of this modern receiver is its sensitivity or ability to pick up distant stations. Even though the owner may not as a rule wish to tune in distant stations, this feature makes it possible for him to use a small indoor aerial when he listens to local signals and in this way to reduce static interference.

When this receiver was first tested in the writer's suburban laboratory, a few miles outside New York City, it was discovered that one of the tubes that were to have been used in the test was burned out and that only five vacuum tubes were available at the moment. In addition, the antenna had blown down in an unusual windstorm.

But, rather than lose the evening, the writer connected up the set to a small, insulated copper wire about 20 feet long, that had been left lying on the floor. After the batteries were connected up and the loudspeaker plugged into the phone jack, so that the last tube was eliminated, the signals from the local stations came in, even under these adverse conditions, with a wealth of volume. Moreover, more than a dozen other stations were tuned in, ranging up to a distance of 400 miles. This is a remarkable performance and it goes far to prove the extreme sensitivity of the new model under very severe test.

When the receiver was installed with outdoor antenna and full equipment of tubes, stations as far west as Chicago and St. Louis and ranging North to Boston and South to Miami Beach, Fla., were easily tuned in with very satisfying results. And it must be stated, too, that this was summer reception.

The circuit of the Stromberg-Carlson receiver consists of three stages of neutralized tuned-radio-frequency amplification, detector, and two stages of high-quality, transformer-coupled audio-frequency amplification.

Up to this last year the use of more than two stages of tuned-radio-frequency amplification in other laboratory practice had not been found entirely practicable because of the difficulty of wholly preventing interstage coupling, or what is popularly known as "regeneration." However, with the good shielding and an improved neutralizing scheme, Stromberg-Carlson has succeeded in using three stages of radio-frequency amplification very successfully and in still keeping the set from becoming in the least unstable. The use of this extra stage makes the set particularly sensitive to weak signals.

The quality of the audio-frequency amplification in any set is the factor that governs, largely, the tone quality that is delivered to the loudspeaker.
Here again in this set, good design has produced the desired results. The audio-frequency transformers that are used have a “flat” curve which means that all musical notes are reproduced with almost equal facility. One fault in a great many of the old types of transformers, and also in the old type loudspeakers, was the tendency to favor certain tones more than others, with the result that the very low tones have been missed and some of the higher tones have been greatly exaggerated. This new Stromberg-Carlson receiver eliminates these troubles and is capable of producing a truly realistic signal from speech and music.

It was with this same idea in mind that the manufacturers of this set have also brought out a cone-type loudspeaker that has the same good reproducing characteristics as the receiver.

In the laboratory tests of the receiver this loudspeaker was used and the combination proved to be excellent.

The last tube in this set is a power tube of either the UX-112 or the UX-171 type. The use of either of these tubes rather than the standard 201-a type tube reduces the possibility of distortion, due to the overloading of the last tube. This power tube is placed in socket No. 2 on the terminal shelf at the rear of the receiver. Standard UX-201-a tubes are used in all the other five sockets.

In normal operation a 6-volt storage “A” battery is used to supply the current for lighting the filaments of all six tubes. The total drain on the “A” battery is 1½ amperes.

The high voltage for the “B” circuit may be obtained from standard “B” batteries with a total voltage of 135 volts. The plate current in this case is at the rate of approximately 20 milliamperes. At this rate of current drain, the heavy-duty type of “B” batteries is recommended.

There are now on the market a number of “B” power-packs (inaccurately called “B” eliminators) that may be used satisfactorily on this receiver, and the energy, then, may be taken directly from the alternating current lighting socket.

In purchasing such a device to go with this receiver, the wisest course is to have the “B” power-pack demonstrated in actual use with the receiver, preferably in the location where it is to be used.

There are also a few good “A” power-packs on the market that may be used with this receiver, and these should also be demonstrated to be sure that they offer the desired results.

---

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Without removing your tubes from the set—

KEEP TUBES LIKE NEW—CHARGE THEM MONTHLY AND ALLAT ONCE

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**New Tip Jack**

A small, sturdy, nickel-plated jack. Fits snugly behind panel. Strong spring hug the cord tip and makes positive connection. Carter well known quality.
With the Experimenters
(Continued from page 434)

A hole is drilled in the lower left-hand corner of the panel for the new condenser cut-out switch and the switch is mounted therein.

In wiring the converted receiver, no changes need be made in the circuits of the last three tubes, except that the grid terminal of the third tube should be connected to the transformer, N. The potentiometer winding of K is not used and, therefore, the only terminals of this instrument to be connected into the circuit are the two left-hand binding posts (looking at the instrument from the rear).

The variable resistance, O1, and the jack, M1, are not used.

It will be noted that the second tube from the left is now the detector tube, instead of the first tube, as formerly, and that the rheostat winding of K is connected into the circuit of this tube. The circuits of the first two tubes should be wired as shown in the diagram, Figure 4.

After the alterations in the receiver have been completed, the batteries may be connected up. The detector and amplifier "B" batteries need not be kept separate, as was the case with the Four-circuit Tuner. All the "B" batteries are now connected in series, with taps taken off at 18 (approximately), 90 and 157½. Otherwise the terminals at the rear of the receiver are connected the same as before.

Operation of the Receiver

The tuning of the converted receiver is much the same as that of the Four-circuit Tuner. The two condenser dials are tuned alike and the rheostat is used to control sensitivity as before. The main change is in the fact that the antenna is also tuned, by means of the variometer.

Other information regarding the operation of the converted receiver may be obtained from the article on the operation of the LC-26 receiver which appeared in the January, 1926 issue.

Further Modifications

The changes that were outlined above are those which are essential to the conversion of the Four-circuit Receiver. For enthusiasts who wish to carry the changes further some additional suggestions are given in Figure 4.

The additional changes shown in this figure are:

1. An Anseeire tandem condenser (No. 1814, .0003 mfd. capacity for each half) is substituted for the two separate condensers used in the Four-circuit Tuner. This simplifies the tuning of the receiver.

2. Substitution of an Anseeire fixed-rigid leak for the former variable leak. He fixed leak, which should have a
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Very low distributed capacity due to the split form of winding. Can be used wherever this type of coil is necessary. Very compact. Only one inch in diameter. Can be mounted on subpanel or baseboard. Strutset for mounting with each coil. List price $1.

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How to Add the New UX-200-a Detector to the LC-26 Receiver

Many readers of Popular Radio have asked whether the new UX-200-a detector tube may be used in the LC-26 receiver in place of the old 200 tube and whether the results obtained would warrant this change.

Figure 5: The resistance shown in heavy lines is the 10-ohm resistance that is added in series with the rheostat to provide sufficient resistance to properly control the filament current for the new tube.
From experiments conducted in the Popular Radio Laboratory, it was found that the use of the new tube results in a considerable increase in the sensitivity of the receiver.

A decided increase was noticeable in the volume of signals from distant stations; signals from several distant stations that were barely audible on the loudspeaker when the old 200 tube was used were increased to ample loudspeaker volume when the new UX-200-a was substituted in the set.

The tone quality of the received signals seems to remain the same with the new detector tube as with the old.

Aside from the advantage of increased sensitivity there is, of course, the important consideration that the filament of the new tube requires only one-quarter as much current as the old 200 tube. Furthermore, the adjustment of the filament rheostat and plate voltage are not nearly as critical as they were with the old tube.

Hence it would appear that the new 200-a tube is a decidedly worth-while tube, and its substitution for the 200 in the LC-26 receiver is well warranted.

The UX-200-a tube requires a higher resistance than the 6 or 10 ohms called for when the old 200 is used if proper control of the filament current is to be obtained. This increased resistance may be obtained by replacing the old detector rheostat with one of 20 ohms resistance, or by connecting a 10-ohm resistance in series with the old rheostat.

The author's pet plan is to install a separate 10-ohm rheostat in series with the old rheostat. Then, either the old 200 or the new UX-200-a tube may be used at will.

In the former case one of the rheostats is turned all the way to the right and the proper regulation of the filament current is obtained by varying the other rheostat. To use the new tube the first rheostat is turned so that it has maximum resistance and a variation of from 10 to 20 ohms is obtained with the other rheostat.

This plan is illustrated in Figure 5; the new rheostat is indicated by the heavy line. This extra rheostat may be mounted behind the panel as its accessibility is not important.

—S. Gordon Taylor

Bull fights in Spain are now broadcast by radio.

Latvia, the little republic in the Baltic, has one broadcasting station.

The Bureau of Standards plans to standardize all radio sets.

On the theory that the soapbox orator can no longer attract the attention of the public, the Socialists are said to be actively considering the acquisition of a radio station of their own.

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The FARADON "UNIVERSAL" Filter Condenser Block as perfected by our Engineers, is designed to operate in connection with the most generally used "B" Eliminator and Power Pack circuits. It contains important features not heretofore found in grouped filter condensers.

The total capacitance is brought out to fixed terminals in convenient units, permitting ready connecting as desired. Units to be connected directly with the transformer secondary are constructed to withstand higher voltages than is usually required, to take care of occasional surge peak potentials. Convenience, safety and continued satisfactory operation are combined in the FARADON Filter Block.

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are also available in individual units of 1/10, 1/4, 1, 2, 3 and 4 mfd. in two voltage classes: Class A, Flash Test 800 V. D. C., for continuous operation on D. C. up to 300 V., or on A. C. up to 150 V.; Class B, Flash Test 1500 V. D. C., for continuous operation on D. C. up to 600 V., or on A. C. up to 300 V. Also a complete line of Condensers in units and gangs for all by-pass and blocking applications.

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POPULAR RADIO maintains for the benefit of its readers a Technical Service Bureau and Laboratory, under the personal supervision of Laurence W. Raytheon, by which will, without charge, answer by personal letter any question, problem or request for information submitted by a subscriber. This service is, however, also available to readers, whose full addresses, at the foot of this column, are as follows:

Superintendent of the Technical Bureau, 299 Broadway, New York City.

In writing please confine your questions to the special subject, writing on one side of the paper only, and enclose a self-addressed stamped envelope.

It is possible that your individual problem has been covered in an issue of Popular Radio, and so as an aid to you we endeavor to make a list of recent numbers in which your subject appears. Recently, too, this list has overlaid and if the information you want is not found here, we are pleased to supply lucky numbers at 5c. a copy.

WHAT READERS ASK

Conducted by HUGH S. KNOWLES

In justice to our regular subscribers a nominal fee of $1.00 per question is charged to non-subscribers to cover the cost of this service, and this sum must be included with the letter of inquiry. Subscribers' inquiries should be limited to one question or one subject.

December, 1925

QUESTION: How to get the Most Out of Your LC-28 Receiver.

RAYTHEON: "How to Get the Most Out of Your LC-26 Receiver."

ANSWER: Do not go (as many readers do) to the trouble of writing to the manufacturer to get the all-sufficient "执教 Reproduction," How to Get It and the Radio that Runs on a Beam.

January, 1926

QUESTION: How to get the Most Out of Your LC-26 Receiver.

RADIO: "How to get the Most Out of Your LC-26 Receiver."

ANSWER: Just open the receiver, and仔细ly read the title of theprevious question, and the answer to it.

February, 1926

QUESTION: What is a Technical Service Bureau?

RAYTHEON: "The condensed to keep a Technical Service Bureau.

March, 1926

QUESTION: How to Build a New Low-Cost Receiver.

RAYTHEON: "How to Build an Improved Browning-Drake Receiver."

ANSWER: This question was asked in February, 1926, and the answer given then can be found in the March issue.

April, 1926

QUESTION: What is a Technical Service Bureau?

RAYTHEON: "What is a Technical Service Bureau?"

ANSWER: This question was asked in February, 1926, and the answer given then can be found in the March issue.

May, 1926

QUESTION: What is a Technical Service Bureau?

RAYTHEON: "What is a Technical Service Bureau?"

ANSWER: This question was asked in February, 1926, and the answer given then can be found in the March issue.

June, 1926

QUESTION: What is a Technical Service Bureau?

RAYTHEON: "What is a Technical Service Bureau?"

ANSWER: This question was asked in February, 1926, and the answer given then can be found in the March issue.

July, 1926

QUESTION: What is a Technical Service Bureau?

RAYTHEON: "What is a Technical Service Bureau?"

ANSWER: This question was asked in February, 1926, and the answer given then can be found in the March issue.

August, 1926

QUESTION: What is a Technical Service Bureau?

RAYTHEON: "What is a Technical Service Bureau?"

ANSWER: This question was asked in February, 1926, and the answer given then can be found in the March issue.

The Use of a Fixed Grid-Leak

QUESTION: I understand that the use of high-nu crystals is advantageous in resistance-coupled amplifiers. Do you advise their use in the LC-26 receiver? I also want to experiment with a fixed grid-leak. My receiver is a little noisy and I believe that the variable leak contributes to this. -J. R. K.

ANSWER: Much has been said regarding the use of high-nu crystals in the intermediate stages of a resistance-coupled audio amplifier. The noise of these has been thoroughly cut out in the LC-26 receiver, in the first and second audio stages, which include the first two tubes to the right of the detector.

In the case of loud signal reception, as from a nearby broadcasting station, it is not necessary to use the high-nu crystals. In any case, the use of more than one of these tubes is not practical. In receiving weak signals, however, as from a distant broadcasting station, a high-nu tube in the first stage leaks by the detector, that is, in the first stage of audio amplification, provides a noticeable increase in signal strength.

In general, when an absolute maximum of results is desired, the use of a high-nu tube in the first stage of audio is recommended, with 201-a type tubes in the first and fourth sockets, a UV-200 or UX-200-a type tube in the second and a UX-112 type tube in the last socket.

The variable grid-leak (Bradley peak) which was specified in the December, 1925, issue of POPULAR RADIO has been successfully replaced in the LC-26 receiver with one of the fixed variety. It has been found that the inexperienced operator frequently has difficulty in adjusting the Bradley peak to the best operating point. Usually the best point is where the knob is turned in just beyond that setting where a slight pressure becomes noticeable. The more experienced operator does not depend on the feeling of pressure but rather, judges the proper setting from the smoothness of oscillation control together with maximum sensitivity of the receiver.

With the use of the fixed leak of which has a proper resistance value, and which is well enough made to remain constant in its resistance the necessity for adjustment is eliminated and equally good results are obtained. For the dried-in-the-wood experimenter, however, the variable grid-leak will always hold a certain amount of fascination; and until manufacturers begin to place reliable resistance units on the market, a variable resistance leak was invaluable for the proper control of the detector tube. Now, however, it is safe to depend on fixed leaks. For those who prefer to eliminate as many adjustable parts as possible this change is recommended.

Usually a six megalohm (6,000,000 ohms) leak has the best value for this receiver. In building a grid-leak in this receiver and in a number of others, an Anemo "Grid Gate" resistance unit of this value was used with excellent results. It may be that in some instances a fixed resistance value of five megalohms or seven megalohms will prove better. This will depend somewhat on the characteristics of the detector tube used. If one wishes to experiment a little it may be worth while to try several different values.

In that ease try cutting down the detector plate voltage, 1½ volts at a time, rotating the resonator knob after each change and advancing the rheostat knob, if necessary, in order to keep the detector oscillating. If the plate voltage is cut down too far the tube cannot be made to oscillate. Leave the voltages at the lowest point at which the tube can be made to oscillate.

If it is still difficult to stop the oscillation by means of the resonator knob, it is evident that the grid-leak resistance is too high. If a variable leak is used turn the knob, a little at a time, in a clockwise direction, trying the resonator knob after each change. An adjustment of the leak will be found where there is a small space on the resonator knob where oscillation will stop and the station causing the whistle will be clearly heard.

In actually tuning the receiver for distant stations the most pleasant method is to adjust the detector rheostat to a point just below that where whirls are heard. This is the most sensitive adjustment of this tube and stations will be brought in without the annoyance of whirls. Instead of a whistle there will be a rushing sound as the wavelength control passes over the resonator knob. In this condition the station is heard, then it rises into resonance with the latter. When brought into exact resonance, the rushing noise will stop and the station will be heard clearly and undistorted.

It may even be possible to turn the rheostat a trifle higher without loss of clarity in the reception of the signal.

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Especially designed for Radio Work. Made of porcelain, small, neat, rugged and serviceable. Can be suspended on antenna or fastened to wall.

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What Causes the Gurgling Noise in the Raytheon Unit?

QUESTION: I have just constructed one of the "Power-pack" eliminators, described in the May, 1920, issue of POPULAR RADIO. On local stations, where the volume is sufficient to permit the use of the volume control to reduce the output of the speaker, there is no noticeable hum. On the weaker stations, however, where the volume control has to be advanced, there is a noise which resembles both a hum and a gurgle. The disturbance has a frequency of approximately sixty cycles. Can you suggest some way of determining the trouble?

-HENRY LLOYD

ANSWER: Where full-wave rectification takes place in the rectifier tube the output which goes through the filter has a complex wave form. The principal component is a 120 cycle one, while in addition there exists a whole series of harmonics of this frequency.

In a rectifier tube of the Raytheon (or "S") type, which depends on the ionization of a gas for its properties, rectification begins only after the voltage becomes quite high—perhaps half as much as is normally supplied by the transformers which are designed for these units. The voltage at which this action begins is called the ionization potential. Rectification continues until the cycle has passed its peak and decreases to the point where ionization ceases. It is evident that this change is very abrupt; and it is this fact that makes the output hard to rectify.

If one "side" of the wave is not rectified, or only partially so, it becomes increasingly difficult to filter the output. In this case, the output has a frequency of sixty cycles with its series of harmonics. When the disturbance or modulation in the output has a frequency of 60 cycles, it is an almost certain indication that one half of the wave is not properly rectified.

This trouble may be due to several causes. In the first place, the tube may be defective. The tubes that are normally used in these "B" battery eliminators are very sturdy and uniform in construction. Occasionally, however, one is damaged in transit, or in some other way. If possible, test the tube in another unit which operates quietly. And, if another tube is available, try it in your unit.

If one of the .1 mfd. condensers which are shunted across the transformer output is defective, a similar trouble may be experienced. If the condenser is short-circuited, one side of the transformer secondary may burn out. The transformer windings are frequently embedded in a compound which is a good insulator to heat to permit the winding to burn out without raising the temperature of the metal container high enough to attract attention.

Disturbances that have a 120 cycle component may be due to a number of causes. Be sure that all of the metal cases of the chokes, transformer and condensers are grounded. If a sensitive receiver, such as a superfund energy with a loop, is used, the unit should be kept well away from it. The loop is actuated by a very weak field; and the field that is due to the unit, may become comparable to it and cause interference.

If the unit is overloaded, a hum may result. The inductance of the chokes depends on a number of factors. A given choke, such as you are using, will have an effective inductance (or "choke")

Important little gateways of reception

CONDENSERS are the entrances that make or mar a good performance. A good condenser stores up tone impulses, to be released at the instant they reach full-rounded perfection. An inaccurate condenser lets only a distorted part of the tone trickle through, and cuts down the receiving range of your set by putting it out of electrical balance. You'll realize the importance of accurate condensers the day you equip your set with Sangamo Mica Condensers. They will improve tone, range and volume.

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Being solidly molded in bakelite, Sangamo Condensers are accurate forever. All edges are sealed tight against moisture, the worst enemy of condenser accuracy. Ribs of bakelite give mechanical strength and prevent a change in pressure on the delicate mica inside, which would also change the condenser capacity. All edges are rounded to prevent chipping. Rough treatment and exposure to heat, salt air or acid fumes will not hurt Sangamo Condensers; they stay accurate. Even a hot soldering iron will do no harm.

Put Sangamo Condensers in any new or old set and notice the difference. A range of 3½ capacities makes it possible to get exactly the right capacity for your circuit.

Sangamo Bypass Condensers are now available in 1/10, 1/4, 1/2 and 1 mfd. capacities.

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Cleveland, Ohio

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If you are a subscriber to POPULAR RADIO your subscription will be extended eight months.

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Enclosed is my remittance of $2.00 for which I am to receive 8 (eight) months of POPULAR RADIO.

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How the Super "First Detector" Tube Works

QUESTION: Is the so-called "first detector" in a superheterodyne really a detector? It is frequently called a "frequency converter," merely a radio frequency amplifier or what-not. Please explain its operation.

—M. DAUGE

ANSWER: The "first detector" is really a detector. Some confusion has arisen in regard to this due to the fact that it is almost impossible to prevent reception regardless of the adjustment of the first tube.

Actually, considerable precaution has to be taken in a superheterodyne circuit to prevent any rectification. When a tube is operated almost within its normal operating limits it will rectify slightly. When no rectification takes place it means that the conditions under which distortionless amplification take place exist.

The average detector tube, or crystal detector for that matter, has what is called a parabolic characteristic. More specifically, this means that the current in the plate circuit is proportional to the square of the input voltage. If an oscillating detector is used, the output current no longer follows this law. The output current then becomes directly proportional to the input voltage. In such a case the detector is much more sensitive to weak signals because of the fact that the efficiency does not decrease as rapidly with a decrease in the amplitude of the incoming signal.

The general case, which includes that given above, one in which a current of one frequency is superimposed on another—both being impressed on the input circuit of the detector. In this case, the output current is the product of the amplitudes of the two. This means that it is directly proportional to the amplitude of either of them.

In the case of a superheterodyne, the oscillator amplitude remains constant; and the output current is then directly proportional to the amplitude of the incoming signal, which results in greater sensitivity (greater than when receiving damped signals without using an oscillator) and distortionless amplification.

Rectification must take place in order to provide a resultant in the output circuit which is capable of going through the intermediate amplifier. The effect is comparable to that which has to take place in an ordinary detector where the frequency of the incoming signal is reduced to an audible frequency which is capable of actuating the receiver. This process is frequently called "de-modulation".
Announcing—

The Perfection of a New Idea in Single Control Radio

The perfection of a flexible transformer which enables the identical matching of inductances in the assembled receiver instead of using just approximately matched coils. Possessing the exclusive rights to this coil (known as the Flexiformer) we have produced a truly single control, seven tube receiver so superior to anything heretofore known that it is rightfully called

Excels in ALL FIVE Tests of the perfect receiver.

More Stations (Efficiency)

Thirty stations in one revolution of the tuning knob is ordinary performance for this receiver. Range—coast to coast.

Simplicity

Just one tuning knob—no verniers. Every station perfectly tuned.

Tone Quality

The combination of the Super-Single and the Plymouth Speaker, containing a scientifically designed and constructed wood horn over eight feet in length affords a revelation in reception. Every audible note is faithfully reproduced.

Appearance

Cabinets designed and constructed under the personal supervision of William H. Thommen, well-known designer of America’s most beautiful phonograph and radio cabinets.

Price

Lower than any set which deserves comparison on a performance basis on any of the previous four points.

Prove it to yourself: hear the Plymouth Super-Single at your nearest dealer. Send for his name.

PLYMOUTH RADIO AND PHONOGRAPH CO. Plymouth, Wisconsin
Blandin

Radio Cabinets

Cabinets, Battery Tables, Speaker Tables, Consoles, or Highboys in striking designs, finished in rich tones of walnut, hand-rubbed lacquer and highly polished. Color decorations in ebony. Carvings antique glaze. Write for circular covering entire line.

Model R-20

The Model R-20 Cabinet is virtually 20 cabinets in one. No matter how often you change sets, the R-20 will fit it. Inside dimensions, 85" high, 86" wide, 135" deep (front-to-back).

Model R-20 open

Patents Pending

The R-20 is easily adjustable to any size of panel from 6" x 11" to 8" x 26", and to any angle from vertical to 90 degrees slanting for slab-face sets. The drawer-tray feature allows ease of accessibility.

Jobbers and Dealers write for discounts.

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2 New Models

Type "G"


Price, $2.50.

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For detectors only. Improves reception. Rating Fill V. 2.0. Fil. Amp. 0.25. Plate Volts, 45-90.

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There's a CECO Tube for every radio need. Buy CECO and enjoy complete radio satisfaction.

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The Popular Radio Medal for Conspicuous Service

To every radio amateur, to every amateur experimenter and broadcast listener, who alleviates human suffering or saving human life, directly through the medium of radio, recognition will hereafter be extended in the form of a medal that shall be known as "The Popular Radio Medal for Conspicuous Service." This medal is unique within the realms of radio that it shall be awarded, not for scientific achievement or invention, but for service to humanity.

To insure a fair and unbiased consideration of all claims, a Committee of Awards has been appointed that includes five distinguished citizens of international fame. To assist this Committee of Awards, an Advisory Committee has been appointed that numbers among its members some of the most eminent citizens of the United States, including representatives of many of our most distinguished institutions.

The conditions under which the medal will be awarded are here specified:

1. The medal shall be known as the Popular Radio Medal for Conspicuous Service.
2. The medal shall be awarded, without discrimination as to sex, age, race, nationality, color or creed, to those radio amateurs, radio experimenters, broadcast listeners and other non-professionals through whose prompt and efficient action radio is utilized to perform an essential part in the alleviation of human suffering or in the saving of human life within the territorial confines of the United States and its possessions, or in the waters thereof.
3. The medal shall be awarded by a Committee of Awards that shall not exceed five in number. No member of this Committee shall be an employee, officer or stockholder of POPULAR RADIO, Inc., nor shall any such employee, officer or stockholder have a vote in the deliberations of the Committee.
4. An advisory Committee, which shall cooperate with the Committee of Awards and which shall be particularly charged with the responsibility of making recommendations for awards of this medal, shall be made up of men and women who, because of their interest in the public welfare or because of their connection with institutions that are concerned to public service, are in positions to bring to the attention of the Committee of Awards the exploits of candidates who are within their particular fields of activity.
5. The medal will be awarded for services rendered since Armistice Day, November 11, 1918.
6. Recommendations for awards may be submitted to the Committee of Awards at any time and by any person. Every recommendation must contain the full name and address of the candidate, together with a detailed account of the accomplishment on which the proposed award is based, and must be accompanied by corroborative evidence from persons who have first-hand knowledge of the circumstances and whose statements may be verified to the satisfaction of the Committee of Awards.
7. The medal will be awarded to as many individuals as qualify for it and at such times as the Committee of Awards may authorize.

BLUE PRINTS ACTUAL SIZE

LAURENCE M. COCKADAY has personally supervised the preparation of Simplified Blueprints of nine of POPULAR RADIO's most unique popular circuits. Each set consists of three or more Actual Size Blueprints: first a Panel Pattern, second, an Instrument Layout, and third, a Picture Wiring Diagram all duplicated in the fullest sense of the word because the panel patterns are the original panel patterns, and all hole drilled as indicated, and wiring to do and new danger of marring the panel through faulty calculation.

The Instrument Layout placed on the panel patterns, to indicate by simple, the exact location of every screw.

The Picture Wiring Diagram gives every instrument in exact size and position with every wire clearly indicated from one contact to the other. With no knowledge of radio symbols you can assemble every part and complete your wiring with no chance of error.

Priced at $1.00 Per Set

Set No. 4—"Cockaday p-Circuit Tuner with Ring-Necked Antique Amplifiers" (five tubes, distortionless, two tube, automatic vacuum tube control, as described in the October 1928 issue of POPULAR RADIO).

Set No. 5—"The Cockaday A-Type Super-Ampolifier with Elite Receivers." (Six tubes, non-radiating, distortionless, as described in the December 1928 issue of POPULAR RADIO).

Set No. 12—"B-Type Super-Heterodyne with Single Control" (as described in October 1925 issue of POPULAR RADIO).

Set No. 13—"Four-Piece Plate Supply Unit" (as described in December 1926 issue of POPULAR RADIO).

Set No. 14—"The LC-60 Broadcast Receiver" (as described in December 1925 issue of POPULAR RADIO).

Set No. 15—"The R-100 Broadcast Receiver" (as described in the February, 1926 issue of POPULAR RADIO).

Set No. 16—"The S-C "All-Wire Receiver" (as described in the March, 1926 issue of POPULAR RADIO).

Set No. 17—"The Power-pack Amplifier" (as described in the April, 1926 issue of POPULAR RADIO).

Set No. 18—"The Improved R-type Power Pack" (as described in the May, 1926 issue of POPULAR RADIO).

Set No. 19—"The New Home Receiver" (as described in the June, 1926 issue of POPULAR RADIO).

Set No. 20—"The New Two and Country Receiver" (as described in the July, 1926 issue of POPULAR RADIO).

Set No. 21—"The Improved Browning-Tone Speaker" (as described in the August, 1925 issue of POPULAR RADIO).

Full constructional and parts details for these Receiving Sets will be found in the issues of POPULAR RADIO indicated. Back issues of POPULAR RADIO will be furnished at the rate of 5c a copy.

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Date

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Set Number 7
Set Number 8
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Set Number 18
Set Number 13
Set Number 19
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Every Kit is fully Guaranteed

Large quantity buying has enabled us to sell this Raytheon "B" Kit direct to you for only $32.50. Nothing extra to buy. Plenty of power. Gives 100 v. at 60 volts. Will last a lifetime. Variable det. at 8 P. Taps. All parts tested before shipment. Send check or money order, or we will ship C. O. D.

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3. Duplex Choke Coil No. 518
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5. Service Multiple Condenser Block, 5 units of 2, 2, 8, 1 and 14 mfd.

Including Diagram and Wire, Only $32.50

IMPROVED BROWNING-DRAKE

National ore and variable condenser of the Antenna Tuning Unit, coupling coil and variable condenser of the Detector Tunning Unit.

1. Technician's oscillator transformer
2. 1000 ohm filter choke
3. 5000 ohm filter choke
4. 1000 ohm fixed condenser, 0.02 mfd.
5. 1000 ohm fixed condenser, 0.006 mfd.
6. X-3 varistorine type N
7. 8000 ohm capacitance variable
8. 1500 ohm variable resistor, 1 mfd.
9. 3000 ohm variable resistor, 1 mfd.
10. 8000 ohm variable resistor, 1 mfd.

COMBINATION CONDENSER.

Variable condenser, 100 mfd.

IMP.

COCKADAY LC-26 KIT

1. General Radio variometer, with rhenium knob...
2. General Radio rheostat, type, with rheostat knob...
3. Precision Oscillograph unit condenser...
4. Audio speaker double dual condenser...
5. Miriam fixed condenser...
6. Miriam fixed condenser...
7. 1500 ohm variable resistor...
8. 8500 ohm variable resistor...
9. 8500 ohm variable resistor...
10. 8500 ohm variable resistor...

Total, including cabinet...

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OCTACONE

Accurate as the Human Ear

Octacone reproduces faithfully all musical sound—from a soprano's trill to the rumble of a kettle drum. Its patented diaphragm—shaped exactly like a human ear drum—vibrates to every pitch and quality of tone in precisely the same way as a listener's ear. An exclusive feature that gives Octacone a naturalness of reproduction unequalled by even the highest priced speakers.

Just as Octacone fits and improves any receiver, it blends in and adds to any scheme of room furnishing. Diaphragm case of artistic simplicity, finished in golden bronze.

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PAUSIN ENGINEERING COMPANY
NEWARK, NEW JERSEY

Built to Last

Unlike most fine instruments, Octacone is built to withstand the hard treatment fine instruments too often receive. Even should it be accidentally knocked from the floor, Octacone will come up smiling—and singing as beautifully as ever.

$19.50

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BROADCAST LISTENER

Comments on radio programs, methods and technique
— from the point of view of the average fan

By RAYMOND FRANCIS YATES

Posing Models Before the "Mike"

LANDS' sakes, we've got a lot of nice things to talk about this month!

It seems that broadcasting has passed through a little renaissance since our last column went to press. One more novelty was exposed by WGBS when it broadcast a fashion show. While our own personal interests in female fashion begins and ends with the figures (no, not the figures of the models but on cancelled checks) we can understand the interest that might be aroused by such an event.

At any rate, it is a good idea and we are mighty particular as to what we label "good idea," we can tell you that.

Motor Races on the Ether

My, we have so many little pleasanties to run off this month! It makes us feel very, very happy.

WGN (which, in case you want our honest opinion, is one of the strongest stations in this country), was on its toes again when it broadcast the 500-mile automobile race at Indianapolis. Auto races between our established drivers should form a substantial bit of broadcasting, provided the announcing is in the hands of a capable and interested observer. The auto race has plenty of action and there is the contagious element of bitter contest.

Broadcasting a Jewish Poker Game

The antenna of this department is very sensitive to new ideas in broadcasting. They feel around and feel around, but it is only once in a blue moon that they contact with anything that we may put down as new. A few weeks ago WGBS (New York) broadcast "A Jewish Poker Game" with Milt Gross (father of "Nize Baby"), Harry Hensfield, Max Fleischer and Jimmy Hussey as the participants.

While all Jewish poker games are not funny, Jewish poker with a caste like the above could not fail to be funny.

Let's see now, that makes five studio managers we have caught thinking during the past year.
“Interviewing” by Radio

We do not need to ask you if you have ever heard a stage or movie star interviewed on the air. If you have escaped you are really a lucky person, for nothing so quickly as a dumb actress (of course, all actresses are not dumb) airing views about this and that.

New York is a bad place for this sort of business; that is, it’s bad for the public but easy pickings for the publicity men. Being interviewed at station WGBS or WRNY is a trump card played by every publicity man just before he gets the air.

How Many Characters Can a Fan Identify in a Radio Drama?

Our “Society for the Improvement of Radio Drama” has received a frightful setback. Just as we were beginning to think that the radio dramatists were falling for our propaganda along comes WGY with the “Reprisal,” calling for a cast of fourteen players with “German ordeliers and Belgian citizens.” This sounds like a terrible lot.

Unless this old bear is badly mistaken “Reprisal” will be a flop. You cannot have fourteen characters in a radio play and expect your listeners to keep their identities straight.

The Arrival of the “First Radio Organ”

WGN, that big, wide-awake station way out there in Chicago, is making no mean effort to become America’s major broadcaster. It is beginning to recognize important details—and when you begin to recognize details you usually improve your stuff.

In the past the organ has been more or less unsuited to broadcasting because of the difficulty of getting certain frequencies to register with anything like fidelity. Experts held, and correctly enough, that radio demanded an organ all of its own with special accommodations made for the benefit of the microphone. WGN, working with an organ specialist, has developed and installed the first radio organ.

We hope this may be taken as a sign that broadcasting is passing out of its Penny Arcade era.

The Oboe as a Solo Instrument

DEAR READER, be honest with us: have you ever in your days, long or short, as they may have been, heard of a famous oboe player?

Whatever our own opinions may be, the publicity man of WGBS announced the performance of Michel Nazzi, “famous oboe player.”

An oboe solo may be a novelty—but we can think of many, many things we’d rather do than listen to one.

GRIMES OWN KIT

100% Shielded Inverse Duplex

T RUTH will out! The real rich values of the David Grimes Inverse Duplex System can be realized to their utmost only when quality parts, workmanship and design are present. Here is a master-made kit easily assembled into a master radio instrument that should last for a lifetime.

The Grimes Own 5 Tube Storage Battery Kit (or the 4 Tube Dry Cell Kit) is built, sold and guaranteed by David Grimes. In addition each standard part is guaranteed by its own manufacturer, forming a double guarantee to the constructor. It is 100% shielded and when assembled, the finished aluminum casings form a sturdy artistic cabinet. The kit incorporates the latest improvements in the art, bringing the famous Inverse Duplex System to the utmost efficiency in selectivity, volume and tone. David Grimes has rightly called this kit his “own” because he is proud of it.

Send for Grimes Own Working Plans

You can now obtain charts and detailed descriptive matter covering the fascinating David Grimes Inverse Duplex System and its most recent developments. Pin a dollar bill to the convenient coupon below and get the valuable illustrated plans.

Study These Parts With Care!

Two Samson Audio Transformers.
One Grimes special resistance coupling.
Five Benjamins non-microphonic UX sockets.
Three semi-straight line Lind vernier tuning condensers and coils.
One Grimes RF Choke Coil to equalize all wave-lengths.
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One Dejur Rheostat.
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High Spots

The Grimes Own is the only completely shielded kit set in existence. It is the first David Grimes Inverse Duplex Kit ever sold. It embodies three stages of radio, detector and three stages of audio frequency. Designed for power tube operation. Connections furnished for loop or antenna.
The Coming of the Radio Drama

For a time we thought that the perfection of the radio drama had been given up as a bad job; but it seems that there has been a larger effort toward improvement in the past few months.

That is encouraging; and every pioneer in this field can feel that the past moral power of this department is squarely behind him. We feel and always have felt that in the radio drama we have only half discovered a source of entertainment that will some day be one of the chief features of the art. The "ear-play," as Waldemar Kaempfrett has aptly called it, is still finding sustenance on crackers and milk; but no one will deny that it is capable of more substantial nourishment.

The dramatic art does not need to be reconstructed for air use; only adapted. The moving picture pioneers learned to present drama minus sound; radio must learn to present it minus sight—a more difficult task. Yet there is promise of a satisfying success; and it seems that the whole thing only awaits the patient application of a serious experimenter.

In presenting drama, some studios give a complete résumé of the plot and of the action before the performance begins. Is a plot that is so involved that it needs an introductory explanation suitable for radio? Is not suspense the greatest factor in drama? How can suspense be developed, let alone sustained, if the audience anticipates every bit of action?

To our small way of thinking the radio drama must be capable of unfolding itself, capable of telling its own story. If it cannot do this it is not drama.

Only superficial thinking is needed to show that the air-play can afford to use only a few performers. Many of the ear-plays that we have listened to have had so many characters that one had to make a conscious effort to keep the characters tagged. After all, identification must be made on the basis of the difference in the sound frequencies of the voices involved and voices that come even within an octave of each other are most difficult to separate. The listener eventually finds himself making an effort to keep his identities straight; and this is fatal to sustained interest.

After some experience listening to ear-plays we feel ready to express the wholly private opinion that no radio drama should require more than five characters for its fullest interpretation. The voice frequencies of the performers should also be widely separated. Otherwise the listener will concentrate on identification, reducing the entertainment value of the thing to a point somewhere near zero. As the available five-character dramas are small in number, it is evident that we must build up.
a school of radio dramatic art. Recently Mr. Lloyd Jacquet suggested a Radio Drama League; perhaps that would help to improve the art of air-plays.

To this observer, it has seemed that, in the past, the locale of each scene has failed to be sufficiently described. Locale is an important part of the plot; it is the matrix into which the plot is poured.

If the scene is a living room, it should be adequately described.

Is it a Colonial room, French, Tudor or Spanish? Is it small or large, light or dark? How is the furniture arranged?

It would seem, too, that a complete description of each performer would help to create the perfect illusion at which radio must aim. Is the hero, dark or light, tall or short, fat or lean? Is the heroine blonde or brunette, slender or fleshy, brown eyes or blue? What is the color of her dress and how is her hair arranged?

If you leave the locale or the descriptions of the performers to the imagination of the listener, he will build them up to suit his own tastes—and his own tastes may not conform with the author’s.

* * *

The Passing of the Old-Fashioned Announcer

ALTHOUGH we are not as yet ready to start the “Association for Preservation of the Memory of the Old-Fashioned Announcer,” we cannot overcome the notion that this will soon be necessary if we are to leave authentic information for posterity.

Much as the thought moves us, we cannot help but feel that these dear boys are well on the way to total extinction.

The newer ideas of broadcasting leave the announcer with a fairly mean part if you should ask us. He will give the name of the selection, the name of the artist and the name of station and that is all.

The “personal reflection” announcement is losing favor with the grown-up folks although it is said that the high-school girls still like to hear Mr. Brokenbush’s flapdoodles.

Did you hear Mr. Milton Cross handle the Victor program of March 25th? He gave the name of the station, the name of the artist and just a few words about the selections. His voice was pleasant, his annunciation good and the announcements were short but informative. That is the announcement of the future.

It looks pretty bad for the Mr. McNamees, the Bill Hays and the rest of the boys.

"Why do you call this a railroad radio?"
"Because it whistles at every station."

—Judge

A New Model—

UniversaL Super-8

For the 1926-1927 season Golden-Leutz have 17 new models. See our Exhibits at the New York and Chicago Radio Shows.

A new 80 page catalog covering our entire line of radio equipment is now ready for mailing; we would be pleased to have you write for a free copy.

GOLDEN-LEUTZ, INC.

Sixth and Washington Avenues
Long Island City, New York

Cable "EXPERINFO" New York
A KIT OF RESISTANCES

Name of instrument: Fixed resistances.

Description: These resistances are put up in a box that includes the various resistance values necessary for the "B" power-pack that has already been described in Popular Radio. They are wire-wound on a special porcelain tube and covered with a vicious enamel to prevent oxidation. They are equipped with soldering terminals for easy connections. These resistances are made especially for plate circuit use and have a current carrying capacity that is suitable for all such work.

Usage: In a "B" power-pack as a means for regulating voltages.


A NEW PHONOGRAPH ATTACHMENT

Name of instrument: Loudspeaker unit.

Description: This unit is furnished with a suitable cord for attachment to a radio receiver. It may be attached directly to any standard phonograph by means of a soft pliable rubber connection joint. It is mounted in a neatly finished black case and when used with a modern phonograph gives a delightful quality of reproduction.

Usage: In connection with a phonograph for reproducing radio signals.


Maker: Brandeis Products Corporation.

Apparatus Approved by Popular Radio

This list of apparatus approved by the Popular Radio Laboratory will be continued as a part of the WHAT'S NEW IN RADIO department until all instruments, parts and complete sets have been included. The listing is alphabetical by manufacturer's name and the installation in this issue includes the letters T to Z.

AERIALS

Wood-wire aerial; Wound Wire Aerial Co.

SX-16-Point antenna wire; Nardell Corp.

AUDIO-FREQUENCY TRANSFORMERS

Thirdarson audio-frequency transformers; Thirdarson Electric Mfg. Co.

United audio-frequency transformers; United Mfg. & Distributing Co.

Audio-frequency transformer; Louis E. Werts

Acme radio transformers; Wholesales Radio Service Co.

BATTERIES

"Twin" dry batteries; Twin Dry Cell Battery Co.

RB-5 volt "B" battery; Universal Battery Co.

USL radio: "A" and "B" batteries; U. S. Light & Heat Corp.

Westinghouse universal "A", "B", and "G" batteries; Westinghouse Union Battery Co.

Milady radio batteries; Willard Storage Battery Co.

Radio "B" batteries; Winchester Repeating Arms Co.

Ward "A" and "B" batteries; Ward Battery Corp.

World storage "A" and "B" batteries; World Battery Co.

BATTERY CHARGERS AND RECTIFIERS

Valley battery charger; Valley Electric Co.

Waterbury "A" battery; Waterbury Battery Co.

Waterbury "A" battery charger; Waterbury Battery Co.

Westinghouse rectifier battery charger; Westinghouse Electric & Mfg. Co.

Dynaret "A" and "B" battery charger; Wilson Electrical Labs.

"A" BATTERY ELIMINATOR

Valley "B" elimination; Valley Electric Co.

Wage "B" elimination; A. H. Wage.

BINDING-POSTS

Labeled binding-posts; Walmer Electric Mfg. Co.

X-1 push post; X-1 Radio Laboratories.
All apparatus advertised in this magazine has been tested and approved by Popular Radio Laboratory.

Illustrated at right is Acme E-3 B-Eliminator with non-filament tube for use with one to six tube sets, 110 volts, 60 cycles, tan finish, rugged construction, price $39.50

Write for leaflet describing this and also other Acme A, B and C Power Supply units.

Make your Radio Set a lamp socket receiver

To transformers and loudspeakers that give you amplification without distortion, Acme now offers its friends further radio comforts—the complete elimination from your present radio set of A, B and C battery nuisances, replacements and expenses.

You can now have lamp socket operation that lives up to the Acme reputation—amplification without distortion.

The change can be made over night. No trouble, no disrupting your set to do it. Merely hook up and tune in.

Other than household current, the first cost of these units is their last. There is nothing to wear out, nothing to get out of order.

See any Acme dealer or write us for special leaflet C15 giving complete information. Acme Apparatus Company, pioneer radio and transformer engineers and manufacturers, Cambridge, Mass.
WITH POPULAR RADIO

Aside from the feature of economy, there is the thrill and satisfaction that comes from building your own receiving set. Thousands of men and women have never been committed to this pastime. They have been impressed with the gross radio public sense that this is a thing of mystery that has enveloped the whole subject of radio. Radiostore Owners, and Laurence M. Cookaday, Technical Editor of Popular Radio, have tried to make contact with the gross radio public since this book and compiled a book that will convince the veriest beginner that technical training is not essential. If you have a little time to devote to a most fascinating pastime, used for a copy of "How to Build Your Radio Receiver."
Cushioned to stop vibration — that's why the Cushion Base Tube makes such a wonderful improvement in reception.

Equip your set with Cushion Base tubes and note the surprising softness and fullness of tone of reception that follows the elimination of vibration. Order your set from your dealer today.

THE VAN HORNE CO., Inc.
902 CENTER ST., FRANKLIN, OHIO

Dongan Electric Mfg. Co.
2983-3001 Franklin Street
Detroit, Mich.
BROADCASTS
By Richard Lord

A Demonstration of the Need of a Law to Control Broadcasting

Although it has been contested since the inception of broadcasting that Mr. Hoover's power to regulate and assign wavelengths has been more or less arbitrary the recent court decision abrogating his authority has resulted in serious confusion.

This decision has at least shown that radio broadcasting, hampered as it is by a law that was never made for it, (the Alexander law passed in 1912) needed the moral support of a man like our present Secretary of Commerce. It was largely through his honest appeal to the common sense of license holders that confusion has heretofore been avoided on the air.

It was to be expected that some of our more wayward broadcasters should take advantage of such a situation and immediately move up into the territory of the more important stations regardless of the possibilities of interference and, in some cases, with disregard for the welfare of either listener or broadcaster.

WOR (New York), almost before the ink in the court decision had dried, moved into the old berth of WJW.

WHAP, a smaller Brooklyn broadcaster, came up just below WJZ.

WRNY immediately began to feel important and pompously and impudently moved into a 374 meter channel; the result of this hasty action has been that WRNY now seriously heterodynes with WGY and neither of these stations can be heard decently. It is merely a case where the work of a good broadcaster is being interfered with by the outpourings of an inferior studio.

WMSG also decided to move out of adolescence and it has arbitrarily taken on the wavelength of 302.8 meters.

What will come of this situation, no one can tell. It will be months before Congress again convenes and the broadcasters themselves do not seem any too willing to call an emergency conference of their own for regulation and distribution of wavelengths on an equitable basis. If the situation becomes much worse Congress will at least be impressed with the importance of passing regulatory legislation when it does convene. Such action should be forced by concerted popular appeal to our Congressmen and Representatives.

* * *

Does Radio Fill Church Pews?
The religious services broadcast by radio, instead of emptying the churches as was predicted, are filling them with more worshippers than they have known for many years—according to a survey that has recently been made by the Sears-Roebuck Agricultural Foundation. Twenty-seven clergymen stated that they had noticed an increase in the size of their congregations as a direct result of broadcasting, while one pastor wrote that forty persons had recently joined his church as a result of radio.

* * *

Radio Newspapers on Ocean Liners
Starting as an experiment only three years ago, the radio newspaper has so grown in favor that now there are over 100 liners on the trans-Atlantic route alone that publish daily papers on their trips across the ocean. The American news is sent out already edited, through station WQX, which uses 200 KW of power and transmits on a 13,500 meter wavelength. Even the headlines are radioed.

* * *

Trying Out New Plays by Radio
One of the ingenious uses to which radio has been put recently has been to try out new plays. Ordinarily a producer must go to the expense of buying scenery and costumes to give a play a short road run before he can know that his play is likely to meet success. One producer has conceived the idea of giving a play a preliminary "performance" before the radio audience, to find out to what extent it might meet with favor. The first play to be broadcast for this purpose was Frederick Arnold Kummer's "Beau Nash," it was sent out over WQBS.
Na-Ald Truphonic Coupler

For those who are—awaiting perfect reproduction

A YEAR ago the phonograph was only a phonograph, and then came the Orthophonic. You will remember the amazement and admiration which this machine caused. Today, in radio circles, the Na-Ald Truphonic Coupler is causing the same amazement and admiration, and for the same reasons. The Na-Ald Truphonic Coupler gives the same thrilling distinctness and fidelity, the same quality and depth of tone, and at a volume far greater than hitherto thought possible. Listen to the announcer's voice. The diction is as crisp and clear as if he himself were in the room. A flute is playing—up, up it goes, and still the notes maintain their flawless purity. A piano plays and no longer do the keys sound out the stale and hollow flatness of a gong but the notes themselves with all their own true ringing clarity and even the delicate overtones are preserved in perfect harmony. An organ, too, is heard—beautiful with that full deep throbbed resonance which belongs to it alone. And now, the full symphony orchestra, not the pale thinness of a single sound but a complete ensemble of instruments with the individuality of each so clear that you can follow the themes of everyone—the French horns as they burst forth to blend again with the whole; or, the bass violas as they pursue their lone and solitary air. And the applause? a jumbled roar? No! The staccato clapping of separate hands. The Na-Ald Truphonic Coupler does more than reproduce. It recreates and brings to you that vivid, breathing, fragile thing—the soul of the music itself.

The Na-Ald Truphonic Coupler is a new instrument; new in principle, new in design, and new in construction. It is neither an impedance, resistance or transformer coupling but a new invention of H. P. Donle which coordinates each compound in perfect proportion for precise, undistorted, and beautifully perfect amplification. Almost overnight it has revolutionized the science of amplification.

Attaching the Na-Ald Truphonic Coupler to your set takes but a jiffy. Connect the battery cables, slip in the tubes, plug in the loud speaker and there it is.

Words won't convince you of the performance of the remarkable little device. A demonstration will. Call at your dealers and he will gladly make you one; and, you, yourself, will hear the radio of which you've always dreamed.

Price—Complete amplifier ready to attach..............$20.00 (includes battery leads, sockets, output unit for protecting load speaker with power tubes, connecting adapter.)

Individual Truphonic Couplers or Output Unit........$5.00 each

Complete amplifier parts for set builders.........20.00 (3 Couplers, output unit, sockets, catacomb, battery leads)

For full particulars write
ALDEN MANUFACTURING CO.

Na-Ald Localized Control Tuning Unit

ALL tuning condensers easily controlled by the touch of but three fingers of one hand! This amazingly simple tuning device reduces the complications of tuning to a single motion! All three condensers are operated at the same opening of the panel. All can be moved together or each can be moved separately. The result is exact tuning from station to station with the touch of one hand.

Price Quadruple $16.00
Triple........10.00
Double.........8.00

Na-Ald 481-XS Cushion Mount Socket

IMPROVED amplification demands a cushion socket if microphonic disturbances within the tube are to be removed. The Na-Ald 481-XS Cushion Mount Socket, by means of a perfected resilient mounting that practically floats the tube, gives complete protection by absorbing both vertical and lateral shocks. The only socket on the market with this feature.

Price............50c

The improved tone and quality of the new UX power tubes 171, 112 and 120 can now be had on any set without the need of rewiring for the additional B and C batteries required. Na-Ald Connectors function as adapters and, at the same time, provide cables for attaching the necessary B and C batteries without affecting the rest of the set.

Price of each......$1.25
"Batteries are Obsolete"

The Davy "A" Power

Is not a storage battery-trickle charger combination. It dispenses entirely with chemical components, condensers and moving parts, thus making its life practically indefinite. It is economical, inexpensive and absolutely noiseless.

Regulation of the radio receiver may be accomplished in the same way as when a storage battery is used.

Simply plug Davy "A" Power in your lamp socket and it is ready to operate your set for as long as you wish. It does not become exhausted as a storage battery does.

Davy Electrical Corp'n
505 Court Street
Brooklyn, N.Y.

Local Laws to Rule Radio

Local radio legislation may take the place of long expected and delayed action by Congress to pass a radio bill for the national regulation of broadcasting. Already, several small communities have proposed and passed ordinances which attempt to regulate radio locally. Bay City, Ill., has been considering a measure which would place a $2 tax on all radio receiving sets. The proceeds of this ordinance would serve to establish and run a radio bureau, the prime function of which would be the finding, and correcting of interference of all kinds.

A penalty is provided for radio sets which interfere with others, with the loss of the license for the third conviction. This is evidently an attempt to do away with the regenerative receiver.

There is no doubt but that the validity of such a law can be questioned, for radio regulation and licensing is now a matter of Federal concern. Secretary Hoover is known to be against the direct taxation of listeners-in.

* * *

The Ideal Receiver for the Farmer

The Radio Section of the U. S. Bureau of Standards is trying to determine which is the ideal set construction for use by farmers. In attacking their problem, the engineers of the Bureau have laid down the following requirements as essential:

1. The receiver must be selective;
2. It must be sensitive;
3. It must be simple in operation;
4. It must have a wavelength range of 200 to 550 meters;
5. It must be ruggedly built.

The last consideration has been selected as the most important of the five, and the Department has begun tests to determine the best receiving sets that would withstand rough handling. Some 30 receivers were put through typical rough handling tests, and if any of the apparatus became detached or inoperative, the set was declared to be too frail for shipment to farms.

* * *

Tropical Explorers to Use Radio

Under the command of Captain Dyott, another expedition will soon start from New York City for the Amazon River, following closely on the Roosevelt trail, down the River of Doubt in Brazil. Radio will again be the medium through which the civilized world will know of the explorers' progress.

This is not the first time that radio has penetrated those regions; last year, the Hamilton Rice Expedition to the Upper Amazon passed on messages that were picked up by amateurs through its entire time in the tropics.

* * *

Five Years to Develop Aircraft Radio

A sum of $85,000,000 has been approved to carry out the provisions of the Naval Aviation Bill, which calls for the construction of 1,000 fighting planes and two dirigibles, both larger than the Shenandoah. All of these airships will be radio-equipped, and will further the incentive in the development of aircraft radio apparatus, which has been much neglected since the War.

Because of the huge size of the dirigibles, it is possible that they may carry radio equipment of battle size, though, of course, not as heavy nor voluminous. Five years is all inventors, designers and scientists will have to work on the various problems of radio reception and transmission from aircrafts, as the program is to be completed within that time.

POPULAR RADIO SETS

Are easier to build if you use Simplified Blueprints

Every Radio Shop Kit includes a set of blueprints. A full size instrument layout shows you just where to place each part. The picture wiring diagram shows you where to connect each wire. Each kit also contains a drilled and artistically engraved panel. A set constructed from a Radio Shop Kit is easier to build and its fine appearance makes it more valuable to you.

Check below for complete information and our prices.

Blueprints $1.00 per set.

☐ The Improved Browning Drake.
☐ Cockadays L.C. 26 Receiver.
☐ S-C All Wave Single-Control.
☐ McLaughlin Single Control Super.
☐ Short-Wave Receiver.

THE RADIO SHOP
of STAMFORD
20 Worth St. Stamford, Conn.
"Mail Order Service for Set Builders"

Radio Corporation of America

1926 MODELS—MALE, FEMALE AND NEUTER

One of the very nicest ways to enjoy radio—so we are told—is to be young and beautiful and to be hired by a publicity director of a receiving set manufacturing concern to go off on a yacht as a photographer’s model, accompanied by other young and beautiful models, and just listen in. Who says that summertime reception hasn’t its advantages?
Coming Events on the Ether

AUGUST 15 TO SEPTEMBER 15

DURING the coming month, August 15th to September 15th, the following regular and special program features are scheduled. This list, which will be augmented monthly as advance information is received, will be published in each issue of this magazine; all broadcast stations are invited to report coming program features of outstanding interest or importance. Reports should reach the Editor of Popular Radio on or before the 25th of the month preceding.

Daylight Saving Time

*August 15; Goldman Band, WEA; 9:45 P. M. (Also broadcast from WEEI, WGR, WTAG, WSAI and WCSH).

*August 16; Goldman Band, WEA; 8:30 P.M. (Also broadcast from WGR and WWJ).

*August 16; Opera "Martha," WEA; 10:00 P.M. (Also broadcast from WCSH, WCCO, WOO, WCAE, WDA, WJAR, WTCI, WCAP, KSD and WSAI).

August 17; Gold Dust Twins, WEA; 8:30 P.M. (Also broadcast from WEEI, WFI, WCAE, WGR, WWJ, WOC, WCSH, WJAR, WCCO, WLIB, WTAM and KSD).

August 17; Eveready Hour, WEA; 9:00 P.M. (Also broadcast from WEEI, WFI, WCAE, WGR, WWJ, WOC, WWJ, WCO, KSD, WJAR, WCCO, WTAM, WGN, WSAI and WCAP).

August 17; Keystoners, WJZ; 9:00 P.M. (Also broadcast from WRC and WGY).

August 17; George Olsen's Orchestra, WJZ; 10:45 P.M.

*August 18; New York Philharmonic Orchestra, WJZ; 8:30 P.M. (Also broadcast from WRC).

August 18; Judge Jr., WJZ; 7:40 P.M.

August 19; Royal Typewriter Hour, WJZ; 9:30 P.M. (Also broadcast from WGY, WRC and WCAI).

August 20; Happiness Boys, WEA; 8:00 P.M.

*August 21; New York Philharmonic Orchestra, WJZ; 8:30 P.M.

*August 21; Goldman Band, WEA; 8:30 P.M. (Also broadcast from WGR and WWJ).

*August 21; New York Philharmonic Orchestra, WJZ; 8:30 P.M. (Also broadcast from WRC).

August 22; Capitol Theatre Orchestra, WEA; 7:20 P.M. (Also broadcast from WEEI, WJAR, WGR, WWL and KSD).

August 22; Atwater-Kent Hour, WEA; 9:15 P.M. (Also broadcast from WEEI, WGR, WCAP, WWJ, WSAI, WGN, WCCO and KSD).

August 21; New York Philharmonic Orchestra, WJZ; 8:30 P.M. (Also broadcast from WRC).

August 22; Opera "The Masked Ball," WEA; 10:00 P.M. (Also broadcast from WCSH, WCCO, WOO, WCAE, WDA, WJAR, WTCI.)

**C R Y S T A L  C L E A R  T O N E S**

**O N  A N Y  S E T**

**Carborundum Detector**

**Stabilizing Unit**

Here is no denying the pure, true quality of crystal reception.

And you can get such reception on any set without the fuss and worry of a nervous Cat's whisker jumping off the sensitive spot.

The Carborundum Stabilizing Detector Unit has revolutionized crystal detection.

It is built around the Fixed Permanent Carborundum Detector—no Cat's whisker—no adjustments—retains its sensitivity and simply can not burn out.

The Stabilizer gives you a resistance controlling feature through which the Detector can be made to match the impedance of any circuit. Simply turn the potentiometer knob.

The addition of an ordinary flash light dry cell gives the necessary booster voltage.

For greater sensitivity—greater distance—but above all for the reception of tones of natural quality equip your set with The Carborundum Stabilizing Detector Unit—it improves any set.

**The Carborundum Company**

**Niagara Falls, N. Y.**

Sales Offices and Warehouses in

New York, Chicago, Boston, Philadelphia, Cleveland, Detroit, Cincinnati, Pittsburgh, Milwaukee, Grand Rapids

Carborundum is the Registered Trade Name used by The Carborundum Company for Silicon Carbide. This Trade Mark is the exclusive property of The Carborundum Company.

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The Carborundum Company

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Hook-Up Book D-3.

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The
VARION
B & C ELIMINATOR
NEW!
BEFTER!
DIFFERENT!

And the Marvelous New Varion A. C. Operated Receiver

Be sure your name is on our mailing list. A special issue of "Broadcasts" will tell the whole story of the new Varion A. C. Operated Set and Eliminator, leaders for this fall. Send in your name today. No obligation whatever.

WHOLESALE DISTRIBUTORS
MORISON
15 EAST 40 STREET
NEW YORK CITY

Build Your Improved Browning-Drake
by the aid of
Popular Radio SIMPLIFIED Blue Prints

Easy, Quick and Accurate

The improved Browning-Drake Broadcast Receiver, designed by Arthur H. Lynch, former Director of the Radio Development laboratories, has been built and approved in the POPULAR RADIO LABORATORY. Here is a receiver which combines all the advantages of a circuit that has long been recognized as standard with new ideas and improvements which have been made to receiver construction since the circuit was first designed.

High efficiency that emphasizes fine tone quality is the outstanding characteristic of this new model.

By using POPULAR RADIO Blue Prints in building your improved Browning-Drake Broadcast Receiver, you can save time, eliminate the possibility of error, and make your set exactly like the laboratory model (see page 476).

If your local dealer cannot supply you with Blue Prints of the Improved Browning-Drake they will be sent postpaid upon receipt of $1.00 per set.

A full description of this set, with detailed directions for building, was published in the August, 1926, issue of POPULAR RADIO. Send 35c for copy.

POPULAR RADIO
Service Bureau 94-A
627 W. 43rd St., New York City

WCAP, KSD and WSAI),
August 24; Gold Dust Twins, WAEF; 8:30 P.M. (Also broadcast from WEEI, WFI, WCAE, WGR, WWJ, WOC, WCSS, WJAR, WCCO, WLIB, WTM and KSD).
August 24; Eveready Hour, WAEF; 9:00 P.M. (Also broadcast from WEEI, WFI, WCAE, WGR, WWJ, WOC, KSD, WJAR, WCCO and WTAG).
August 24; Keystone, WJZ; 9:00 P.M. (Also broadcast from WRC and WGY).

*August 25; New York Philharmonic Orchestra, WJZ; 8:30 P.M. (Also broadcast from WRC).

August 26; Judge, Jr., WJZ; 7:40 P.M.
August 26; Royal Typewriter, WJZ; 9:30 P.M. (Also broadcast from WGY, WRC and WCAD).
August 27; Happiness Boys, WAEF; 8:00 P.M.

*August 28; Goldman Band, WAEF; 8:30 P.M. (Also broadcast from WGR and WWJ).

August 29; Atwater-Kent Hour, WAEF; 9:15 P.M. (Also broadcast from WEEI, WGR, WCAP, WWJ, WSAI, WGN, WCCO and KSD).

August 29; Capitol Theatre Orchestra, WAEF; 7:20 P.M. (Also broadcast from WEEI, WJAR, WGR, WWJ and KSD).

*August 30; Opera "Mignon," WAEF; 10:00 P.M. (Also broadcast from WCCO, WOO, WCAE, WDA, WJAR, WTM, WCAP, WSAI and KSD).

September 1; Radio Nature League, WJZ; 8:30 P.M.
September 2; Judge, Jr., WJZ; 7:40 P.M.

September 3; Happiness Boys, WAEF; 8:00 P.M.

*September 4; Goldman Band, WAEF; 8:30 P.M. (Also broadcast from WGR and WWJ).

September 5; Atwater-Kent Hour, WAEF; 9:15 P.M. (Also broadcast from WEEI, WGR, WCAP, WWJ, WSAI, WGN, WCCO and KSD).

September 5; Capitol Theatre Orchestra WAEF; 7:20 P.M. (Also broadcast from WEEI, WJAR, WGR, WWJ and KSD).

*September 6; Opera "Emani," WAEF; 10:00 P.M. (Also broadcast from WCCO, WOO, WCAE, WDA, WJAR, WTM, WCAP, WSAI and KSD).

September 7; Gold Dust Twins, WAEF; 8:30 P.M. (Also broadcast from WEEI, WFI, WCAE, WJAR, WWJ, WOC, WCSS, WJAR, WCCO, WLIB, WTM and KSD).

September 7; Eveready Hour, WAEF; 9:00 P.M. (Also broadcast from WEEI, WFI, WCAE, WGR, WWJ, WOC, KSD, WJAR, WCCO and WTAG).

September 7; Keystone, WJZ; 9:00 P.M. (Also broadcast from WRC and WGY).

September 7; George Olsen's Orchestra, WJZ; 10:45 P.M.

September 8; Radio Nature League, WJZ; 8:30 P.M.

September 9; Judge, Jr., WJZ; 7:40 P.M.

September 9; Royal Typewriter, WJZ; 9:30 P.M. (Also broadcast from WGY, WRC and WCAD).

September 10; Happiness Boys, WAEF; 8:00 P.M.

*September 11; Goldman Band, WAEF; 8:30 P.M. (Also broadcast from WGR and WWJ).

September 12; Capitol Theatre Orchestra, WAEF; 7:20 P.M. (Also broadcast from WEEI, WJAR, WGR, WWJ and KSD).

*September 13; Opera "Manon," WAEF; 10:00 P.M. (Also broadcast from WCCO, WOO, WCAE, WDA, WJAR, WTM, WCAP, WSAI and KSD).

September 14; Gold Dust Twins, WAEF; 8:30 P.M. (Also broadcast from WEEI, WFI, WCAE, WGR, WWJ, WOC, WCSS, WJAR, WCCO, WLIB, WTM and KSD).

September 14; Keystone, WJZ; 9:00 P.M. (Also broadcast from WEEI, WFI, WCAE, WGR, WWJ, WOC, KSD, WJAR, WCCO and WTAG).

September 14; George Olsen's Orchestra, WJZ; 10:45 P.M.

September 15; Radio Nature League, WJZ; 8:30 P.M.

September 16; Judge, Jr., WJZ; 7:40 P.M.

September 16; Royal Typewriter, WJZ; 9:30 P.M. (Also broadcast from WGY, WRC and WCAD).

September 17; Happiness Boys, WAEF; 8:00 P.M.

*Special Summer Feature.

Short Waves for the Navy

The latest indication that the short waves that were so despised a few years ago have come into their own is the announcement that the U. S. Navy is soon to equip the flagships of all Naval sea-going units with short-wave apparatus. Experiments with 250-watt short-wave transmitters at land stations and on some destroyers have proven so successful for long range work that all flagships of the main squadrons will be equipped with 5 KW short-wave transmitters and those of the minor units with .5 KW sets. Two destroyers, the Memphis and the Pittsburgh have been authorized to conduct special communication tests on 10 and on 35 meters with amateurs while cruising in European waters, and other destroyers now going abroad to relieve ships are being fitted out with short-wave sets.
Cornell
Voltage Supply
(Battery Eliminator)

means better, richer tone—greatly increased volume and distance—a constant, even flow of power.
And it is an actual money saver also as compared with the use of batteries.

Where Reliability is Born

To eliminate troublesome, expensive "B" Battery has long been the aim of radio experts, but it remained for Cornell engineers to completely master the difficult problems presented in the best, most simple and truly scientific manner, as typified in the new Cornell Voltage Supply.

Price Type "B" complete in handsome case, with Raytheon Tube, cord and plug. For use with practically any 1 to 10 tube set, variable radio frequency 50 to 150 volts (audio amplifier 100 to 180 volts), and any speaker

$39.50

Type CB is similar to type B with the addition of variable C Voltage Supply of 1 to 50 volts.

West of the Rockies add $1.90

If your dealer cannot supply you, it will be sent express prepaid upon receipt of price. Write for full information with name of your nearest dealer.

Cornell Electric Manufacturing Corp.

General Offices:
135 East 58th Street, New York

To Dealers—The Cornell Voltage Supply is sold direct from factory through authorized Cornell dealers. If you feel you can qualify, write today for full information.

F. O. B. New York

Tested and Approved by Popular Radio Laboratory.

Cornell Electric Mfg. Corp. - 56th St. - New York, N. Y.
FREE PARTS for the new 
"Improved Browning-Drake Receiver"

If you want to build your own set, here's your opportunity to secure FREE all the parts you need for this Improved Browning-Drake Receiver. Call or write your radio friends, and de
anyone who has a set and tell them of the many special features of Popular Radio.

These liberal offers will make it possible for you to secure an order from anyone you deal with. For each subscription with remittance you send us you will receive credits as per the following scale:

### POPULAR RADIO

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<tr>
<td>6 months</td>
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<td>45</td>
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<td>12 months</td>
<td>200.00</td>
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Use the full amount collected with names and addresses of subscribers and tell us the parts your credits entitle you to and we will send them to you. If the subscriptions you secure do not give you enough credits for the parts you want, we will allow you to purchase credits at the rate of 3 cents each. Example: With (7) seven 1-year subscriptions (210 credits) and 2 credits additional in each you may have a Jefferson "Concertone" sealed audio-frequency transformer, 0.008 mfd., & Underwood & Underwood "RADIO DETECTIVE" for running down RUM-RUNNERS.

This rapid radio direction finder has been installed on some of the small patrol boats of Uncle Sam's dry navy to check up on the movements of the ships that approach our coasts. By means of this apparatus the operator can tell the position of any ship (when it is transmitting) accurately enough to steam over and give it an inspection in case it is suspected of carrying a contraband cargo.

### Radio Locates a Long-lost Sister

Twenty-six years ago Siegfried Jensen, a young engineer living at Windbaek, Southwest Africa, set out for the Congo on a mission for King Leopold II of Belgium. And that was the last that his widowed sister, Mrs. Lydia G. Nelson of San Francisco, heard of him—until a few weeks ago, when she was listening in on her radio set and was astounded to hear a broadcast appeal that her brother had sent out for her and that had been relayed from Africa. She verified its context by cable, and on July 18th she sent sail to join him.

"During the last twenty years I often prayed that I would meet him, but little realized that I ever would," she said. "My prayers were answered by the modern miracle of radio, and I am very happy."

### Radio Fills the Village Pulpit

A radio amateur with a receiving set recently took a hand in making the little church of St. Mark's, at Ferryville, Maryland, one of the unique churches in the country. When its pastor, the Rev. J. J. Abell, died the church seemed likely to be abandoned, as there was a larger church a few miles away. But the radio amateur installed a receiver in the church and now the congregation is growing larger than ever through the inspiration of programs broadcast by radio.

The choir receives the weekly program in advance and sings along with the radio.

* * *

"Fading Secretary"—a New Profession

"Fading secretary" is the designation which Miss Mary E. Watkins of San Francisco applied to herself when she presided over the radio receiver during the after-dinner hours in the home of an army officer and his family in Honolulu. She reports that the position was remunerative as well as unique, and she recommends it to those who want to combine business with pleasure.

* * *

Radio Entertainment for the Tired Jurymen

Radio's latest job, according to reports from Denver, is to soothe the ruffled nerves of jurymen who have spent hours of futile argument without reaching an agreement and must be locked up for the night. In two recent long drawn out murder trials the court ordered that radio sets be installed for the entertainment of the jury after working hours. A bawd, however, kept within close enough range to shut off the set if any news comments on the trial were broadcast.
The "Jewel Case"

not merely rare beauty
but new acoustic principles!

The "Jewel Case"—like a rich antique jewel cabinet in outward appearance, with all of the rare tone beauty of an old violin. Undreamed of fidelity, and small though it may be, volume is greater than any speaker yet marketed.

Velvet Speaker Number 21 is startling in its far flung progress toward the ideals of beauty and acoustic perfection. Be first to offer it and reap the sales. The price is reasonable—the quality the highest—and dealer, jobber co-operation unusual. Write today for the Velvet franchise!

Sales Dept.,
The Zinke Co.,
1323 S. Michigan Ave.,
Chicago, Ill.

Manufactured by
The Borkman Radio Corp.,
Salt Lake City, Utah
Kalamazoo, Mich.

VELVET RADIO SPEAKER NUMBER 21
Price $45.00
The work of master craftsmen—in beauty and acoustic perfection

NUMBER 12
12 1/2 inch bell
$16.00

NUMBER 14
14 1/2 inch bell
$23.50

If you build sets you sell sets you service sets you listen to a set

YOU cannot afford to be without a copy of

"Audio Amplification" By Samson

Radio, from "mike" to loud speaker, involves many steps, each step having its own particular "loss" or "distortion." You cannot help those which occur at the transmitting end, but you are to blame for those in your own set. A poor amplification system not only causes losses due to its own inherent faults but magnifies many times those which originate at the other end. Hence the great importance of an understanding of the requirements and operation of Audio Frequency Amplifiers.

The material contained in this book represents the results of many years' research work in the laboratory on the subject of Audio Amplification, and is written in a manner which will enable anyone to better the quality of reproduction in their particular set. Quality comes with understanding, and understanding comes with this book.

Every man the least bit interested in the best reproduction obtainable in radio should have this book. Its practical and technical information is placed at the disposal of radio enthusiasts for the small sum of 25 cents, and is a valuable contribution not only to the individual, but to the industry as a whole, a necessity to the seeker after better reception.

If a copy of this book is unobtainable from your dealer or jobber, tear off and send to

SAMSON ELECTRIC CO.

CANTON, MASS.

Gentlemen: Here's my quarter or 25 cents in stamps. Send me "Audio Amplification."

Name........................................

Address......................................

A Court Summons Served by Radio Is Declared Lawful

According to a decision rendered by Supreme Court Justice Stephens in Rochester, N. Y., on July 25, 1926, a court summons served by means of radio broadcasting is lawful.

When Mrs. Lena F. Lapierre despaired of finding her husband (who left Elmira in March, 1920) through the usual legal channels, her attorney turned to the radio. A summons directing Lapierre to appear at the office of his wife's attorneys subsequently was broadcast from station WHEC. This is reported to be the first use of radio for such a purpose. Justice Stephens held the radio process of serving was lawful and signed an order summoning Lapierre, preliminary to decision on the wife's plea for divorce.

Q. S. T.

All radio amateurs will be interested to learn that Popular Radio has just completed arrangements for forwarding to transmitting amateurs in England, Ireland and Italy all calls heard (QSL) cards that may be addressed to them by American amateurs. These cards will be delivered through local agents in those countries, who have or can obtain knowledge of the present addresses of the foreign amateurs.

Plans have also been completed by this magazine for forwarding to transmitting amateurs in this country in turn all QSL cards that may be addressed to them by amateurs from those countries and arrangements are being made now for furnishing a similar service with radio amateurs in all of the principal countries of the world.

American amateurs are invited to send their cards to English, Irish and Italian amateurs through this office, which will not only assure safe delivery through the special agencies which are thus provided, but which will publish a monthly list in a trans-oceanic "Calls Heard" department.

Address your cards to the foreign amateurs by call numbers and enclose them in envelopes to—

THE CALLS HEARD EDITOR

POPULAR RADIO

627 West 43d Street, New York.

The new department will publish these records of amateur performances as soon as sufficient time has elapsed to enable the amateurs to communicate with this office.

The Sesqui's Radio Room

Radio fans who attend the Sesqui-centennial Exposition at Philadelphia this summer will find there an interesting exhibit of radio apparatus which has been installed under the direction of the Department of Commerce. The exhibit will include all kinds of transmitting and receiving apparatus as well as the apparatus that was used until lately by Secretary Hoover's radio police to see that stations kept on their assigned wavelengths. Among the exhibits is a new type of receiving set that is capable of picking up transmissions on any wavelength from the ultra-short waves up to about 50,000 meters. There is also included a number of "antique" receivers and transmitters, to illustrate the amazing progress that radio has made within the last few years.

THE YELLOW PERIL © RADIO

The Japanese exclusion act is powerless to prevent ether waves from the 6 KW station JOKE in Nagoya, Japan, from entering U. S. territory; its programs are now being picked up regularly in California. Note the unique microphone which is adjusted to the artists who perform in the Japanese manner—on the floor.
In planning what you are to handle this coming season, you hope, of course, for none of the grief which has accompanied many receivers in the past, and the Browning-Drake sound merchandising principles, in marketing a product of undisputed excellence, we believe, will be interesting to you.

The research at the Cruft Laboratory of Harvard University, begun in the summer of 1923 by Glenn H. Browning and Frederick H. Drake, has set the mathematical standard of design for radio frequency transformers, and is universally recognized as the scientific authority on this most important subject, justly called the "heart of any circuit."

One stage of scientifically designed radio frequency, incorporating the Browning-Drake transformer, together with the flexibility of a two control receiver, has yet to be improved upon for all around satisfactory reception. Our research facilities are such that minor refinements are constantly being made without the necessity of yearly models to upset the industry.

Producing one model, fairly priced, with reasonable dealer discounts, and distributed only by the highest grade jobbers, the Browning-Drake Receiver has never been cut, and no dealer has ever lost money on Browning-Drake. Your percentage of returned sets will be an absolute minimum, for your customers have confidence in the Browning-Drake name and its standards, and know it represents a laboratory standard of development which will not be superseded or radically changed for many years.
The New
McCullough AC Tube
Comes Into Its Own!

Eliminates
Troublesome
A Batteries
—
No Hum
—
Greater Amplification
—
Less Microphonic
—
Better Tone
—
Receiver Always at its Best

A selected group of manufacturers are turning out for your use complete broadcast receivers equipped throughout with The New McCullough A C Tubes.

Be sure to have your dealer demonstrate one of these sets to you as soon as he has one in stock.

All you have to do to make this kind of an A C Set work is to plug into your lighting circuit. And no batteries are needed!

Mr. Jobber:—
Unless you can give your dealers a Batteryless Set this year you will lose a lot of business. Ask your set manufacturer to equip one model with the McCullough A C Tube and make it batteryless. We will assist your manufacturers.

Mr. Dealer:—
The only fundamentally new thing this Fall is the Batteryless Set. You should carry one in your line. If you will write us, we will tell you who is making them. Your competitor will sell one. How can you go wrong if you do?

McCullough Sales Company
(Laboratories)

20 Grand Avenue :: :: :: :: Brooklyn, New York
YOU radio fans who want a set that will eliminate both "A" and "B" Batteries can now have one at a reasonable price. The Cleartone Radio Electric Model 110, operating from the house current and using no fluids or acids, costs only $200, without tubes or loud speaker.

This remarkable set uses McCullough AC Tubes, which abolish the battery problem and are undoubtedly the greatest achievement in radio today. It has been highly approved by such a great authority as Professor Wilcox of the Armour Institute of Technology of Chicago.

The Cleartone Radio Electric Model 110, is the result of five years of exclusive radio receiving set manufacturing. Tone quality and volume are exceptional. Two vernier dial controls with the proper degree of selectivity simplify operation. The high quality of workmanship insures a set which will give years of satisfactory service, fully guaranteed by a manufacturer of the highest standing in the radio industry.

Write for full details.

THE CLEARTONE RADIO COMPANY
2427 Gilbert Avenue :: :: Cincinnati, Ohio

CLEARTONE Complete RADIO SETS
THOUSANDS of people have made the discovery that Eveready “B” Batteries, when used in the proper size, and on sets equipped with a “C” battery, are a most economical, reliable and satisfactory source of radio current.

Here is the secret of “B” battery economy, reliability and satisfaction:

**On all but single tube sets** — Connect a “C” battery. The length of service given below is based on its use.

**On 1 to 3 tubes** — Use Eveready No. 772. Listening in on the average of 2 hours daily, it will last a year or more.

**On 4 or more tubes** —

*NOTE: A “C” battery greatly increases the life of your “B” batteries and gives a quality of reception unobtainable without it. Radio sets may easily be changed by any competent radio service man to permit the use of a “C” battery.*

Use the Heavy-Duty “B” Batteries, either No. 770 or the even longer-lived Eveready Layerbilt No. 486. Used on the average of 2 hours daily, these will last 8 months or longer.

These figures are based on the average use of receivers, which a country-wide survey has shown to be two hours daily throughout the year. If you listen longer, of course, your batteries will have a somewhat shorter life, and if you listen less, they will last longer.

Evereadys give you their remarkable service to the full only when they are correctly matched in capacity to the demands made upon them by your receiver. It is wasteful to buy batteries that are too small. Follow the chart.

In addition to the batteries illustrated, which fit practically all the receivers in use, we also make a number of other types for special purposes. There is an Eveready Radio Battery for every radio use. To learn more about the entire Eveready line, write for the booklet, “Choosing and Using the Right Radio Batteries,” which we will be glad to send you on request.

Manufactured and guaranteed by

NATIONAL CARBON CO., INC.

New York  San Francisco

Canadian National Carbon Co., Limited

Toronto, Ontario

Tuesday night means Eveready Hour

— 8 P.M., Eastern Standard Time, through the following stations:

- WEA-F New York  - WEA-C Cincinnati
- WJZ- Providence  - WJZ-Cleveland
- WBB- Boston  - WBB-Detroit
- WME-Worcester  - WME-Chicago
- WOR-Pittsburgh  - WOR-Davenport
- WOR-Buffalo
- WGA-St. Louis  - WGA-St. Paul

www.americanradiohistory.com
6 Other Crosley Radio Achievements

The Crosley 1-tube "Pup"—$9.75—a double-circuit set, with which laymen have heard radio signals probably the greatest distances.

The 4-tube 4-29—a 4-tube receiver of amazing efficiency. Already proven its right to a permanent position in the Crosley line. CRESCENDON equipped!

The 5-tube 5-38—$38. The 5-tube tuned radio frequency set incorporating the CRESCENDON—a spectacularly popular model.

The 4-tube RFL 76—true cascade amplification; non-oscillating—non-radiating, regardless of how it may be mishandled.

The 6-tube RFL 90—introductory the double drum station selector) Solid mahogany cabinet. Musicone built-in—ample room for batteries and accessories, 41 inches high, 30 1/2 inches wide.

Contrast the surpassing performance of this new type of Crosley Radio with what has hitherto been considered radio perfection.

The cabinet is solid mahogany, beautifully finished in two-tone and striped in gold. Metal fittings are rose gold finish.

The metal shielded chassis is divided into three compartments. The units shielded from each other, prevent interstage as well as external coupling. This improves stability of circuit and increases selectivity. This has never before been offered in sets of moderate price.

Crescendo Control affords unusual volume from distant stations. Heretofore single dial control sacrificed selectivity. By means of the Acuminators, very sharp tuning is accomplished where the reception from local stations spreads broadly over the dial. Under average conditions, when once adjusted, these acuminators do not have to be touched again.

The CROSLEY MUSICONES

Crosley manufactures radio receiving sets which are licensed under Armstrong U. S. Patent No. 1,113,149 or, under patent applications of Radio Frequency Laboratories, Inc. and other patents issued and pending.

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Write Dept. 16, CROSLEY RADIO CORPORATION, CINCINNATI, O.

www.americanradiohistory.com
HERE are now three types of Micadons—each made to meet a new development in radio.

Micadon 601 is the standard of small fixed condensers. Designed on revolutionary principles, it was one of the first radio products to discard heavy molded insulation with its high dielectric losses. It provides and maintains a constant, fixed capacity wherever small condensers are required.

In Micadon 640, the need for higher capacities in super-heterodynes, reflex and resistance-coupled amplifiers has been met. The same accuracy, the same principles of insulation and protection against losses in its fixed and permanent capacity have given this condenser its unequalled popular demand.

Micadon 700 is the newest addition to this famous line. Completely shielded in its bright aluminum case, it is designed to withstand even the voltage found in low-power C.W. vacuum tube transmitters; thus providing the most compact, efficient and economical unit of fixed capacity that radio has yet known.

Three different types—but every one a Micadon. In the patented principles of their design; in the scrupulous care given to every stage of their manufacture; in their delicate precision, fully shielded and protected—worthy to bear the name of radio's greatest maker of condensers.