A NON-RERADIATING REGENERATIVE CIRCUIT—(See Inside)

15c A COPY ILLUSTRATED EVERY WEEK MARCH 1

RADIO WORLD


Miss Bird Milliman, champion tight-wire walker, balances herself 25 stories above the New York streets and listens in on a portable radio set. Woolworth Building in background.—(C. Kadel & Herbert.)

BROADCAST PROGRAMS FROM FAR AND NEAR

www.americanradiohistory.com
Crosley Again Astounds the Radio World

Greatly increased production allows lowered prices

New Two Tube Regenerative Set at $18.50

Ever since we started making radio apparatus it has been our firm policy to offer to the public the best possible receivers at the lowest possible cost. That this policy has been appreciated is proven by the fact that a shortage of Crosley radio apparatus has existed at all times, although The Crosley Radio Corporation has been producing more radio receiving sets than any other organization in the world. Heretofore constantly added improvements have forced us to maintain steady prices, but so great has been the response of the public for Crosley instruments that greatly increased production allows us to lower the price of the entire line, and still maintain our constant research for improvements.

As an astounding example of the results of this research, we now offer a new and wonderful two-tube receiver, consisting of Armstrong regenerative detector and one stage of audio frequency amplification, giving loud speaker volume on local stations at all times and on distant stations under fair receiving conditions. Otherwise head phones should be used for distant reception. This instrument, known as the Crosley Model 3-A, sells at the remarkably low price of $18.50. It has been thoroughly tested in our laboratories, and its satisfactory performances have even surprised us.

Other Crosley instruments are well known. Their exceptional performances have given pleasure to hundreds of thousands of people in all parts of the United States. Note the following price reductions on these well-known Crosley receiving sets:

CROSLEY TYPE V, single tube Armstrong regenerative receiver, the same instrument used by Leonard Weeks in Minot, North Dakota, in his established communication with the McMillan expedition at the North Pole, formerly $30.00, now reduced to $16.00.

THE CROSLEY TWO-STAGE AUDIO FREQUENCY AMPLIFIER to match the Crosley Type V, formerly $20.00, now $18.00.

THE CROSLEY MODEL VI, two-tube receiver incorporating radio frequency amplification and detector, formerly $30.00, now $24.00.

THE CROSLEY TYPE 3-A, a three-tube Armstrong regenerative receiver, consisting of detector and two stages of audio frequency amplification, formerly $65.00, now $55.00.

THE FAMOUS CROSLEY MODEL X-J, a four-tube receiver, consisting of one stage of radio frequency amplification, detector and two stages of audio frequency amplification, probably the biggest selling radio receiver in the world, formerly $65.00, now $55.00.

THE CROSLEY TYPE 3-C, a three-tube Armstrong regenerative console set with built in loud speaker, formerly $125.00, now $110.00.

THE CROSLEY MODEL X-L, a four-tube set, consisting of one stage of radio frequency amplification, detector and two stages of audio frequency, formerly $140.00, now $120.00.

It is our firm belief and hope that these new lowered prices will enable every listener to enjoy the benefits in pleasure and instruction that only the radio can give. Take advantage of this astounding announcement. Choose a Crosley Radio Receiver today.

For sale by the best dealers and Jobbers Everywhere

The Crosley Radio Corporation
POWELL CROSLEY, JR., President
The Premium Equipment Company and Crosley Manufacturing Company
3401 ALFRED STREET CINCINNATI
Crosley Regenerative Receivers are manufactured under Armstrong U. S. Patent Number 1,113,149

CROSLEY
Better-Cost Less
Radio Products
A Ringing System for Radio Telephony
Remarkable Radio Selective Signaling Plan Described

WITH the increased application of the telephone in the administration of business, demand will come for connections with various kinds of ships. Obviously the radio telephone must be resorted to for such connections and it will be desirable to have it function as nearly as possible like the ordinary line telephone.

It will be very desirable in many cases not to have a ship operator in attendance at all times, but instead be able to signal him by some device such as a ringing bell. It is furthermore advantageous to be able to call one station without signaling others. A design which meets these requirements has been produced by the Bell System engineers.

This design functions much the same as the ringing methods used on the wire telephone lines now extensively employed for despatching trains. This meth-
od is now designed to include about seventy-five stations in a single system.

The essential features of this system were set forth in a paper by C. S. Demarest, M. L. Almquist and L. M. Clement, which was read before the midwinter convention of the American Institute of Electrical Engineers, held recently in Philadelphia. The authors stated that with their system, ordinary types of radio transmitting and receiving devices may be used, without modification. They claim a high degree of freedom from interference either static or C. W. telegraph. This point was demonstrated in tests in which it was found that radio telegraph signals similar to those from C. W. or spark transmitters would cause the received speech to become unintelligible when the energy level of the interference was only 20 or 30 per cent of that required to cause the signaling system to fail.

The reliability and range of operation of this system are due in a large measure to the characteristics of the particular type of alternating current relay used. This relay is unusually sensitive, as it will operate on as little power as 30 microwatts corresponding to a current of about 0.25 milliamperes.

Fig. 1 shows this scheme in its simplest form which may be made to serve as the basis for a variety of systems, suited to different purposes. As seen in this diagram, the outgoing signal is produced by applying an alternating current of a particular frequency to the radio transmitter in the same manner as the speech currents are applied. Modulation of the radio carrier wave at the signaling frequency results. In this particular system the signaling current frequency employed is 135 cycles.

At the receiving end of the radio carrier wave, modulated by the signaling current, is detected in the radio receiver in the usual manner. The output of the detector thus includes a component similar to the signaling current originally sent into the radio transmitter at the outgoing end.

The received signaling current is sent into the alternating current relay shown in Fig. 2. This operates a very sensitive system of D. C. relays which in turn send certain impulses into a device known as a selector and indicated in Fig. 3. Though many combinations of impulses may be sent into this selector, only one will actuate it so as to ring the local annunciator bell.

The selector consists essentially of a polar relay with a ratchet attachment so arranged that successive operations of the relay, at the proper speed, cause the stepping around of a contact wheel. Stop-pins are provided at certain points to prevent the contact wheel from returning to its normal position when the regular sequence of stepping is interrupted at these points. Any interruption of the regular sequence of stepping when the contact wheel is at any other point causes it to release. When the contact wheel has operated over 17 steps a contact is made which operates a signal. Thus, it is seen that to operate the selector so as to give a signal, the direct current pulses must occur in the proper sequence and the pauses between the groups of pulses must occur at points where stop-pins are located.

In Fig. 4 the system is shown arranged for two-way operation. This embodies a duplication at both ends of the features of the one-way system. With such an arrangement any one station of a number operating on a given wave length may signal any other station in the same system without calling in stations not desired.

Fig. 5 shows a typical assembly arrangement for panel mounted radio receiving and signaling apparatus on a standard rack.

---

![Typical assembly arrangement for panel mounted radio receiving and signaling apparatus on standard rack.](image)
Solving the Apartment House Antenna Problem

ONE of the big reasons why radio is sometimes restricted in congested districts is that the owners of apartments refuse to allow more than a certain number of antennae to be erected. In some cases they will not allow any.

However, with an idea of allowing the use of more than one set on a single antenna, the Radio Division of the Navy Department sought to find out just why more than one set could not be efficiently operated on a single antenna without causing undue trouble, due to de-tuning of one receiver by the manipulation of a second or third receiver.

A solution of this problem was finally found, much after the manner of the resonance coil antenna. The apparatus is herewith shown, with several sets operating on one single wire antenna. The specific apparatus used is not ready for publication just yet, due to lack of information about it outside of official circles. However, it is stated on information furnished by sources that are supposed to be reliable, that this device will work to perfection on five or more receivers, and it is also stated that the type of receiver does not matter in the least.

The device is shown in the accompanying illustration, hooked up to different types of receivers, two of which are regenerative sets. It is located on the left hand side of the receivers and is labelled "SE170 Coupling Resistance Panel."

The device was perfected primarily for use on battle-ships of the navy, to permit the use of one antenna for all the receivers used on board, so that the rest of the several antennae could be used for the transmitters, without the trouble of switching from sending to receiving.

This apparatus will no doubt fill a long felt want in the field, as most apartment house roofs are at the present time so encumbered with wires stringing this way and that that they resemble a trap, and many tenants are prevented from using a set mainly because they cannot erect another wire on the roof.

Great Gathering of Amateur Radio Operators Will Meet in New York March 3-7

By E. Lauffer

The greatest gathering of radio amateurs New York City has ever seen will meet March 3-7 inclusive for the fourth annual amateur convention and radio show under the auspices of the Executive Radio Council, Inc. The convention will be held at the Hotel Pennsylvania.

The First District, which comprises the New England states and the Third and Eighth District, which take in upper New York, Pennsylvania, New Jersey, Delaware, Washington, D. C., etc., will have delegates present.

Everyone of the affiliated clubs of the Executive Council will have a booth at the show. The interesting, instructive and novel exhibits by the various clubs are well worth going to see. These give the layman an excellent opportunity to talk with experienced radio men. The membership of most of these clubs includes a great many laymen and advanced broadcast listeners.

In conjunction with the convention there will be a radio show at which more than fifty of the world's best manufacturers will exhibit their latest in the way of new apparatus. Many devices will no doubt be on view for the first time. A large lecture room has been set aside and some of the most prominent men in the radio world are scheduled to talk. The speakers will include such men as Major Armstrong, Paul Godley, K. B. Warner, secretary of the American Radio Relay League, and Professor Hazeltine.

The annual banquet will be spread the evening of March 5. Excellent speakers, good entertainment and a fine time is promised all those who attend. The awards for various contests will be presented on this night.

The first New York initiation of the Royal Order of the Wouff-Hong, a secret amateur radio organization, will be held the night following the banquet. In a short time this famous organization has grown to a membership of many thousands who carry out principles that incorporate the most solemn of amateur traditions.

The Executive Council, which is composed of delegates from practically every radio club in New York and New Jersey, has as representatives the most influential and important amateur radio men. Under their jurisdiction and with the full backing of the radio inspector and the Department of Commerce, it has enforced local operating rules and co-operated with the American Radio Relay League in every way.

The council has policed the air to maintain the nightly quiet period between 8 and 10:30 P. M. and it has secured a better cooperation between amateurs and listeners in New York and vicinity.

Tickets for the banquet and full admission to the show, as well as reservations, may be obtained by writing to the offices of the council at 120 Liberty Street, New York.
WASHINGTON, D. C.—The question of whether or not commercial and amateur radio operators should be licensed by the government is very likely to come up in connection with Congressman White's bill to regulate radio communication. Like the former bill, which did not pass last year, the new bill, it is understood, will require that existing regulations for the licensing of all operators be continued and in addition that fees be established, whereas no fees are charged today. Since the question affects over 18,000 amateurs, about 6,000 commercial operators, and a large percentage of the public, an outline of the situation, with some of the pros and cons, follows:

Certain governmental officials, acting for what they believe the best interests of the government and public, seek to abolish the present requirements for both commercial and amateur licenses, which they claim are unnecessary, making unnecessary work for the Department of Commerce and its inspectors. Transmitting station licenses for commercial, ship and shore stations, and amateur stations, they believe, are necessary and adequate, as far as the government need concern itself. The ship operators, commercial station owners, and amateurs possessed of transmitting stations, they claim, would see to it that regulations were observed and proper operation maintained. Locomotive engineers do not have operating licenses, even though handling trains filled with people, they point out, explaining that the railway companies are responsible in case of accidents, and sufficiently interested in efficiency to keep only skilled and experienced men at the throttles. It is also shown that the navy and Signal Corps operators are not subject to regulations and requirements for commercial or amateur operators, the two government departments being responsible. In this connection, it will be recalled that these two services protested violently a year ago when the proposed radio bill threatened to require that their operators be subjected to the regular commercial examinations. They won. Naval and army radio operators are not required to take the Commerce Department's standard examinations, except when they enter commercial service. Many examples are given by those who advocate the abolition of the operators' examinations, of lack of government control where the safety of the public may be at stake, some even citing that the Steamboat Inspection Service is unnecessary.

On the other hand, other governmental officials insist on the necessity of standardized commercial and amateur examinations and licenses in the interest of efficiency, safety of life at sea and the minimization of radio interference. One of their chief defenses is that it is in accordance with the international agreement, especially on ship stations. Article X, of the International Radiotelegraph Convention, London, 1912, they explain, provides:

"That service of the station on shipboard shall be carried on by a telegraph operator holding a certificate issued by the government to which the vessel is subject, or, in case of necessity and for one voyage only, by some adhering government."

The regulations go further, prescribing two classes of certificates and specifying the requirements of operators. Our own national law now requires that each ship carrying fifty or more passengers must be radio-equipped and supplied with two or more skilled operators.

If the question comes up in the forthcoming public hearings, officials of the radio section of the Department of Commerce will probably testify that it would be practically impossible to control radio stations without controlling the operators who transmit. Station licenses do not require any technical ability or knowledge on the part of the owner. Unskilled operators, if used, would increase interference and break rules as to operation before the department inspectors could detect and inspect the station offending. The field force of 53 inspectors and supervisors is busy all day now, it is said.

Aboard ships the risk of permitting unlicensed operators to handle sets and transmit is more than the present officials care to assume responsibility for. There is constant need for ship stations to be in operating condition in the interests of safety at sea. If a ship was burnt up by an incompetent operator or he could not send an SOS properly, resulting in the loss of a ship, it would be too late to close the station, it is pointed out. Who would be responsible? Advocates of eliminating licenses say the owners, just as on railroads.

Shippers and commercial operators do not object to the licensing system used in the past 12 years, and the department records do not show the failure of a single operator licensed in that time. American ships could not clear from foreign ports unless their operators were licensed, it is explained. During the past year, American inspectors cleared 11,305 American and foreign ships from our ports, each of which carried two licensed operators. Defenders of the bill's provisions say that the four radio operating companies serving shipowners, who their opponents say would be responsible, do not control all ships, there being hundreds of independently equipped ships.

On the status of the amateur, the Department of Commerce records show that most of the trouble today is with the unlicensed amateurs, through breaches of the law and radio interference. Licensed amateurs have very well, and most of them are proud of their certificates, it is claimed.

One value in licensing both commercial and amateur operators is the establishment of lists of efficient operators from which the military arms of the government can draw men, as was done during the past war. These lists change, as the licenses are for two years' duration, and only 20 per cent. of the licensed operators renew their licenses. During the past two years, 5,966 commercial operators were licensed. Out of 3,131 applicants in 1923, only 1,877 qualified, showing that 1,254 who thought they were efficient, found they were not. This tends to show the necessity of government licensing. Amateurs to the total of 18,828, were licensed in 1922-23, of which 16,846 were new men.

Instead of eliminating examinations and licenses, the department is understood to favor making qualifications harder in order to establish a high class of operators both for commercial and amateur work.

Congressman White has not yet expressed a willingness to change his bill or eliminate operators' licenses, but it is known that both sides of the question have been called to his attention.
The Last Step of Amplification

Choke Coil System Almost Distortionless with Power Tube

By Brainard Foote

Fig. 1-Sketch of "Flower" spark coil, the secondary winding of which is used as a choke coil in the amplifier of Fig. 2.

"J ust a little more volume" is the oft-expressed wish of the B. C. L. who has a three-tube receiver and a fairly good loud speaker. There are sets, it is true, operating with a third stage of audio-frequency amplification, but as a rule, the less said about such a method of increasing volume the better! This applies to an amplifier using three audio transformers, for the results, while enormous in volume, are usually distorted beyond passable speech or music.

The distortion is due to the fact that no "step-up" transformer amplifies uniformly at all frequencies when a large amount of current is applied to the primary. Then again, the audio transformer doesn't amplify two frequencies satisfactorily at the same time when overloaded as it is on the third stage. A 1 to 1 ratio instrument would do quite well, however, and this is what a choke coil amplifier amounts to.

The choke coil system doesn't "boost" the volume so very much unless the energy is already quite strong, for it is only the tube amplification constant and not that of a transformer, which can increase the output. Hence, the best combination seems to be that of one or two stages of straight transformer-coupler audio-frequency and a final stage of choke coil audio-frequency.

As a matter of fact, the addition of the choke coil amplifier to a two-tube set already using one step of audio will result in plenty of volume for all of the local stations that are received loudly on the detector. Moreover, the quality of such amplification is remarkably good, and a good loud speaker will give nearly the clarity and full-tonal values that one experiences when listening with the head receivers.

However, a well-designed two-stage transformer-coupled audio amplifier compares quite favorably with the choke coil system of the same number of tubes as far as quality goes, but the volume with the choke coil system is considerably less. For ordinary purposes, therefore, it is best to use two steps of straight audio-frequency and to fall back upon the choke coil additional amplifier for the extra volume needed for a dance or for the entertainment of a dozen or more people, where there is a good deal of conversation and other noise to interfere with the volume secured with the two stages alone.

A further modification of this audio and choke coil combination scheme is in use by the writer and is illustrated herewith. This consists of a two-stage audio amplifier with transformers for inter-stage coupling, and an extra tube with the choke coil connections. This latter is used with a short length of phone cord and an extra phone plug, so that the choke coil stage may be "tacked on" either to the second transformer-coupled stage or to the first. This plan provides plenty of volume and unusual clearness for local reception, using one stage of regular amplification and the choke coil tube. But for weak signals, as received from DX stations, the choke coil amplifier may be added to the second stage, so that there are then three tubes amplifying at audio-frequency. This is successful in putting stations like WDAP or WLAG on the loud speaker even though they don't happen to be pounding through in the manner in which they are occasionally received.

To add the choke coil amplifier to a receiving outfit, the following parts are needed: Two Ford spark coils (obtainable from Ford service station), one .006 mfd. fixed condenser, one .0005 mfd. fixed condenser, one .02 megohm grid leak resistance and mounting, one standard tube socket, one power tube (UV201A nearly as good), one .04 mfd. fixed condenser, one .03 mfd. fixed condenser (radio transmitting equipment house), eight binding posts, one rheostat.

See Fig. 1 for the proper terminals of the Ford coils to use. These are the secondary terminals, and the primary coils are not used at all. Indeed, if the garage or service station happens to have some old coils whose secondaries are intact but whose vibrators are ruined, these will do just as well and can be bought very cheaply. Fig. 2 gives the wiring diagram. The input posts are connected to a phone cord and plug so that they may be plugged into the amplifier jacks, or they may be joined directly to the inside springs of a double circuit jack in the plate circuit of the second stage tube.

It is important that input terminal No. 1 go to the plate side of the jack. Otherwise the amplifier will not work, and the leads from the phone plug should be reversed. No harm will result from a wrong connection, however. The .006 mfd. condenser acts as a by-pass and reduces tube noises and cuts down the volume of code interference to quite an extent. Otherwise it has no value and has no effect upon speech or music. Note that the grid leak is placed to the filament circuit and not across the grid condenser. The capacity of the latter is not critical and a value between .00025 and .0001 works satisfactorily.

Coming to the tube, a few words on its selection may be helpful. The VT2 or UV202 gives the very best of quality, but the UV201A is far more economical
and amplifies almost as faithfully. The large size telephone condensers are of the type ordinarily used in amateur transmitting apparatus and may be purchased from a supply store carrying this sort of apparatus. The ½ mfd. condenser is merely a by-pass condenser placed across the "B" battery. This is very helpful in the case of batteries having a fairly high internal resistance—as old cells—and reduces inter-stage coupling of the resistance variety within the battery. This form of coupling often causes howling when old or undersized "B" batteries are attached to a two- or three-step audio amplifier.

Note the method of connecting the loud speaker. It is not directly in the plate circuit of the amplifier as is usually done, but is connected through the ½ mfd. condenser across the second choke coil. Thus the speaker is shunted across the choke coil and operates by reason of the voltage and current fluctuations going on in the choke coil. The latter conveys the plate current from the "B" battery to the plate of the tube, and thus the "B" battery "juice" doesn't pass through the windings of the speaker. This is desirable for several reasons, chief among them being the reduction in "B" battery frying and hissing sounds and reduction in various crackling and scratchings which are often heard. Quieter operation is the result, and little is heard when voice or music has ceased except the slight commutator hum which always signifies the fact that a broadcasting station is tuned in.

The return lead (No. 2 output) of the loud speaker is connected to the negative "A" battery—or it may go to the positive with the same results. The experimentally inclined may try one or two other locations for the speaker, leaving one of its leads connected to the No. 1 binding post on the output side, where the condenser intervenes between the speaker and the choke coil. The other lead may be connected to the lower end of the choke, and quite frequently it happens that even clearer amplification is obtained when it is connected to the No. 1 input connection. This is the same as bridging the loud speaker from the plate of the last tube to the plate of the tube just previous and there is plenty of voltage variation going on between these two points to actuate the speaker. As a rule the circuit shown is O. K. in all respects.

Passing to Fig. 3, the reader is given a circuit which the writer strongly recommends as being both very flexible and efficient. This has been mentioned already, and depicts the wiring of the ordinary audio-frequency amplifier with the choke coil added. In both of the circuit diagrams, it is assumed that the same filament battery is used for both transformer-coupled stages and the choke coil stage. Otherwise there wouldn't be a "grid return" for Fig. 2. This takes place through the "B" battery, where the "A" battery is commoned. The same "B" batteries are also used, and 90 volts are sufficient for ordinary purposes. Sometimes volume is improved a bit by raising the "B" battery to 120 volts, but the increase in strength of speech and music isn't very great, and the addition of voltage usually means the insertion of "C" batteries and further complications.

The circuit arrangement of Fig. 3 is such that the loud speaker may be employed in the familiar manner—directly in the plate circuits of either of the two transformer-coupled steps of amplification, or it may be used with the choke coil amplifier. In the last-named instance, the extra phone plug shown is inserted in the first jack for local work and into the second for weak signals. It is, therefore, possible to use one stage of transformer coupled audio and one of choke coil coupling, or to employ both of transformer coupling. This will be useful in comparing the nature of the amplification in the two cases where the same number (3) of tubes are in service, including the detector tube.

Observation will point out that a reversed connection of the extra phone plug will connect the grid condenser end of the choke coil to the plus "B" battery, and naturally, there will be no amplification, because there will then be no voltage fluctuations between the upper end of the choke coil and the filament. The choke coil amplifier plug might also be inserted into the detector jack, but it seldom happens that broadcasting is coupled with sufficient strength to amplify very much in that way. The choke coil method requires a fairly "husky" input—but when this is obtained by regular audio amplification—it certainly does function.

Now Comes the "SOS" on Land

Most amateurs and some fans are acquainted with the ominous SOS of the sea, and its significance—a vessel in distress, calling for aid. These letters, or another national call, may come to be a distress call on land if airships get carried away, railway trains get stalled and other means of communication are put out of service by storms.

When the "Shenandoah" was torn from her moorings the navy cleared the air in an effort to locate and aid the ship. Recently, when some western trains were stalled in a heavy snow storm which carried down practically all the available wire circuits, a literal land SOS was sent out from the local train dispatcher.

Four broadcasting stations, and perhaps more, are known to have aided stalled railway trains that night. Listeners-in in Washington heard WPAH, at Wauca, Wis., transmitting a message from the Chicago & Northwestern train dispatcher to the superintendent of the division in Chicago. The message told of the stalling of a train by snow near Green Bay, Wis., and WPAH tried to get the message to KYW in Chicago. This station was in the midst of a program and didn't come in. WOAW in Omaha, however, heard WPAH, and advised that it was standing by for a message to be relayed to KYW. Eventually the message got through, and snow plows and aid were sent the stalled train. Later in the evening, WLAG at Minneapolis also broadcast relative to a Burlington train in difficulties.

Such experiences as these point to the use of an emergency radio service on land, not unlike the SOS of the sea, which can come to the aid of the public when disaster befalls carriers or ways by wire.
New York’s Acting Mayor Listens In

(C. Kadel and Herbert)
Acting Mayor Murray Hulbert of New York City, listening in on a radio set, during a few spare moments that he had at a recent social function. How many of you know that the Acting Mayor was a radio enthusiast?

One Experimental Broadcaster in France

FRANCE has no regularly licensed radio transmission stations assigned to broadcasting, according to advice from the Under Secretary of State on Posts and Telegraphs. Until the matter has been definitely settled by the government, there will be no special broadcasters. There is, however, one private station authorized to try out radio dissemination, with the aid of three government stations, under provisional authority.

The three French government stations co-operating are: the Military Station in the Eiffel Tower, “FL,” operating on a wave length of 2,600 meters and five KW power; the Superior School P. T. T. at Paris, “ESP,” with a wave length 450 meters and 450 watts; and the Lyons station “YN,” wave length 740 meters and 250 watts. The private experimental station is that of the French Radiotelephony Co., in Paris “SAJ,” wave length 1,789 meters and 6 KW power.

Agriculture via Radio

THE Department of Agriculture’s radio broadcasting service this year will reach a still greater proportion of the rural listeners through the co-operation of about 100 broadcasting stations. These newcomers are in addition to about 75 already distributing matter daily on crops, produce and live stock. The plan of expansion provides a distribution of the information from Washington by mail in the form of weekly reviews on the several commodities. In the past, many stations could not co-operate on a daily telegraph schedule, but now they hope to broadcast every day a short weekly review of each specific form of agricultural data received.

Government Wants Radio Engineers

THE U. S. Civil Service Commission has broadcast a call for radio engineers in the Army Signal Corps service. The govern-

A “Safety Pin” Radio Set

(C. Kadel and Herbert)
Miss Helen Frey, 270 Connecticut avenue, Washington, D. C., and the "safety pin" radio set she constructed at a total cost of eighteen cents—and the darn thing worked! The set is made on a stiff piece of cardboard, and the coil is 80 turns of fine wire on a piece of paper, with a ten-cent-store crystal detector. Heaven help economizers on a set like this!

An Early Fixed Detector

BACK in 1906, when there were no such things as tube receiving sets and no fixed crystal detectors, a naval officer, now in charge of radio development and research work of the Bureau of Engineering of the Navy, tells of an early make-shift detector.

On board the U. S. S. “Georgia,” during some gun fire tests, the operators experienced great difficulty in copying code, even from the ship in the immediate vicinity. Every time the ship fired a salvo, the crystal detectors jumped off and had to be readjusted. Consequently parts of the messages were never received. Another war-time difficulty was the old top-side radio shack exposed to enemy fire. This the radio officer moved below on the gun-deck as an experiment, the lead-in wires being run below through a conduit from the aerial between the masts. Even though less exposed to the roar of the guns reception was difficult, and the cat whisker continued to be shaken off the crystal.

Something had to be done. The radio officer secured a lump of hard coal and a heavy needle from the ship’s tailor. Driving the needle into the lump of coal, he provided a fixed crystal detector—perhaps the first known detector of this type. It functioned poorly, although it stayed fixed. By putting on the “Georgia’s” very best operator, messages from the flagship, which was 400 yards away and sending at full power, came in faintly, were copied, and no more reports were missed.

Caught With His Mouth Open

(C. Miller-Fotograms)
Secretary of Labor James J. Davis delivering his famous speech against radicals before the microphone of WCAP, Washington, D. C. Secretary Davis is one of the foremost antagonists of the radicals and his speech through the air was so forceful that it made lots of people think on the several new ideas he advanced.
The Vacuum—There's Something in It

By Dr. W. R. Whitney

Director, Research Laboratory, General Electric Co.

I WANT to show that in a vacuum, of which one might say “there is nothing in it” (and surely less than in anything else), there is, indeed, an endless amount of interest and utility. The American public now buys over a million dollars worth of glass vacua a week, but that is far from being the most interesting part of the subject.

Everybody pretends to know that “Nature abhors a vacuum.” But the man who started that tale merely meant that a good vacuum was hard to produce. As probably no one has ever made a vacuum with less molecules of gas in a cubic inch of it than there are people in the world, we can maintain that perfection in vacuo is still precluded by Nature.** * *

While the vacuum is not essential to the work of Millikan in isolation of the electron, yet the earlier work by Thomson and others, and much of the recent work on this ultimate constituent of matter, has been necessarily carried out in vacuo. Today there seems to be no end to the studies which can be based on the fact that any atom or molecule of material may be separated electrically into a positively charged ion (carrying most of the mass) and a negatively charged electron (carrying most of the current).

These two interesting entities may be followed through their activities, and it is by these activities that we are now enabled to rectify alternating current and also produce alternating current from direct. By means of vacuum tubes we may now also produce from current of one alternating frequency, current of all other desired frequencies, and this has opened up a new broad field of high frequency power studies. ** **

Electrons, as negative charges, distil from a heated filament and pass under voltage-drop across a vacuum to an electrode, now commonly called the “plate” in wireless tubes. This pure emission current is the basis for the so-called rectifiers because only when the filament is negative does any current flow across the gap. When gases are present greater currents may be carried because of the ionization of the gases, and so the tungsten rectifiers, containing a little argon, and the older mercury vapor rectifiers, involve the same principle. Without some gas present the negative electrons by their very concentration constitute a space charge which limits the current. This space charge is removed by the ions produced within the gas introduced.

When we interpose a grid or inter-connected wires between the hot filament and the plate of the above two-electrode tube, we have what we now so commonly use in wireless for receiving, for amplifying, and for production of high frequency currents. The discovery of the controlling or triggering action of the intermediate electrode was made by De Forest. A negative charge applied to this third electrode or grid may easily stop all current from the hot filament to the plate. As it takes practically no energy to charge this grid, only a token of energy (voltage), the slight power attained from a wireless antenna in its fluctuation may be used to control or to trigger, or to let through corresponding jolts of much greater energy, which are in turn supplied by a local battery or power circuit. ** * *

A loud speaker devised by Dr. Hewlett consists of a 26" flat conducting disc in a magnetic field. The vibrations of the disc corresponding to the voice currents produce the sound waves without the intervention of a horn. The use of vacuum tubes in this device consisted in the following:

A microphone was placed near the speaker and the sound waves of his voice caused to be generated in this microphone feeble electromotive forces which were applied to the grid of a pilotron. These feeble electromotive forces caused relatively large variations in the electric current flowing between filament and plate, which in turn were used to secure larger electromotive forces to be applied to the grid of another pilotron. By the use of several amplifying pilotrons the original feeble electrical currents were multiplied several thousand times and supplied to the loud speaker which reproduced the original sounds with many times the original volume and great faithfulness of quality. To operate this amplifier of pilotrons required a direct current of several hundred volts. This was obtained by first transforming the power from the ordinary alternating current lighting circuit to a relatively high voltage, next rectifying this high voltage alternating current by means of rectifiers, and finally smoothing out this pulsating current by means of appropriate electric circuits.

The high degree of faithfulness of reproduction realized in this loud speaker is due partly to the absence of a horn, eliminating horn resonance (one of the usual sources of distortion in a speech reproducer), and partly to the method of vibrating the diaphragm by forces which are distributed fairly uniformly over its surface, instead of being acted upon in a very limited region, as is the case in most other loud speakers. This feature eliminates rattling and ringing of the diaphragm or the production of high overtones by the diaphragm.

Broadcast Changes

LIST of limited commercial or broadcasting stations licensed during the week ending February 15th:

<table>
<thead>
<tr>
<th>Call</th>
<th>Class A Stations</th>
<th>Frequency Lgths.</th>
<th>Power Keys</th>
<th>Power Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>KFNC</td>
<td>Alonzo Monk, Jr., Corsicana, Texas .........</td>
<td>1280 234</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>KFNF</td>
<td>Henry Field Seed Co., Shenandoah, Iowa ....</td>
<td>1130 266</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>WBBV</td>
<td>Johnstown Radio Co., Johnstown, Pa. ......</td>
<td>1210 238</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>KFNY</td>
<td>Montana Phonograph Co., Helena, Mont ......</td>
<td>1150 261</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>KFNX</td>
<td>Peabody Radio Service, Peabody, Kansas ..</td>
<td>1250 240</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Transferred from Class C to Class A

<table>
<thead>
<tr>
<th>Call</th>
<th>Wave Frequency Lgths.</th>
<th>Power Keys</th>
<th>Power Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEB</td>
<td>The B en w ood Co., St. Louis, Mo., &quot;A&quot; ......</td>
<td>1100 273</td>
<td>250</td>
</tr>
</tbody>
</table>

Transferred from Class A to Class B

<table>
<thead>
<tr>
<th>Call</th>
<th>Wave Frequency Lgths.</th>
<th>Power Keys</th>
<th>Power Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHAA</td>
<td>State University of Iowa, Iowa City, Iowa, &quot;B&quot; ......</td>
<td>620 484</td>
<td>500</td>
</tr>
</tbody>
</table>
A Non-Reradiating Regenerative Circuit

By C. White, Consulting Engineer

The popularity of the regenerative receiver has been solely based upon two facts—first, its ability to give good volume with a minimum number of tubes, and its simplicity and economy. If it had not been for these two facts, the regenerative receiver would never have obtained such a strong hold on the radio market. It is a good, efficient receiver when operated properly, but very few users of regenerative receivers ever operate them with any regard for the other fellow.

Owing to the fact that a single circuit regenerative receiver, especially, is a good transmitter when it is in oscillation makes it an especially undesirable type of receiver in crowded city districts. It has been proven that even the ordinary single-circuit regenerative set when in oscillation is capable of sending a disturbance three or more blocks. Any radio fan who operates such a type of receiver can just as easily tune in without causing this type of interference, if he will only take care in turning his dials. A great many times radio fans are too eager to pick up a station to take care to prevent their tube from oscillating. The receiver outlined in this article is a simple regenerative receiver with a filtering tube in front. This filtering tube prevents serious radiation of energy from the receiving antenna no matter how the receiver is operated. It not only affords a rapid and simple method of tuning a very efficient circuit but also takes the circuit out of the pest class.

The simplicity of this circuit is one of the key-notes of its success. There are very few paths for energy to get lost, and it is equally as simple to wire as the average regenerative receiver. In tuning it affords a quality which is not present in the single circuit receiver alone, and sounds in operation much like a neutrodyne. When a station is passed on the dials there is that sandy sound in the phones much similar to the sound encountered while tuning a neutrodyne. This smooth action makes it possible to secure better results in quality and volume on distant stations. The anti-radiation feature is incorporated by the use of tube No. 1. This tube is the standard type of UV199 or C299, and uses a small Eveready "3" battery for filament supply. It will be noticed that no B battery is used but the plate return is connected to the slider on the potentiometer P-1. This potentiometer affords a method of balancing the grid bias voltage impressed on the grid of tube No. 1 and the voltage impressed on the plate. Sometimes, however, much better results are secured when the connections XX are opened and another No. 3 cell battery is inserted in the plate circuit. This battery should be of the same type as the A battery and should have its positive terminal connected toward the plate side of the circuit. In order to prevent strong A. C. hums the grid condenser C-1 and the grid leak R are inserted between antenna and ground. This path also effectively shuts out much extraneous noise.

The apparatus required in this circuit as symbolized on the diagram is as follows: The condenser C-1 is a .0001 mfd. fixed mica condenser, while the resistor R is 3/4 megohm leak. The condenser C-2 is an 11 or 23-plate air variable, while C-3 is a .00025 mfd. fixed condenser. The potentiometers P-1 and P-2 should have a resistance of 400 ohms apiece. The unit E-F is a 180° variocoupler, using the rotor as coil F. Any type of vacuum tube may be used as a detector. The UV199 can be employed, if so desired, and perfectly good results can be secured provided a good grid leak G and a rheostat of at least 30 ohms be used. Do not attempt to use the same A battery for tube No. 1 and tube No. 2, for by so doing, the efficiency of the circuit will be greatly impaired. Shielding with copper foil will only be necessary in the immediate vicinity of C-2. The movable plates of C-2 should connect to the ground side of the circuit. Sometimes far better results are secured when the tickler coil connections are reversed at the points marked YY.

Old users of the tickler coil type single-circuit receivers will readily recognize that this receiver is a modification using a muffer tube and a parallel connection of the tuning condenser C-2. Any type of aerial can be used, but an outdoor aerial of 100' length will give very satisfactory results. Sometimes, however, it is possible to use a coil type of indoor aerial on strong local signals. In tuning the receiver is no more involved than its prototype. The tickler coil F still operates a definite control over volume, while the potentiometer P-1 in conjunction with P-2 affords a very effective way of clearing up static and other outside noises. In general, it will only be necessary to burn tube No. 1 very low. Any of the standard types of amplifiers can be used with the same common A and B batteries as for tube No. 2. The great benefit of this receiver is its smooth operation, pure tone qualities, and absolute assurance of not interfering with your neighbor's reception.

New Iowa Station Divides Time with WOC

The new 500-watt broadcasting station at the University of Iowa, Iowa City, Iowa, will operate on 484 meters, dividing operating time with The Palmer School of Chiropractic, WOC, at Davenport, Iowa. The Iowa City station has been assigned call letters WHAA and will be heard on Sunday afternoon and Tuesday, Thursday, Saturday and Sunday evenings.

---

RADIO WORLD 11
Radio Music Fund Committee Appeals to Listeners-In for Contributions

By Laurence Blackhurst

The first serious attempt to have listeners-in pay for broadcast programs was inaugurated last week when an appeal was made through the daily newspapers in New York by the Radio Music Fund Committee. This committee, according to a statement supplied to the press, consists of Clarence H. Mackay, Felix M. Warburg, Frederic A. Juillard and A. D. Wilk, Jr., all well known for their support of musical activities.

They have selected Station WEAF to broadcast the proposed concerts by grand opera and other musical stars. The actual expense of broadcasting will be borne by the American Telephone & Telegraph Company, owners of WEAF. The committee invites from the radio public contributions to the Radio Music Fund of one dollar upwards to be sent to the Central Union Trust Company of New York, subject to the order of the committee. If the contributions received are not sufficient, in the opinion of the committee, to warrant going ahead with the plan, all contributions will be returned by the trust company. If, after starting the broadcasting program, the committee deems it advisable to discontinue the concerts, whatever balance remains of the fund may be returned to the contributors "or disposed of for musical or educational purposes as may be determined by the committee." The members of the committee, as now or hereafter constituted, do not assume personal responsibility nor guaranteed personally any radio music concerts under the present plans or as they may be later modified.

The statement concludes: "The success of the plan depends entirely upon the cooperation of the radio audience in making possible to themselves the best radio programs obtainable. Although any radio listener may avail himself of these programs, unless the response is instantaneous and wide-spread, it will be impossible to present the great artists now contemplated. The public benefits; it should respond promptly."

Officials of Station WEAF were quoted in the daily press as saying that from $100,000 to $200,000 would be required to insure twice-a-week concerts for a season of grand opera stars. They expect listeners-in to contribute enough to pay for a few fine programs and then decide whether to give enough more to provide a program for next season. There is no intention of broadcasting grand opera, only concert programs by grand opera stars and well-known concert singers.

A writer in "The New York Times" expresses these views:

"It is not easy to see how collections are to be made from the listeners or fees exacted. They go to no ticket office, pass through no turnstile, and disclose the possession of a receiving set to no authority. That they should pay something for what they want and get seems only right; but unless all pay, any payment is unfair or at best a sort of charity, and the number who will pay for what they can so easily get for nothing, once it is put 'on the air,' cannot, without exaggeration, be called great."

An editorial in "The Sun and The Globe" offers this opinion:

"Radio is too strong to be incapable of a demonstration such as the committee call for. Yet it is quite plain that the voluntary basis of support cannot be a permanent basis. There must be some method of making delivery contingent upon payment. At present this is physically impossible—the noises of the air are to be had for the gathering. Yet with the problem of making them exclusive and vendable clearly needing solution, the scientists and inventors will probably find a way to make a song flung upon the air as safe from the unpaying listener as an aria at the Metropolitan is from the passer-by outside on Broadway."
How to Build a Reflex Distance Getter

By G. R. Entwistle
Radio Editor, "Boston Traveler"

Did you ever wish for a radio set that would consistently bring in the distant stations loud and clear so the entire family could benefit, yet one which was inexpensive and extremely simple of operation? This article tells how to do it.

In the particular reflex circuit described below, developed by the Acme Apparatus Company, only two controls are necessary; one for selecting the different broadcasting stations at will, called the tuning control, the other for controlling the intensity of signals. Yet, with such a simple receiver, incorporating six stages of amplification, three of audio and three of radio, using only four tubes, the writer has consistently brought in most all of the popular stations east of the Mississippi and many others farther west on a loop and with sufficient volume to operate a loud speaker; in fact, telephones have not been used as yet with the receiver.

Just what is meant by a reflex amplifier? The reflex is a combination of radio and audio-frequency amplification, which uses the same tube for both kinds of amplification. The radio-frequency amplification makes the receiver more sensitive; that is, it brings in the distant stations. It is the radio telescope that reduces distance.

The audio amplification builds up the sounds so as to enable them to be reproduced by a loud speaker. It is the radio magnifying glass that gives the voice waves their volume. By reflexing, the passing back of the amplified radio waves through the same tube for further amplification at audio frequency, we obtain a very desirable economy of vacuum tubes.

The reflex circuit is one of the highest developments of radio today. In addition to using the same tubes for both kinds of amplification, it gives a greater number of stages of amplification than the number of vacuum tubes employed. A four-tube reflex permits at least six stages of amplification, three of each kind.

The circuit described is the result of two years of persistent research and can be depended upon fully to give results if instructions are carefully followed. This circuit has been thoroughly tested and will work. The only tools required for its construction are a screwdriver and possibly a soldering iron.

The following apparatus is required: Three audio frequency transformers; three radio-frequency transformers (type R2, R3, R4); one Pot-Rheo; one loud speaker; four good sockets; one crystal detector; four fixed mica condensers of the following capacity: .0025, .001, .002, .005; 10' No. 14 solid bus wire; eight binding posts; one baseboard 21"x10½"x3½"; three radiion terminal blocks; one loop; one low-loss vernier condenser (.0005 maximum capacity. Must be a low-loss condenser); four vacuum tubes (UV201A); six-volt storage battery; 6½-volt B battery (3-22½-volt units); 200-ohm potentiometer and a six-ohm rheostat can be used in place of the Pot-Rheo.

The breadboard type of reflex, mounted in plain view on top of the board, where its parts are readily accessible and plainly visible at all times, is a good starting point, and will be described in detail. First, secure a board 21"x10½"x3½" and mount the various instruments as shown in the diagram.

As a starting point secure the first audio transformer 4" over from the left hand edge of the board and 2½" down from the rear edge. This will locate screw X. After securing the first audio transformer in place, the other two can be suitably mounted 1½" away from each other.

Next the radio-frequency transformers can be mounted end-to-end as shown, placing them 1½" from the audio terminals as is shown. It is important to arrange the different kinds of transformers so that the leads, CC, in common between the second and third audio and radio transformers, are in a direct line as shown. This will give a neater appearance in the wiring. The position of the remainder of the equipment is not important, except that you arrange it as

---

*Image of the circuit diagram is also included.*
near as possible to the layout shown in Fig. 1. However, it might be well to turn the crystal detector around so that its adjustment will be made from the front instead of from the side. Follow the wiring diagram exactly.

No matter how much pains are taken with the wiring of the circuit itself, if the pickup circuit, consisting of a variable air condenser and loop, is not carefully selected, only mediocre results will be obtained. To this end a low-loss condenser must be used so as not to waste the feeble energy intercepted by the loop.

A good loop can be made as follows: Wind six turns of any available wire spaced 3/4" apart on a support 3½ x 4", which can be easily rotated. Another smaller loop can be made by winding 16 turns of wire spaced 3/4" apart on a suitable support 20" on a side. The wires should be held by insulating supports. The frame can be of wood. The output of the reflex amplifier is connected to the loud speaker.

The following precautions will be found helpful:

Never attempt to wire up a reflex set using flexible leads connecting together the heterogeneous arrangement of parts.

Radio-frequency transformers should be mounted end to end to prevent interaction.

Use a No. 14 wire run directly to a waterpipe for a ground.

Low-loss condensers must be used and should preferably be fitted with a reduction gear or vernier plate for fine adjustment, particularly in the secondary circuit if the antenna is used.

A potentiometer is required for controlling the operation of the first radio-frequency tube.

Use a quick contact crystal detector.

Use good sockets, as inferior products provide leaks which absorb practically all of the slight amount of energy received by the antenna or loop. Be sure that the grid wire of the first tube is connected to the stationary plates of the variable condenser.

Be sure to follow the diagrams exactly.

Considerable time has been spent to get the circuit right. Do not take liberties with it.

Although the breadboard type of receiver is suggested as a starter, it is possible to build up the amplifier with a possible view of enclosing it in a cabinet at a later date. The panel arrangement of such a reflex amplifier would be extremely simple.

There would be one large control dial for different values of loop condenser for tuning in the different broadcasting wave lengths.

A snap switch could serve to make or break the filament battery current while the concentric knobs of the potentiometer and rheostat could be mounted on one side of the condenser control, while the catwhisker knob for adjusting the sensitivity of the crystal detector could be placed on the other side. A loop could be mounted at one side on top of the cabinet, while the horn of the loud speaker could extend through the top on the other side.

The Los Angeles Radio Exposition

By Charles F. Filstead, 6CU

The Second Annual Radio and Electrical Exposition, held at the Biltmore Hotel in Los Angeles, California, came to a close in a blaze of glory. This great radio exposition has splendidly shown the wonderful strides that radio has taken in the past year. In this single year radio has advanced from an infant industry to one of the big enterprises of the country. In any other trade a span of several years would not reveal such wonderful expansion and advancement as radio has shown in this one year.

The beautiful draperies and the wonderful decorations of the grand ballroom and foyer of the Biltmore Hotel, lent an artistic and appropriate background to the elaborate displays of manufacturers and dealers. Receiving equipment from every part of the United States was on exhibition in such profusion that the prospective customer who knew nothing of radio was completely confused. Neutrodynes predominated; there was hardly a booth that did not have on exhibition some form of neutrodyne. All types of receiving sets from the lowly crystal to the lordly super-heterodyne were represented. Whether the spectator was an amateur or professional, he could learn much of interest and value to himself.

The movie world of Hollywood was well represented at the show; every night this or that film luminary was on hand to shower his— or her—benign influence upon the exposition. Control wires were run from the two local broadcasting stations, KHJ and KFI, to the balcony of the grand ballroom, and between nine and ten each evening, film folks and talented musicians broadcast from the exposition. On one side of the ballroom was KHJ, and on the other side was KFI, and in between were gathered the common people “to listen and to see.” This is probably the first time the general public has had an opportunity to see artists actually broadcasting by radio. That the words of the broadcasters might be made audible to the people gathered below, Western Electric public address systems were connected to the microphones of the two stations, and through them the mighty voices of KHJ and KFI roared forth.

Even the transmitting amateurs were well represented, for the Southern California Radio Association, an organization of Los Angeles amateurs, had an interesting booth from which they solicited new members.

Night after night the exposition was packed to the doors with an eager throng of radio enthusiasts determined not to miss a single feature. It was a matter of standing in line and moving forward a foot at a time through the crowded, but so interested were the spectators in the exhibitions that no inconvenience, no matter how great, could daunt them. It was a record crowd for an exhibition of this kind, and far exceeded the expectations of the men who made the exposition possible.

Such an unusually large and prosperous crowd does not make the prediction that $300,000,000 will be spent on radio in 1924 seem so impossible as it would appear at first glance. There is an excellent chance that this figure will be greatly exceeded, impossible though it may sound. This great radio exposition is but a shadow of those that will come in the future. Its invigorating influence will be felt by the radio trade for many months to come.

The Chamber of Commerce, the dealers and the manufacturers of Los Angeles are to be complimented on the splendid spirit of co-operation they showed in the presentation of this exposition. But all their efforts would have been in vain if it had not been for the enthusiastic response and hearty interest that the citizens of Radioland evidenced in the exposition. Let us hope that this exposition will foster even closer cooperation between the radio buyer and the dealer in the future.

www.americanradiohistory.com
A One-Tube Crystal Reflex Without Transformers

**By Louis Porter**

NOW that the fans have seen or heard about nearly every circuit embodying the reflex principle, the common notion is that they are both expensive and not developed far enough. They do not as a rule allow of portable or cheap construction, as heavy and expensive transformers are used as a general rule.

However, there are reflex sets that use tuned impedance radio-frequency, and the writer has had experience with them. It is because of this that the reflex circuit shown here was developed. It uses no transformers at all. Two 50 turn spiderweb coils, in a common mount, coupled closely together, and a condenser give all the amplification that can be used on an outside antenna, and the variometer and condensers give enough variation of the received energy across the grid of the tube to be really sharp tuned. The Porter fixed crystal detector gives wonderfully clear and perfect reproduction that is so necessary to good speaker work.

This circuit is not put forward with the idea that it is just a "freak" that once worked. It has been demonstrated, many sets have been made and they work to perfection. There is a clearness and freedom from distortion that make people wonder just what happened, and as fixed condensers are used in series with a variometer there is a freedom from interference that is also startling. Yet the tuning is easy enough for even the most mediocre of beginners.

In order to build this receiver, certain things must be purchased, which are herewith listed: one variometer, one Porter fixed crystal detector, five fixed condensers of the following capacitances: two .001, one .0001, one .00025, one .0005; one .0005 variable condenser, two 50 turn honeycomb coils, one tube and socket (UV201A), necessary A and B batteries and phones, three switch points and one handle.

Wire the condensers up as follows: With a small piece of perforated copper strip, fasten the three condensers together as shown in the drawing. Bring a lead from the other side of each of them down to the switch points. From the switch handle, bring another lead to the grid of the tube, and one side of the variometer. From the other side of the variometer bring a lead to the ground, and one side of the .001 reflex condenser. From the plate, bring a lead to the stator of the variable condenser and also to one side of the 50 turn honeycomb coil. From the rotor side bring the lead to the other side of the coil, and also to one side of the second .001 condenser. From the other side the lead goes to the minus post of the tube socket and the minus of the B, which can be made one lead. The plus side of the B goes to the phones, and from the phones to the rotor side of the variable condenser and coil.

From the outside lead of the second coil, bring a lead to the Porter fixed crystal detector, and from there to the ground side of the reflex condenser. From the other side of the condenser bring a lead to the inside connection of the second coil. Also bring a lead from the same side of the condenser to the plus lead of the filament circuit.

The set is now all wired up and ready to work. Place the tap switch on the central point and vary the variometer at the same time turning the variable con-
denser. If the signals heard are weak when the rotor of the variometer is near either 0 or 100, change the capacity of the antenna circuit by switching in either the larger or smaller condenser. Then return, until the signals are both loud and clear.

In hooking up the set, the flat perforated copper strip makes the wiring easy, as no soldering is necessary. Only a screwdriver, a good pair of pliers, and an assortment of nuts and machine screws are needed. Short connections, which would otherwise be impossible, can thus be made, and the resistance kept down to a minimum, as the strip affords a much greater surface than the wire or bus bar commonly used.

The writer has experimented with many circuits and has developed quite a few. One that is of interest is a circuit using the 110-volt A C line for both B battery current and antenna and ground. It is a two-tube circuit and is so loud that it is really painful to the ears of anyone within 50' of it. However, as it has to be developed considerably before it is ready for work in the hands of an amateur, it will not be disclosed until the time when the writer feels anyone can tackle it with certainty as to results. It might be of interest to state that the circuit has been demonstrated before the radio editor of "The Detroit News," who proclaimed it a wonder.

**WHAT RADIO WORLD CLASSIFIED ADS DO FOR ADVERTISERS**

John T. Pierce, 4171 Woodland Ave., Los Angeles, Calif., writes to RADIO WORLD as follows: "I have obtained such good results from your Classified Ads, that I wish to become a regular advertiser in your columns."

"If Mr. Pierce can do this so can other advertisers who use our Classified Department."

RADIO WORLD'S Quick Action Classified Department, at 5c per word, ten words minimum, has been a gold mine for many advertisers.

"Why not for you?"

RADIO WORLD, 1493 Broadway, New York City.
Big Business and Broadcasting

ALFRED C. BEDFORD, chairman of the board of the Standard Oil Company of New Jersey, made a most interesting address the other evening before the American Institute of Banking at its annual dinner in New York City. In the course of his remarks he advocated the use of radio as a means of requiring the leaders of big business to account for their actions directly to the public and enabling them to lay their cases before the people when they seek vindication. Mr. Bedford evidently has taken the trouble to inform himself on the possibilities of broadcasting and has been greatly impressed in doing so. He is quoted as saying to his audience of bankers:

"As a result of the development of broadcasting, no man to whom large responsibilities are entrusted can longer hide in the background of impersonality. Radio is bridging the gap which has separated the administrators of modern business from their public. It has established personal contact and laid the foundations of sympathetic understanding. Now one may talk to a nation, and all may listen in, and, by becoming familiar with the tone, the inflection, and the timbre of the voice, get to know the man."

"Complete" Radio Sets

EFFORTS are being made to standardize radio apparatus and the nomenclature which describes sets and parts. Is it not time all manufacturers and dealers standardize descriptions of sets? When is a set complete? How much more must one expend for tubes, batteries, aerials and for phones?

Just after Christmas, a woman called the Chesapeake & Potomac Telephone Company and asked for aid, explaining that she knew WCAP was broadcasting, but she could not get it on her new set.

The operator inquired if the tubes lit up, whereupon she asked what they were; and being told, said there didn't seem to be any in the set. Further inquiry showed that she had neither tubes, batteries, aerials nor phones, but that the donor of the gift supposed he had presented her a radio receiver ready for operation.

Other examples, such as this, convince of the need of better salesmanship and also of better advertising, for some advertisements are found to be misleading, although probably not intended to be deceptive. The dealer who sells the set and loses the sale of accessories and the purchaser was embarrassed and disappointed when he learned that vital parts were missing from the "set." The word "set" implies that it is a complete entity. An automobile salesman would not sell nor advertise a car without a battery, headlights and tires. If the set is not complete and ready to operate, why not say "without tubes, batteries or phones" as a few manufacturers do? Complete sets could also be advertised and then the purchaser would know just how much he would have to spend.

The Radio Subconscious

SEVERAL of our old friends defend the belief that experienced operators can copy or memorize more than one English message at a time, citing one expert in San Francisco credited with having taken three dispatches at once—proving to be correct. A written-out. There is a former Naval operator, now in a high governmental radio position, who claims that while copying one message, he has often been able to note mentally other messages, interfering with the reception of the first, and later write them out. Whenever he was copying some dull and uninteresting report, he says, he always was able to note with accuracy messages pertaining to shore leave, pay or other features in which he was especially interested.

Another government official says he once got the same message from two shore stations, transmitting simultaneously, while he was aboard ship off California. An important message for his ship was routed via San Francisco and also via Los Angeles. Both KPH and KPJ called him at the same time, and when he told San Francisco to go ahead, both began to send simultaneously. He tried to take them both, which proved very easy when he discovered they were identical. His O. K., intended for KPH was considered by both stations as acknowledgment. The only trouble arose later, when both shore stations billed his ship for the message, each claiming credit for transmission.
The Radio University
A Question and Answer Department conducted by the Technical Staff of RADIO WORLD for the information and instruction of its subscribers. A "trouble shooter" is always ready here to help new radio fans.

I am the owner of a three-tube "Erda" reflex, using the parts recommended by the "Erda" concern. They claimed that continuous reception on the loud speaker, but up to two miles, is possible on one station to operate on the low power. My "Erda" is in excellent condition. The panel layout is just according to the measurements of the parts recommended. Can I use my present equipment for these circuits? (C. D. Forest, Drungburg, Ind.)

The circuits you are using is the conventional single circuit receiver. To improve the circuit, reduce the coupling between the detector and the stylus, and correct this will be the point to remove the condenser across the plate circuit. I have a few suggestions of next thing possible to do: you will need to install a detector in your primary. You have entirely too much wire in the circuit and you have 25 feet of radio frequency and much too little wire. Please place the three-plate condenser across the antenna to the ground and use the three-plate condenser. You cannot stop fading.

I am located just 3/4 mile from the high tension lines supplying the Long Island Railroad. My antenna is bright white and I will build the detector. Would you give me the suggested type of condenser that is simply a radio frequency circuit using a crystal detector. It is frequency, and it is to be constructed like one of the others, but as far as volume and distance, you have more improvement to be had on a loop more efficiently. You do not need the condenser in the plate and secondary circuits. Why is the feedback coil reversed? Why is the coil reversed in a Westinghouse K-2? I am using now 100 feet of wire, I can get anything below 900 miles, using three UV19A tubes. I am using one 630 primary and one 630 secondary transformer. Can you fill this in for me? W. C. Philpott, Firth, Idaho.

Reflex coils are a very critical form of radio receiver. Before you build your set, you should advise the manufacturer of the transformer and condenser by the following method. The transformer and condenser by the following method. The transformer and condenser by the following method. The transformer and condenser by the following method.

You are located in a rather unfortunate position, being so near the high tension lines of a railroad. About the only solution that will aid you in the least is to use a loop antenna, with a metallic shield on the side facing the railroad, the shield being grounded. This shield can take the form of a piece of copper screening, tacked to the wall, the floor, or the roof. A rough estimate to remove the number of turns and the number of turns is one that I might use. Would the enclosed sample of wire be of any use in this loop? If so, how many feet? E. F. Hull, 1102-17th Street, 7th Avenue, Chicago, Ill.

The wire you enclose is for a single coil, not for a multicoil, as the core is too heavy. Use a single coil on a multi-coil receiver, and only a soft draw, if possible, or better yet get one wire of the same size. A well-drawn wire, wound on a rod, would be as good as anything for the coarse pieces, with small pieces of hard rubber as insulators where the ends of the cross pieces are located. The two sides of the primary should be connected to the generator. Which would be the correct, value of grid leak and condenser that I should use? W. E. Weck, 506 West Third Street, Oil City, Pa.

There are two means of correcting this blocking. One is by the one of your fears, that is, to divide the grid of the second detector to the filament instead of adjusting the grid condenser, and the other by using a variable grid leak of the compression of the tube, or a set of two halves. I should think that the first case a leak, a series of the particular condenser will prove very satisfactory, and also one that will be controlled by any point of 1/4 megohms will be about right. It is also of a possible future, 0.00015 instead of larger.

Would it be possible to arrange the two-tube detector, as described in Radio World for December 8, 1921, in a three-tube Coucaldy—E. J. Musby, 135 Fourth Street, Jamestown, N. Dak. This cannot be done. Due to the particular circumstances of the tube, it is not possible to add radio frequency.
Wherever the Radio News Brea...

Miss Catherine Jay Moore, of New York City, one of the very few feminine fans who take a real heartfelt interest in radio listeners, and who is carrying on an anti-squeal campaign in her neighborhood. She very kindly junked her old regenerative receiver, and bought a neutrodyne, which gives her better results.

Mrs. Robert Hatfield, and her family, improving their bridge game by listening to the lectures delivered through WEAF by Raymond F. Rhode, a weekly feature of that station.

Chief Wireless Officer Maudley, of the S. S. "Clysmic," who has established several high speed records for taking down messages on the typewriter. He can and has copied messages on his "mill" up to forty words per minute, which as any code man will tell you is "going considerable."

This Los Angeles fan, using a set that the kiddies could play with, and yet which could not be damaged, arranged the set as shown, using the small "cozy corner table" as a cabinet. Mother and the kiddies are listening in to bed-time stories before the sand man starts in to sprinkle his magnetic eye-clovers.

M. N. Murray, well known and beloved back-stage doorman of the Globe Theatre, New York, who has a speaking acquaintanceship with more famous personalities of the stage than you can shake a stick at, listening in between-whiles to the show playing there, which was being broadcast from a station over a mile away.

American sport enthusiasts, wintering at Chateau Frontenac, Quebec, Canada, listening in on American concerts, after a strenuous afternoon of skating and skiing on the ice and snow clad hills surrounding the city.
ks, Our Cameramen Record It!

Four-tube receiver built by Alfred Caldwell, of New York City, which is a marvel of compactness, the tuning, batteries, tubes and all being encompassed in a cabinet and panel 6 x 7 x 4 inches. For local signals, no antenna is necessary, and the set operates a loud speaker on DX with antenna and ground.

Inventor of Sidney Hale, English scientist, which automatically codes and decodes messages by means of a vacuum tube trip circuit. One machine sends the material in code, and it is translated in type on the other machine. Ordinary typewriters are used, with special key-coupling arrangements, connected to a coding and decoding wheel under the base of each machine.

Richard Carlisle, president of the radio club at the College of the City of New York, at the official station of the college, 2XNA, the transmitter of which was constructed by members of the club. Practically every state in the country has been covered by this 20 watt transmitter, as well as several stations in Canada, Cuba and Mexico. Richard Carlisle at the key.

Richard A. Bonnell, famous taxidermist, whose fine work adorns the dens of some of the most famous animals in the country, always works with the radio set going full blast, as he claims that it shortens his working day and he can concentrate and work faster.

The latest photo of Baby Peggy, child film artist, in her home on the Pacific Coast, who just succeeded in getting WEAF through on her new Federal DX set, which she took back west with her after completing her eastern tour. She looks as though she had China instead of just little old New York, with its powerful 1000 watt.

Dr. E. F. W. Alexanderson, Chief Engineer of the RCA, experimenting in his home at Schenectady, N. Y., on a new wave trap which enables him to tune out WGY, located less than a mile from his home in Schenectady. The patent on this device has been granted Dr. Alexanderson, and bears the number 1,477,43.
Station KYW, Chicago, Ill.

536 meters (690 Kcs.) C. S. T., Feb. 28—9:30 A. M.—“Our Hymns”-Program prepared by the Chicago Hymn and Musical Review Society; 11:35 A. M.—“Table talk” by Mrs. Anna J. Peters, known as “The Fair Motter Boys”-for children’s bedtime story; 7:00-7:30 P. M.—“Dinner concert” by the Congress Hotel Orchestra. 10:00 P. M.—2:00 A. M.—“Midnight review.”

Broadcast by A. J. Peters.—Late news and comment of the financial world. The service is broadcast every half hour during the two-hour period.

Station WJZ, New York City

655 meters (660 Kcs.) C. S. T., Feb. 28—12:15 P. M.—Program prepared by the Brick Presbyterian Church; 13:00 P. M.—Organ recital by the Hotel Astor; 4:00 P. M.—“Forefathers’ Day”-Program prepared by the Union Bible College; 5:45 P. M.—Eveline Spencer, “Frozen Fish,” a Middle Atlantic Development; 6:45 P. M.—Recital by Olgia Erika Schott, piano; 7:00 P. M.—“The Larger Aspect of World Affairs”-Discourse on “Psychology,” by Dean James Lough; 7:45 P. M.—Closing program of the Department of Markets and Farms; Farm and home reports; Stock Exchange; foreign exchange quotations; weather forecast; “The Magazine of Wall Street”; “Evening Post” news-

Station WOC, Davenport, Iowa

464 meters (629 Kcs.) C. S. T., Feb. 28—10:00 A. M.—“Paul Crider’s Morning”- announce and introduce weather, 10:15 A. M.—“Time signals.” 11:00 A. M.—“The Western States”-program of music and news, and weather forecast. 7:20 P. M.—Sunday school for children. 8:00 P. M.—Musical program by the Chico Children’s concert. 8:30 P. M.—“The News”-Program prepared by the Western States Sunday School; 9:30 P. M.—“The Spani’s visit”-Program prepared by the Western States Sunday School. 7:00 P. M.—“Some Facts About Balloon Type Tires,” by Ricard E. Walsh. 9:02 B. M.—“The Radio Orchestra,” Gerald M. Barrow, director. Harry L. Reiche, baritone soloist.

Station WJY, New York City

465 meters (670 Kcs.) C. S. T., Feb. 28—7:30 P. M.—“Program prepared by Frank Sprykit, “Income Taxes”-Program prepared by Inspector Leo Gilmore; 8:00 P. M.—“The Honorables’”-Program prepared by the Union Baptist Church; 8:45 P. M.—Leon Gilbert Simon, baritone, accom- panied by Mrs. M. R. Belta; 10:00 P. M.—“Brea’s and Tobias.” 2:30-3:50 P. M.; 6:00-10:50 P. M.

Station WOC, Davenport, Iowa

464 meters (629 Kcs.) C. S. T., Feb. 28—10:00 A. M.—“Paul Crider’s Morning”- announce and introduce weather, 10:15 A. M.—“Time signals.” 11:00 A. M.—“The Western States”-program of music and news, and weather forecast. 7:20 P. M.—Sunday school for children. 8:00 P. M.—Musical program by the Chico Children’s concert. 8:30 P. M.—“The News”-Program prepared by the Western States Sunday School; 9:30 P. M.—“The Spani’s visit”-Program prepared by the Western States Sunday School. 7:00 P. M.—“Some Facts About Balloon Type Tires,” by Ricard E. Walsh. 9:02 B. M.—“The Radio Orchestra,” Gerald M. Barrow, director. Harry L. Reiche, baritone soloist.
Station KFAE, Pullman, Wash.
330 meters (350 KHz.) P.M. - Local.
March 1-9:30:00 P.M. - Weather forecast.
March 1-9:30:00 P.M. - Weather bulletins."

Station WOS, Jefferson City, Mo. 175 meters (475 KHz.) P.M. - "Weather bulletins."
February 21-9:00 P.M. - Weather.
February 21-9:00 P.M. - "Weather."
Radio Receiving System

This invention relates to radio communication and aims to provide means for eliminating interference.

Means for rotating the rotor of the dynamo-electric machine and means for detecting the current induced therein are provided. Current will be induced only upon the receipt of incoming signals which disturb the balancing of the two magnetizing windings on the stator.

The above outlined system is typical of one which may be employed for the receipt of undamped or unheterodyned telegraphic signals.

Where damped signals are received, it is unnecessary to use balancing magnetizing windings on the rotor since a change in the normal current output of the dynamo-electric machine may be easily detected. I may employ, if found necessary, means comprising saturation coils to bring the stator to a degree of magnetization close to the knee of the saturation curve so that received signals of unusual loudness or static will be damping out.

In other forms of apparatus embodying my invention to avoid the generator ripple, I may use heterodyne machines, and for greater amplification, I may cascade the same.

Since all electromagnetic waves reaching a receiving antenna produce an effect to a greater or less extent, it is necessary to adopt means for eliminating or reducing the effects of all waves but the ones proceeding from the desired sending station. Various means have been proposed for this purpose, the most common probably involving the tuning of the antenna in receiving circuits to the wave length to be received. This is more or less successful when the desired wave and the interfering waves are of the same frequency, and of widely different frequencies, but it is of little use when the interfering waves are much stronger than the desired waves and of nearly the same frequency. Interference of this nature is encountered when the receiving station is near to an interfering transmitting station as compared to its distance from the transmitting station being received.

Circuit devised to eliminate the interference of a nearby strong signal from a powerful transmitter, and allow the reception of a relatively more distant and weaker signal on a frequency near that of the powerful station.

The aim of my invention is to overcome relatively strong interference of this kind, though it may be used for the prevention of interference regardless of the strength of the interfering current.

Vacuum Tube Device

The invention relates to vacuum tubes of the audion type, such as are commonly employed for repeaters, amplifiers, detectors, oscillators, etc.

Such devices may have only two electrodes, an anode and a cathode when used as rectifiers, or they may have three electrodes, the additional electrode being usually in the form of a grid which is adapted to control the space current between the cathode and the anode.

The present invention relates to improvements in mounting the electrodes and provides means whereby one of the electrodes is adapted to support the other.
This instrument (Magnavox Combination Set) consists of Magnavox Electro-dynamic Reproducer combined with a Magnavox Power Amplifier in one unit. It is an important addition to Radio in the home.

THE illustration at left shows the interior construction of the Magnavox electro-dynamic Radio Reproducer, a type representing the greatest advance ever made in radio reproducing equipment. The diaphragm (shown above) is of special interest, as explained in the body of this advertisement.

MAGNAVOX—True Radio Reproducer

The basis of the operation of a Magnavox Reproducer is its diaphragm, the importance of which can be seen from the fact that it is required to render an almost human service in recreating every tone and quality of instrumental music as well as speech.

This diaphragm (as illustrated) has been designed and constructed in accordance with entirely new principles. Its shape, size and special character make it capable of responding to the widest range of tones.

But even this highly efficient diaphragm might be handicapped by operating restrictions—every diaphragm must have a vibrating force applied to it, and the inherent ability of any diaphragm will be injured if it is affected by mechanical operation or other foreign influences.

The use of the electro-dynamic principle of operation (found only in Magnavox Reproducers) removes all objectionable influences. This principle, utilizing the famous "movable coil" permits the Magnavox diaphragm to respond in perfect unison to the original tone.

These exclusive features, fundamental to radio reproduction, account for the superiority of Magnavox Radio equipment.

There is a Magnavox for every receiving set: Type R for storage battery sets, and M1 for dry battery sets.

THE MAGNAVOX CO., Oakland, Calif.
New York Office: 370 SEVENTH AVENUE
PERKINS ELECTRIC LIMITED, Canadian Distributors Toronto, Montreal, Winnipeg

A1-R—$59.00
This instrument (Magnavox Combination Set) consists of Magnavox Electro-dynamic Reproducer combined with a Magnavox Power Amplifier in one unit. It is an important addition to Radio in the home.
The Selectoformer

The need of variocouplers, switches, taps, etc., is claimed to be largely done away with by the “selectoformer” just designed by the Electrical Research Laboratories, of Chicago. It permits of greater selectivity in practically any tuning unit now using a variocoupler, except the one-tube reflex sets. It requires no adjustment and has for its main object the coupling of the antenna to the receiver without causing a broadening of signals.

The antenna circuit is never tuned to resonance with any particular incoming signals and coupling of signal to the receiver is only sufficient to excite the receiver at the wave length to which it is tuned, without adding the resistance of the antenna circuit to the secondary circuit, which always causes a broadening and loss of signals.

With the usual type of variocoupler it is possible to reduce the inductive coupling between the primary and secondary to a very low value, but capacitive coupling exists which allows as full a coupling as if the total inductive coupling were maximum. The inductive and capacitive coupling between the primary and secondary circuits is always fixed at a very low value by the selectoformer. With other fixed couplers, reducing the coupling reduces the volume of signals. The selectoformer, due to its particular construction, reduces the resistance of the secondary circuit and therefore increases the signal volume.

The selectoformer increases the selectivity when substituted for a variocoupler, or loose coupler, and is especially good in the two and three tube reflex circuits. It also makes an excellent wave trap when used with a 23-plate variable condenser and when so used it actually adds to the strength of the incoming signals. It also prevents reradiation from sets which oscillate when it is used as an absorbing circuit for such oscillations.

Radio Trade Notes

The Maxam Radio Company, Inc., 55 Tremont St., Boston, Mass., operating a number of chain stores, are in the market for all kinds of radio apparatus and materials.

Frank R. Byam, 107 Salem avenue, Burlington, N. J., intends to open a retail radio store.

Newark Company Sued for Infringement

In the Federal Court at Newark, N. J., suit was filed last week against the Koehler Machine & Tool Company, of Newark, by the newly formed Hazeltine Corporation and 13 radio manufacturing firms charging infringement of patents on the Hazeltine neutralyne circuit. The suit asks for an accounting and preliminary and permanent injunctions against the Koehler company.

De Jong Blue Prints Now Available

Harold De Jong, consulting engineer, 118 India street, Brooklyn, N. Y., has prepared and is ready to distribute among fans desiring them, a complete set of blue prints for his receiver. The plans, which are five in number, are most complete. Each sheet deals with a part of the receiver, and complete bills of material and apparatus needed are specified. Measurements are most accurately charted for the make of apparatus given, and if the builder can read a plan at all, he can understand these and construct the receiver as outlined. With the plans comes a photograph of the receiver, which is a reproduction of the original from which the plans were drafted, and if the instructions are followed out, the completed receiver will resemble the photograph. For the radio enthusiast desiring blue prints from which to build a three-tube receiver, these plans will prove welcome information.

Radio Literature Wanted

Manufacturers of and dealers in radio apparatus and accessories are notified that literature and catalogues describing their products have been requested, through the Service Editor of RADIO WORLD, by the following:

James C. Schlegel, 16 Wangoo street, Oshkosh, Wis.; W. D. North, Middleboro, Mass.; E. R. Martin, 250 East 72nd street, Cleveland, Ohio. (Dealer and set builder.)


Coming Events

INTERNATIONAL RADIO & ELECTRIC SHOW, Baltimore, Md., March, 1924.

RADIO will be featured at the electrical exhibition to be held at Melbourne, Australia, in September, 1924.


FOURTH ANNUAL RADIO SHOW, EXECUTIVE RADIO COUNCIL, SECOND DISTRICT, I.N.C., Hotel Pennsylvania, New York City, March 3-7, 1924.

RADIO SHOW, New Haven, Conn., March 15-22, 1924; Thomas M. Friscoe, Manager, 30 Congress Ave., New Haven, Conn.

New Radio and Electrical Firms

Liberty Radio Corp., New York City, 1,000 shares common stock, no par value; L. T. Corbin, J. J. Bernoitz. (Attorney, G. T. Hoar, 14 East 38th St.)

Elite Radio Co., New York City, $5,000; L. Pelli, B. Shaw, H. B. Ahtman. (Attorney, S. Zucka, 110 Nassau St.)

Hunts Point Radio and Electrical Central, New York City, $20,000; S. H. Polese, H. and E. Hart. (Attorneys, Buckowitz & Miller, 299 Broadway.)
TO BUILDERS OF SETS

We Specialize in the

Famous AMBASSADOR

Long Distance Circuit

A Real Achievement! The Ambassador set, which took the country by surprise! Coast to coast reception. The beauty
of this hook-up lies in its simplicity and sharp tuning. Guaranteed outfit of complete parts for 3-bulb set includes
700 Amplifier Tuning Coil, full .0005 Mfd. 23-plate R.C. Condenser, 3 genuine Bakelite Sockets, 3 nickelplated Jacks,
2 Supertran 10-1 and 5-1 Transformers, 3 Panera Rheostats, 1 Cutler-Hammer Switch, 20025 Don Mica Grid Condenser,
Robbins Perfect Grid Lock, a .006 Don Mica Fixed Condenser; H.R. Panel, drilled, 7x18, black; finely finished imitation ma-
bhany Baseboard; Bus Wire, Box of Assorted Screws, Nuts, Bolts, Lug, etc., 1 Binding Post Mounting Strip, 7 Engraved
Top Binding Posts, 3 Nickelplated Bells, 2 5-in. Dials 17 E., Strip of Solder. Also a beautiful 7x18, 3-ply Veneer Wood Cab-
inet, covered with durable Du Pont's Fabrikoid Leather, built to last a lifetime of service—$60.00 (Free diagram and full
instructions with each set). Completely assembled and wired, ready for use, $60.00.

ROBBINS & FUERST CO.
1815 East Tremont Ave., New York City

"FRESHMAN SELECTIVE"

Mercury Variable Condenser

For Transmission or Reception

$5

It is the only variable condenser the plates of which vary in area—AN ENGINEER-
ING FEAT NEVER ACCOMPLISHED BEFORE—making it most efficient for
fine adjustment and selective tuning.

No Leakage.
Absolutely Quiet.
No Plate Vibration.
Cannot Short Circuit.
Will Stand 5,000 Volts. Walls.

.0003 MF (Equiv. to 17 pl.) $5
.0005 MF (Equiv. to 25 pl.)
.001 MF (Equiv. to 43 pl.)
All your dealer's, otherwise send purchase price and you will be supplied at cost.

Ask your dealer or write for our free diagrams at Freshman, Tri-Flat, Kauf-
man and other good circuits.

C. O. D. Delivery Free To Your Door
Marvelous New "Sun" Receiver Guaranteed Non-Regenerative

Most Important Development in Radio
Reception in Three Years
(Patent Applied for)

Phenomenally successful results through development of accurately balanced counter Electric Motive Force. Superior in range and selectivity to most 5 and 8 tube sets. Wonderful new principle brings in quality and volume of tone unequalled. Reproduces piano or the elusive notes of the soprano as faithfully as if the artist were in the room. Loud-speaker volume at long range surpasses local reception of other sets at any price. Entirely free from distortions, howls, squeals or hissing spill-over common to other sets. There is no other set like the "Sun."

With This "Sun" Tuner Unit and Standard Parts
It Is Easy to Assemble a Genuine "Sun" Set.

Special "Sun" Tuner Unit, Including Sun Loading Coil and Sun R. F. Transformer, Only $24.00

We furnish complete list of parts required, easily understood wiring diagram and instructions for assembly so comprehensive that any one can understand and follow them. If you prefer to order a "Sun" Receiving Set, as illustrated, the price is $150. Established dealers everywhere are prepared to furnish the "Sun" Tuner Unit at $24.00, or completely assembled "Sun" Receiver Sets at $150. (If your dealer cannot supply you, we will ship either complete "Sun" Receiver Set or "Sun" Tuner Unit direct on receipt of check or money order.)

RADIO WORLD
Relatives of Unknown Dead Located by WOC

STATION WOC, Davenport, Iowa, checked up another score for locating missing persons a few days ago in the case of a young man who died in a hospital at Maryville, Tennessee, and whose relatives were unknown.

A special delivery letter from F. A. Zoller, M.D., of Maryville, giving all known facts about the young man was broadcast immediately by the Davenport station.

L. H. Fredericks, city editor of the Rockford (Illinois) Morning Star, listening at his home in Rockford, recognized the description of the young man as being the son of a Rockford citizen, L. O. Berg. In less than an hour the parents had communicated with Maryville authorities and arranged for shipment of the body just as the undertaker was about to make other plans for its disposition.

Statistics compiled at WOC show that results are obtained in twelve per cent of all such reports broadcast from the Davenport station.

Lattice Coil Specialties

Variconductors
Variconductors
R.F. Transformers
Mica-Mills
Condensers
Plain Cables
Tapped Cables

ESTRU LATTICE COIL PRODUCTS have been designed so as to produce as nearly as possible IDEAL INDUCTANCE in various forms. It was not the intention in designing, to produce Miniature Apparatus, the small size being the result of careful electrical design with no UNNECESSARY Mechanical parts which would detract from the electrical efficiency.

YOU will appreciate these facts as set forth in your COMPLETE DESCRIPTIVE LITERATURE, which will be sent on request and is GUARANTEED with all ESTRU PRODUCTS.

RADION

The Supreme Insulation PANELS

They Do Not Chip When Drilled

Drill, saw or engrave a Radion Panel. Use what tools you will, dull or sharp, this material will not chip or show ragged edges. Its proven electrical values make RADION the supreme insulation both from a scientific and a practical standpoint.

Made in the beautiful MAHOGANITE, or polished black with Dials and Knobs to match.

Look for this stamp on every genuine RADION Panel. Beware of substitution and imitation.

Sold at all good radio stores or write

AMERICAN HARD RUBBER CO.

11 Mercer Street
New York
GET A REAL "B" BATTERY!
Powerful—Durable—Rechargeable

Roberts Rechargeable "B" Battery
LASTS A LIFETIME
MADE OF EDISON ELEMENTS
SATISFACTION GUARANTEED

No Change of Wearing Necessary
Only Three (3) Main Terminals to Connect
Type A—160 volt, with variable detour, from
14-17 volts, $1.35.
Type B—160 volt, with variable detour, from
14-17 volts in detector, and variable voltage from
44-140 volts for amplifier, $3.55.
Type C—160 volt, with variable detour, from
16-17 volts, $2.72.
Type D—160 volt, with variable voltage, from
14-25 volts on detector, and variable voltage, from
44-140 volts for amplifier, $3.95.

Manufactured by
W. ROBERTS STORAGE "B" BATTERY COMPANY
1138 MYRTLE AVENUE, NEAR BROADWAY, BROOKLYN, N. Y.

A rating of the switch lever shows instant voltage
BATTERY SATISFACTION AT LAST. Hundreds of enthusiastic
owners of Roberts "B" Batteries tell us:
"Positively the best battery on the market—I have tried them all."
"All my battery troubles are over!"

BATTERIES CAN BE OBTAINED FROM THE FOLLOWING DEALERS:

Brooklyn Radio Service, 372 Myrtle Ave., Smith and Lawrence Sts., Brooklyn; E. John St., New York City;
171 Broadway, New York City, Twentieth Century Corp., 162 Franklin Ave., Brooklyn, Boz Lithograph Co., 165 W. 60th St., New York City,
Matthew Cronin, 147 W. 74th St., New York City, John F. Pullum, 378 Ninth Ave., New York City,
Cortlandt Radio Shop, 77 Cortlandt St., New York City, Anna Radio, 81 Cortlandt St., New York City,
Clinton-Hill Station, Newark, N. J.

---

RADIO

SEND FOR OUR COMPLETE
MONEY SAVING CATALOG
TIMES SQ. AUTO SUPPLY CO., INC.
MAIL ORDER DEPT.
115 BROADWAY AT 44TH STREET
NEW YORK, N. Y.

Cortlandt Radio Co.
TWO NEW YORK STORES
60 Cortlandt St.
(49 W. 23rd St., N. Y. C.)

Do You Want the Best for Least Cost? Yes

5 TUBE SET NEUTRODyne for...
$44.75
Includes a handsome engraved panel.
Complete parts for the above set with drilled and engraved
finest engraved panel..........................$28.75

MAIL ORDERS PROMPTLY FILLED

WE REPAIR
RADIO TUBES
VO-11 $1.60
VT-14 $1.60
VS-5 $1.50
WD-10 $1.00
UV-201 $1.25
C-75 $1.00
C-101 $1.30
C-102 $1.30
D-1 $2.00
D-2 $2.25
D-3 $2.50
D-4 $2.75
D-5 $3.00
D-6 $3.25
D-7 $3.50
D-8 $3.75
D-9 $4.00
D-10 $4.25
D-11 $4.50
D-12 $4.75
D-13 $5.00
D-14 $5.25
D-15 $5.50
D-16 $5.75
D-17 $6.00
D-18 $6.25

Mail order and promptly attended to.
Dealers and agents write for special discounts.

H. & H. RADIO CO.
P. O. Box 22-B
Clifton-Hill Station
Newark, N. J.

SOME SUNBEAM SAVINGS

From

12 Years

In

Wholesaler

The

Spot.

You.

SUNBEAM

Federal No. 65 Transistors.........$5.95
All-Carbon Transformers.........$5.95
Cortlandt Carbons...............$5.95
Henderson C. L. Transistors......$5.95
Henderson Master Lead Speaker...$6.95
Branden Table Talker...............$8.95
Federal Phones..................$6.95
FREE WITH EVERY ORDER! SUNBEAM ELECTRIC CO.
SUNBEAM 200V-75W TRANSISTOR
214 East 81st Street
New York City

A. E. HILL MANUFACTURING COMPANY
ATLANTA, GEORGIA

www.americanradiohistory.com
New Radio Corporations
Comet Radio Corp., New York City, $100,000; J. Siegel, D. Schraf, M. Walker. (Attorney, M. Siegel, 1263 Broadway.)

400-500-1000 MILES
On Crystal Set, with remarkable Howard-Thorito Variometer Little Set, using Howard field detector and sensitizers for aerials and ground. $2.00 postpaid; $1 for detector and specifications to apply to your set; $2 and sent for information. Bank references if desired. Look into this. We have made a discovery.
HEARWELL CO., Engineers
53 Greenhaven
Boston, Mass.

PHONES
MANHATTAN Loud Speaker
PERFECTONE Loud Speaker
MORRISON Loud Speaker Unit (will fit any phonograph
PERFECTION Loud Speaker (a quality product)
HERALD Loud Speaker
WESTINGHOUSE

EXIDE BATTERIES
100 AMPER HOUR
150 AMPER HOUR

GOLDEN RULE RADIO CO.
59 Cortland St.; Branch Store: 118 Nassau St., New York City

MONTREAL—CALIFORNIA
(50 more than 2500 miles)
ON ONE MYERS TUBE

Remarkable radio reception is an everyday result with MYERS TUBES. Mr. W. E. Gerard, 73 Pine St., Montreal, Canada, with a set designed and constructed by himself, and using only one MYERS TUBE, hears KDZB, Bakersfield, California.

To get distance with clarity, MYERS are the only tubes correctly designed for radio without bunched leads. Two types—for dry or storage battery. Insist on MYERS at your dealer's—otherwise send purchase price and be supplied postpaid. Write for free circuit diagrams.

F. E. A. C. H. complete with mounting clips ready to mount on your set, no sockets extra equipment necessary.

F. B. Myers Co., Ltd.
Radio Vacuum Tubes
240 Craig St. W.
MONTREAL
CANADA

Trade: "THORIO"-Mark
DETECTOR—AMPLIFIER
T. No. 1. Detector-Amplifier. 1/5 Volt Filament. 1/2 Amps. Price $1.50
T. No. 2. Detector-Amplifier. 1/5 Volt Filament. 1/2 Amps. 3.00
T. No. 3. Detector-Amplifier. 1/5 Volt Filament. 3/4 Amps. 5.00
T. No. 4. Detector. 1/5 Volt Filament. 1/4 Amps. Price $1.00

HAYDEN SALES COMPANY
105 GRAND STREET
JERSEY CITY, N. J.

Panels cut-drilled
For quick service and high class work see us.

TRIPLE PANEL MOUNTING SOCKETS
This scarce item ready for instant delivery.

E X A M P L E

S A L E

1923

RADIO WORLD

HOWARD

Radio Co. Inc.
4248 North Western Ave.

Every Question Answered for only $1

R E C E I V I N G

Sets

BLAIRCO—Regenerative 3-Tube Set.
Model 2. Licensed under Armstrong Regenerative Patents. Price: $14.00

BLAIRCO—Regenerative 2-Tube Set.
Model 3. In beautiful cabinet with loud speaker enclosed. Price: $19.00

C O P Y R I G H T 1 9 2 3

RADIO WORLD

HOWARD

Radio Co. Inc.
4248 North Western Ave.

HOWARD

Radio Co. Inc.
4248 North Western Ave.
Better Results:  
With A  
STAR SINGLESLIDE COUPLER

The single slide triple coil, a combination coil to do the work of variometer and coupler. Having 6 connections. 2 for primary, 2 for grid, 2 for plate. All with one control and No extra knobs. No soldering.

You Can Buy DIRECT Until a Distributor Has Been Appointed in Your Territory

Price, $10.00
WE PAY POSTAGE AND INSURANCE

We will give two prints of approved and tested circuits showing Star Coupler in use with each coil. Write today.

DEALERS—DISTRIBUTORS: Wire or write to-day for full particulars on Guaranteed Star Radio Products.

OUT OF THE ETHER
Chats About Broadcasting Stations

By Hirsch M. Kaplan

The other evening we tuned in station CHAC as Joseph Smith and his Mount Royal Orchestra were entertaining with a splendidly performed program of dance music. Just to prove how good they really were let us cite that our feet became itchy after listening for a short while, so as a cure we grabbed partners and a merry time was soon had by all.

How do you like station WAAM these days? We will say that they are great and getting better and better at each performance. The other evening they offered Fritzi Leyton entertaining with a well arranged program of popular numbers, which we greatly enjoyed. We have heard her perform at other stations but her recital this time was the best ever. Just a little inside dope. Mr. Gilliam of station WAAM dropped in on us the other morning and confidentially told us that he had booked some wonderful features for the near future. Just a word to the wise ought to be sufficient, so don't forget to tune down to 263 meters.

WHAZ gave us a treat in the form of the Troy Burns Club and their Scotch concert. Of course the main feature on their program was the Scotch folk songs, ballads and the selections played upon the familiar instrument known as the bagpipe. The gentleman who played this instrument sure did show nationality, for his playing was all to the mustard.

All insects are not bad, H. E. Hodgkiss of Penn State College told us through

(Concluded on next page)

NEUTRODYNE PARTS

Full set of Neutrodyne, Varieties Goodenough with dials, and Neutrodyne of Heath $13.25

Above sets are guaranteed, and are made under patentable patents.

Complete parts for three tube Neutrodyne tube (tubes, batteries, or phone not included), drilled plate, tube sockets, resistors, lead mordomets, knob-blinding posts, wire, copper, and blue prints.

COMPLETE FOR $19.95

Send $10.00 in full, and we will send you the full set of Neutrodyne parts.

NEUTRODYNE PARTS

SUPER-I-VERSIBLE RHEOSTAT

$3.00 Each

Ask for the "MICROSTAT" Trade-marked by the Premier Electric Company.

100% EFFICIENCY

From Your Tubes with the NEUTRODYNE PREMIER "MICROSTAT" Trade-marked $3.00 Each

Ask for a sample and inspect or "MICROSTAT" at your dealer's.

Premier Electric Company

1805 Grace Street
Chicago, Ill.
Out of the Ether
(Concluded from preceding page)

station WPAB. In a short but exceedingly interesting lecture he told of the benefits derived from such insects as the bee and silkworm while others, as ants, potato and fruit bugs, were of the destructive class.

No doubt many of you folks during the past week have been disappointed over the failure of being able to tune in station KFKX. Well, to relieve you of all this mental strain let us inform you that this station is now being operated on a wave of 341 meters. At latest reports they have not changed their schedule of operation, so if you will tune in on the new wave friendship will be renewed.

A station which is coming through splendidly these days is that of WSAI. The other evening we tuned it in as Adolph Steiderman was rendering a very delightful organ recital. The greater part of his program consisted of classical numbers which he put over in good fashion.

Symphony orchestras may come and go but the Edison Symphony Orchestra in our opinion can go on forever. This splendid combination furnished a very good program of dance music as offered by Clyde Doerr's and Jaska De Babary's orchestras.

Our theatrical performance for last week was presented by the WGY Players. They presented Owen Davis's famous Broadway drama "Icebound." As usual the acting as could be pictured was very good and this plus the attractive selections rendered by the WGY orchestra were very well worth our slight efforts of tuning them in.

You remember that splendid combination of May Singh Breen, banjoist, and Peg Wannamaker, pianist? Well, they again furnished us with a very delightful program of popular hits through station WEAF.

---

USE
EVEREADY
Radio Batteries
-they last longer

LOUD SPEAKING CRYSTAL SET

Nassau Cabinet Co.

IT'S A FRAME-UP
CAST ALUMINUM FRAMES
FOR YOUR RADIO SET
MAKE IT RIGID and STRONG
NO WARPING
NO SHORT CIRCUITS
NO MORE CABINETS
JUST APPLY FLAT HAMMOCK OR PLATE GLASS OCHERS TO THE FRAMES

A SIZE FOR YOUR SET. PRICE.................$3.00 each

QUINNY RADIO CONSTRUCTION CO.

1360 W. Market St. - Newark, N. J.

D-206, 1311 2nd Street and St. Nicholas Avenue

New York City

Save

1/2 Price

of

New Tubes

Burned out or broken tubes repaired and guaranteed equal to new.

Harvard Radio Laboratories

200 Old Colony Ave., New York, N. Y.

An Absolute Guarantee with every instrument made them famous!

SHAMROCK (FOR SELECTIVE TUNING) 180°

Vario Coupler

list price 

$3.50 each

DOUBLE DUTY

Pig-Tail

Variometer

SHAMROCK MFG. CO.

316 W. Market St. - Newark, N. J.
Professor Todd Wins Aerial League Prize

THE prize for this month's report in the World Radio Checkup has been awarded to Professor David Todd, of Amherst College. The problem collected by him showing the effect of the polar lights (aurora borealis and aurora australis) on both space and wired telegraphy and telephony.

At Professor Todd's suggestion, an additional first prize and four second prizes of ten dollars each, with ten diplomas of merit are to be awarded to the best reports received by the League during the next two months. These will be awarded the man furnishing the most complete data on the effect of these strange electrical disturbances. These reports will be listed under the title "Aerial Checkup."

Anyone may enter the contest, and the field is large. It is necessary to list and chart the various disturbances heard over the air, and compute them in terms of auroral disturbances, checking up to make sure that the clicks and spits coming through the air originate at the auroral sources, and not from some nearby extraneous source. These reports will then be carefully checked by experts living within the auroral band, in the Arctic or Antarctic regions, who will compare the number of auroral disturbances, and check these with the written reports. The person closest to the number of actual disturbances caused by the aurora will win the prize.

These disturbances may be charted by anyone owning a receiving set, as they present themselves, in a series of clicks, spats and rushers, peculiar in terms of auroral disturbances, and the writer of the set. This information has to be addressed to Henry Woodhouse, president of the Aerial League of America, 200 Madison Avenue, New York City.

CURE RE-RADIATION!

CLEAR THE AIR FOR RADIO

Why Baste Good with Your Neighbor?

DK Radio Frequency Transformer will do it for you. 

Increasing your Receiving Range tremendous-

Absolutely eliminating all static and howle- 

Adding High Fidelity to your set.

Shielded the use of a Low- 

DK RADIO FREQUENCY TRANSFORMER 

is probably in your corner and can be planned in any desirable position in your set. Add this indispensable unit to your present set. 

PRICE $1.50

If your dealer cannot supply you, send direct to

R. ROBINSON COMPANY

83 Barry St., SOUTH BOSTON, MASS.

Dealers Write for Terms.

DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS DEPARTMENT AT 5c A WORD

A GIANTIC DELUGE of MAIL—We brings 1,000 packages of mail, magazines, bargain offers, money coming good, offers of a new job, "something big" to market, all in the blank space at the bottom of the column. Write in! 

A UNUSUAL ADVERTISING opportunity. Get this space and REACH 1,000,000 readers of the Radio World every month! 

DO YOU WANT TO BUY, SELL OR EXCHANGE RADIO OR OTHER GOODS? TRY THIS DEPARTMENT AT 5c A WORD

RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

GUARANTEED Dry B Batteries

Shipments prepaid at the following prices direct to consumer: 

23⁄4 volt variable... $1.25 25⁄8 volt variable... $2.00 33⁄4 volt variable... $3.25 Guaranteed money back if not satisfied. 

SLEEPER'S MONOTROL Radio Co.

23 W. Mt. Eden Avenue New York City

RADIOS OF THE BETTER CLASS

Fads' Neutrondyne SLEEPER'S MONOTROL 

TWIN SETS

LEDO RADIO CO.

5 Columbus Circle 

N. Y. C.
Radio of Excellence

"PARAGON"

Type RB 2A, $125.00
Parts for Acmeadyne in Stock

BALLANTINE Tuned Radio Frequency Transformer. $9.00
LANGREIN & KAUFMAN Variometers and Variacupulators.... 7.00
AMPERITES. 1.18
MYERS HI-MU Vacuum Tubes. 4.35

Service That Is Certain
RADIO & MECHANICAL TRADING CORP.
23 Warren St. New York City

SUBSCRIBE NOW AND TAKE THE WORRY OFF YOUR MIND. RADIO WORLD, 143d Broadway, New York City.

THE RADIO POCKET KNIFE
The compact pocket size outfit that fits all requirements. Folds up to the size of an ordinary Radio, only 3/8 inches over-all.

PIEERS, WIRE CUTTER, SCREW DRIVER, WIRE SCRAPER
and a Good Sturdy CUTTING BLADE
Keen-Edged Warranted Finest Cutlery Steel, Guaranteed American Workmanship and Beautifully Finished.

$2.50 each, Post Prepaid
R. J. ROBERTS AGENCY
181-183 Duane Street
New York City

Dealers Write for Attractive Premium

THE RADIO RECEIVER FOR ALL TIME

OPERATING FEATURES
Volume
Distance
High Selectivity
Non-Interference
Simplicity
Reliability

Constructional Features
Regenerative
Non-Relativistic
Compactness
Dry Cell or Storage Battery
Minimum Upkeep

Copyright, 1924, by Harold De Jong

OPERATES ON AERIAL OR LOOP

Set No. 109-2-Detector and Two Step Amplifiers. $1.00
Set No. 109-1-Detector and Two Step Amplifiers. $1.25
Set No. 108-Detector Only, $1.00

DESIGNERS OF RADIO RECEPTING SETS
HAROLD DE JONG
Consulting Engineer
181 India Street
Brooklyn, New York

KFEY Co-operates with Local Schools

STATION KFEY, operated by the Bunker Hill & Sullivan Mining & Concentrating Co., at Kellogg, Idaho, will co-operate with the school of the district in an endeavor to stimulate public speaking and has offered the services of its broadcasting equipment to the high school students for broadcasting their arguments in debates, etc., when such arguments are considered exceptionally good and worth while.

S. G. Garrett, of the Auto Supply Company, of Wallace, Idaho, has volunteered to install the Wallace High School assembly room loud speaking equipment, and the Bunker Hill & Sullivan Mining & Concentrating Company will install similar equipment in the assembly room of their high school where the student bodies of both schools may listen to arguments submitted by debaters. H. H. Hoffman, superintendent of schools in Mullan, Idaho, is going to request the radio fans in the County to offer the use of their radio receiving sets for the students of Mullan.

Station KFEY is very much interested in the problem of daylight transmission, and will appreciate receiving any cards or calls from radio fans who may hear any broadcast during daylight hours.

Radio Stimulates Cable Business

CLARENCE H. MACKAY, president of the Mackay companies, in his annual report, states that the influence of radio as a whole had a stimulating effect on the cable business instead of a harmful one as was expected. Business was exceptional during the year 1923 and the volume handled increased.

The laying of new cable lines from Emden, Germany, to the Azores, and from there to New York were delayed because of the protracted nature of the negotiations with the Portuguese government due to landing rights.

FAHNESTOCK’S
RADIO PRODUCTS

No. 31

The Antenna Connector

Snap larger connector over Antenna Wire; insert Lead-in Wire into smaller clip and a perfect connection is the result.

Improved Ground Clamp


No Soldering—For Radio Use Only
Our name stamped on all products, none marked without it.

At Your Dealers
FAHNESTOCK ELECO. CO.
LONG ISLAND CITY, NEW YORK

ARE YOU GOING TO
BUILD A SET?

Our specialty is—Making outfits of complete parts for the construction of all good sets. Our sets contain only the best standard apparatus. No inferior material is used in order that you may reduce the cost of the set. Our prices are absolutely the lowest that it is possible to sell good reliable outfits at.

By utilizing the complete outfit we are enabled to give a lower price than what the parts would cost if bought separately.

The outfits are complete, with drilled panel, box, wire, bonding posts, brass standard parts, and directions, all assembled, ready to wire, which saves but a few hours work.

We pay transportation charges, and we guarantee satisfaction.

1. Antenels. One tube. Operates a loud speaker. This simple set that has just been designed. $12.00
2. Fiftelwinder. One tube. Equal to three tube sets for distances. 10.50
3. Reflex. One tube. Operates a loud speaker. 2000 to 3000 miles with any kind of apparatus. $6.00
4. Reflex. Two tube. 500 to 1000 miles loud speaker range. $25.00
5. Reflex, Three tube. Up to 3000 miles loud speaker range. $50.00
6. Superdeux. Five tube. 150 miles loud speaker range. $105.00
7. Ultimate. Six tube. $600.00
8. Superdeux. Four tube. The Wonder Set. The set just described in Radio World. Results equal those of six to eight tube super-deux. $25.00
9. Major Armstrong’s Radio Flimmer. Two tubes. This set is the most powerful ever made. In actual tests, using only a loud speaker, this set has given greater volume at a larger distance than any outfit made. The set contains a high frequency antenna, three stages of audio frequency amplification, and three stages of power amplification. Slightly harder to operate than an ordinary set at first, but very well worth while. 25.00

If you wish to make any set which is not listed here, write us. We make outfits of all kinds of sets, and use only the best of apparatus.

BILTMORE RADIO COMPANY
236 Lamartine St.
Boston, Mass.

PATENTS
MANUFACTURERS
PATENT CO., INC.
FREE INVENTION RE.
520 FIFTH AVE.
PLATE VANDERBILT 1713
NEW YORK.
"Dream Daddy" to Tour Broadcasting Stations

EVERYONE knows the answer to the question "Where does a ball-player go when he has a day off?" Yes, that's it; he goes to a ball game. This same funny idea presents itself again in an announcement from Philadelphia that Harry E. Ehhardt, nationally famous as "Dream Daddy," the bed-time story-teller at WDAR, will spend his mid-winter vacation this year in a tour of the principal broadcasting stations of the middle west and east. "H. E. E." as he is known when he announces from Lit Brother's station in Philadelphia, will be accompanied by Carl Zeehns, one of the co-authors of the song "Dream Daddy" and other songs and a splendid singer, who will entertain from the stations they visit.

The first stop will be at KDKA, East Pittsburgh, Pa. From there the following will be visited: Louisville, Ky.; Cincinnati, O.; Chicago, Ill.; Detroit, Mich.; Cleveland, O.; Buffalo, N. Y.; Schenectady, N. Y.; Springfield, Mass.; Boston, Mass.; Medford Hillside, Mass.; New York, N. Y.; and Newark, N. J.

The trip will be a whirlwind one. Each of the stations will announce its own date when these two well-known radio entertainers will be present, and it is expected that "Dream Daddy" and others will be a hit and will entertain from the stations they visit.

Army Graduates 25 from Radio School

TWENTY-FIVE enlisted men from all branches of the army were graduated from the army radio school at Camp Van, N. J. last week. Major Owen S. Albright, commandant of the school, said they would be placed at army stations throughout the country, making twenty-four hour service possible over the War Department Radio net.

The Ultimate Radio Receiver

**THE FLEX-O-DYNE CO.**
1674 Broadway (At 52nd St.)
New York, N. Y.

KELLOGG Switchboard & Supply Co.
Has openings for exclusive deal- ter- ritory in New York, New Jersey, and Connecticut.

APPLY
CLARENCE E. MORRISON
GENERAL DISTRIBUTOR
2 STONE STREET
NEW YORK

Worksman Radio Service

"THE AGENT IS ON SERVICE"

14-16 Vesey St.
NEW YORK

VACUUM TUBES REPAIRED

WD-11, WD-12, UV-201A, UV-199 and others for $3.00

Quick service. All tubes repaired by us guaranteed to work as good as new.

Send your dead tubes. We prepare parcel post to you. All you pay is $3.00 to postman.

THOMAS BROWN CO.
21-519 ORANGE ST.
NEWARK, N. J.

COMPLETE PARTS FOR THE original "C. White Power Amplifier" with Como Duplex Transformers

This amplifier has been considered the best that can be made for QUALITY AND VOLUME

Parts for one stage Como Push-pull amplifier as illustrated consisting of:

1 Pr. Como Duplex Transformers
2 Tube Sockets
1 Rheostat
1 Mahogany Mounting Board, Wire, Screws and Terminals
1 Photographic Diagram

Price $16.00

Complete

Parts for two stage Power Amplifier consisting of:

1 Pr. Como Duplex Transformers
3 Tube Sockets
1 Rheostat
1 Audio Frequency Transformer
1 Mahogany Mounting Board, Wire, Screws and Terminals
1 Photographic diagram

Price $21.50

Complete

About illustration shows the hook-up for one stage Como Duplex Push-Pull. These parts are complete and nothing else is required. Results are absolutely guaranteed. For those who do not wish to assemble the parts we furnish the board all wired with everything in place and ready to use at an additional cost of $3.00 for one stage and $4.00 for two stage; Radio tested in our laboratory.

POND RADIO LABORATORIES
264 So. Huntington Ave., Boston, Mass.

www.americanradiohistory.com
"Kills Your Reflex Troubles"

CRYSTAL IS REMOVABLE & REPLACEABLE
CUP TURNS IS ADJUSTABLE FOR REFLEX WORK
EASILY MOUNTED
SPECIALLY ADAPTED FOR REFLEX WORK

"LINCOLN"
Enclosed Fixed Adjustable Detector

This wonderful new invention has caused a sensation. Thousands are in use already and radio fans throughout the United States are clamoring for it.

Study the illustration—note that the solid gold cat’s whisker can easily be turned, adjusted or removed. Observe that the crystal can be turned or replaced at a moment’s notice. See that a metal cover—handsome nickel-plated metal—prevents breakage and keeps out light and dust.

Every one carefully set and tested when shipped. Guaranteed—any faulty part will be replaced within one year. Defective crystal within six months will be replaced. That’s fair—isn’t it? This wonderful Enclosed Fixed Adjustable Detector costs only $2.00. Ask for it at any dealer or write us—today.

Jobbers and dealers: Radio fans want this unique invention. Wire or write us.

Mention this advertisement.
Address:
Dept. RW-31

LINCOLN MFG. CO.
Los Angeles

The Herald Loud Speaker is CLEAR

DINE out—at home! A famous restaurant, a great orchestra playing, and you there—in the life, the thrill, the glorious music—because the clear Herald brings it all right into your own dining room.

Broadcasting sounds so real because Herald makes it so clear! No blast, no blur, no blare. But every tone of every program—pure, strong and satisfying.

THE Herald, like other good musical instruments, improves with age because of its laminated core, mica diaphragm and permanent magnet. It stands up under power without rattling. The adjustable diaphragm makes it possible to get the most out of a weak set. Height 30 inches. 6-foot cord. Price $30. Slightly more on Pacific Coast and in Canada. Write for folder and enclose your dealer’s name.

Herald Electric Co., Inc., 113 Fourth Avenue, New York
A Freed-Eisemann KNOCKDOWN NEUTRODYNE RECEIVER

NEUTRODYNE has taken the country by storm. It is the remarkable distance getting, powerful, non-oscillating and non-whistling receiver.

A 32-page book answers every question. The panel is accurately drilled. A baseboard is furnished; in fact, everything down to the very last screw and nut, including all necessary parts excepting the cabinet.

Besides the book there is furnished schematic blueprints and template for drilling the baseboard, also full-size pictorial perspective wiring diagram, so that it will hardly be possible for the amateur with ordinary care and skill to make an error.

Remember that here are licensed parts—not a collection of apparatus trusting to luck that they will assemble properly. Each part is designed and fitted to work with each other part in this particular set. The instructions are so complete and the parts so accurately matched that you will be grateful for the manner in which we have eliminated guess work in the amateur construction of this receiver.

For sale by dealers of the better class throughout the country, for amateur and experimental building. Builders are cautioned against attempting to build a Neutrodyne Set with parts which are not recommended and designed by the manufacturer to work with each other.

32-page illustrated book of instructions on “How to Build the Neutrodyne,” with full size pictorial wiring diagram and full size panel and baseboard templates, $1. At your Radio Dealers.

Freed-Eisemann Radio Corporation

SPERRY BUILDING
MANHATTAN BRIDGE PLAZA
BROOKLYN, N. Y.

DEALERS!
Write for Name of Nearest Distributor.

NOW the opportunity is presented to obtain a complete set of parts, recommended by the manufacturer, to work with each other in building your Neutrodyne set. An illustrated 32-page book on how to build the Neutrodyne with full-sized diagrams and templates included.

Complete With Full Instructions
$80

Front View KD-55 Neutrodyne Being Assembled