LIST OF BROADCASTERS—(Continued in this Issue)

15c. a Copy October 20 $6.00 a Year

1923

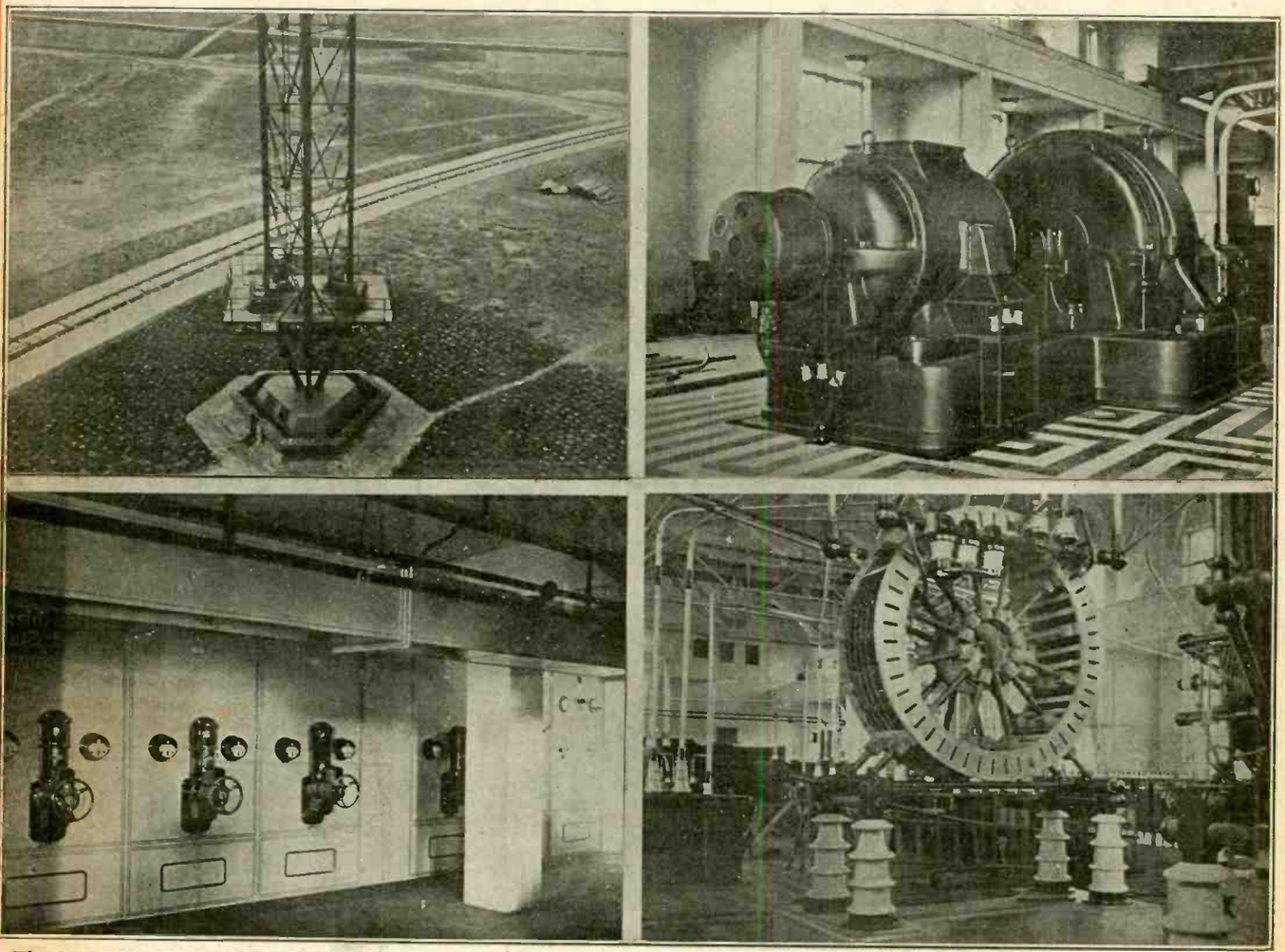
RADIO WORLD

Title Reg. U. S. Pat. Off.

WORLD

ILLUSTRATED EVERY WEEK

VIEWS OF HOLLAND'S NEW HIGH-POWER RADIO STATION



The upper left picture shows the foot of the 210 meter antenna mast. Below is an interior view of the switch cells in the basement of the station building. At the upper right is a picture of the high-frequency generator and its driving motor. The photograph at the lower right shows the antenna air transformer. A detailed description of this powerful and interesting station will be found on page 3 of this issue.

HOW TO BUILD A STORAGE B BATTERY (See Inside)

The Wireless Oracle

By Hirsch M. Kaplan

Station WDAP offered Harry Davis and the Drake Hotel Orchestra, who sure did keep us awake with their jazzy program.

The Gibson Mandolin Club, through WGY, rendered a program of splendid mandolin music. Following this the WGY Student Players presented a popular play entitled "The Romantic Age."

To my surprise, when tuning in, I happened to turn my loop in a northwesterly direction and who should come booming in but own old friend WLAG. They were offering dance music by the Dugar Orchestra.

Did you ever listen-in on Bob Stewart and his Jordan-Lewis jazz band about 7 P. M.? It's good stuff. Helps to digest the meals. Just tune in on 509 meters and there you are. Another good thing about WIP is that they give us the baseball scores first. The other night WOR kept us waiting until about 8 o'clock. Gosh! If we have to wait that long we'll have to go out and buy a paper.

The Westinghouse Band through Station KDKA kept us in good spirits by playing many of the old familiar marching tunes.

Jack Kaplan and his Drake Hotel Orchestra came bustin' through from station WDAP. Bet Jack's bunch occupies one of the upper rungs of Chicago's ladder of merit.

Another rare treat that was enjoyed was the Melody Makers of the S. S. "Berengeria." Would like to hear them more often, wouldn't you? They broadcast through Station WJZ.

Mrs. George Regensburger, soprano; Chester A. Gerst, baritone, and Hymen Diamond, violinist, will please accept these few lines as "tangible evidence" that here's one guy who liked their offering from Station KDKA.

Our friend Burr McIntosh, formerly at Station WEAF, is now located at Station WJZ. We wish you the best of luck, and trust you will enjoy your new quarters.

Government Wants Radio Operators

THE United States Civil Service Commission announces an open competitive examination for radio operators.

Receipt of applications will close November 20. The examination is to fill a vacancy in the Bureau of Agriculture Economics, Department of Agriculture, at an entrance salary of $1,400 a year, plus the increase of $20 a month granted by Congress, and vacancies in positions requiring similar qualifications.

Applicants must have completed eight grades of common-school or equivalent education, and have had at least six months' experience as commercial radio operator on board a vessel or at a wireless telegraph station, or one year's general experience as radio operator in other than commercial work.

Competitors will not be required to report for examination at any place, but will be rated on the subjects of education and experience.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the board of U. S. civil service examiners at the post office or custom house in any city.

DX Nite Owls, Attention!

THE DX season is nearly upon us.

All faithful DXers are requested to get ready for the fray and prepare themselves for the night vigil.

Send your records to the Editor of RADIO WORLD.

Write only on one side of the paper and write clearly.

Give full particulars of your location, your set, your aerials and other items of interest.

VOLUME FOUR OF

RADIO WORLD

[Entered as second-class matter, March 28, 1922, at the Post Office at New York, N. Y., under the Act of March 3, 1879]

A Weekly Journal Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Lackawanna 6976.

Vol. IV, No. 4. Whole No. 82 **October 20, 1923** **15c. per copy, $6.00 a year**

Holland's New High-Power Radio Station Is Now Completed

By Dr. Alfred Gradenwitz

INASMUCH as Holland, for communicating with Dutch India, had no cable line of her own to rely upon, the problem of providing a wireless service between mother country and colonies was bound to assume particular urgency. However, though preliminary tests had brought out the possibility of wireless communication between Java and Holland, considerable far-sightedness and daring was required to undertake the building of a radio station of a range twice greater than a transatlantic station. In fact, the scheme was likely to raise many new problems and generally to exert a stimulating effect on the planning of high-power wireless stations.

The new station, recently completed by the Telefunken Company, is situated at Kootwijk, near Apeldoorn, Holland, and mainly insures a duplex service with the station of equal size and capacity erected by the Radio Department of the Dutch Indian Colonial Office, at Malabar, near Bandoeng, Java. The distance between the two stations is 11,500 kms., the shortest line of connection passing mainly overland, crossing about half way the mountains of Central Asia and being, during the northern summer, wrapped up for about three hours, and during the northern winter, for about seven hours, in complete darkness. The Dutch receiving station is temporarily situated at Sambeek, about 60 kms. to the north of Kootwijk, whereas the Indian receiving station has been installed at Tjangkring, about 25 kms. away from the transmitting station. This, however, is only a provisional arrangement, it being contemplated eventually to control both the transmitting and receiving services from central stations situated in large cities.

The unique and interesting government radio station just completed at Kootwijk, Holland.

Station Building.—Inasmuch as Kootwijk Station is a solitary building lost in the midst of vast sand dunes, the architect called upon to plan a station house of monumental outlines, yet adapted to its actual purpose, had a most difficult task to solve. While a similar problem in the case of Nauen had found a successful solution, a point was made of creating something decidedly new. This was done by choosing in the place of bricks, concrete and iron as building materials, and thus warranting from the outset an essentially different conception. Moreover, in the place of the cross arrangement adopted for the ground-plan of the Nauen station, a simple rectangular ground-plan was chosen, as primarily entailed by the huge engine hall. A separate, well articulated tower and cupola being adopted for the antenna wire admission, the whole building was given overpowering effects hardly to be equalled with such simple means. The dignified character of this building cast of concrete and devoid of any ornamental decoration is even enhanced by the skilful arrangement of a forecourt encompassed by a concrete wall, where the cooling tank has been installed.

Antenna System.—In opposition to Nauen Station, where the antenna wires are suspended from steel cables passing over the tower tops, the antenna system of Kootwijk Station was, without any roof cables, fixed immediately to the tops of the towers, thus reducing the sag and insuring greater ease of manoeuvering. The antenna system is what is termed a concentric sheet antenna, comprising a cen-

(*Concluded on page* 12)

A Circuit for Real Clarity plus Distance

By R. L. Dougherty

AMATEURS and builders have become so accustomed to using tubes as detectors that they have totally forgotten or disregarded the fact that the crystal is a wonderful detector. It is, as a rectifier of the high-frequency currents which carry the voices and music, unsurpassed for faithful reproduction. No matter what tuning system you use with a tube, when you reach a certain point in the adjustment, distortion is bound to show itself. To prove this, listen in on a crystal detector set to a violin or organ solo (the two hardest instruments to reproduce faithfully), with their undertones and overtones, and you will realize how true this statement is.

With this idea in mind, and knowing that to be successful the average set must at least have the ability to get distance, the following circuit is described. It does not incorporate regeneration because you cannot obtain regeneration with a set using a crystal as a rectifier.

The circuit consists of a tuner, one stage of tuned impedance radio-frequency, one stage of transformer coupled radio-frequency, crystal detector, and one stage of audio-frequency amplification for use with a loud speaker on any signals that may be heard with the headphones in the crystal detector circuit with anything like fair volume. With the faint signals, those just faintly heard, the phones should of course be plugged in on the audio-frequency amplifier.

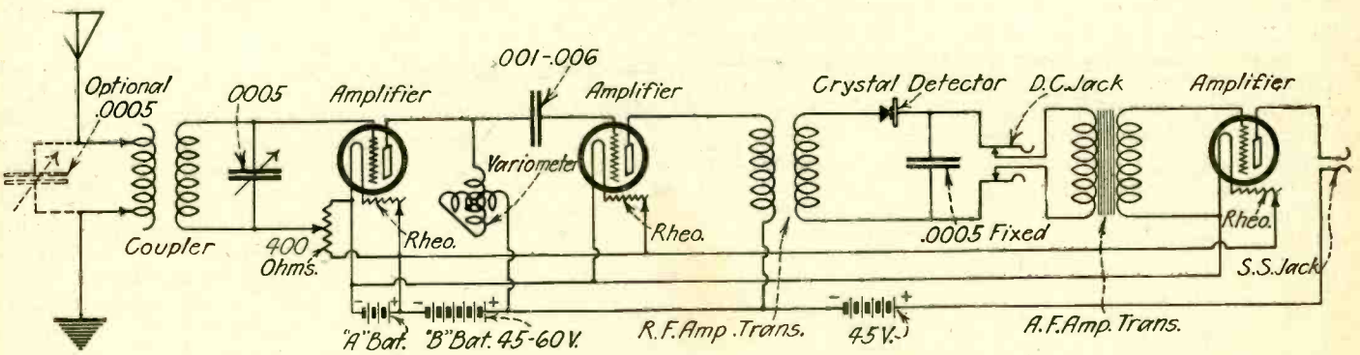


Fig. 1. Schematic diagram of a three-tube receiver comprising one stage of tuned radio-frequency, one stage of transformer coupled radio-frequency amplification, crystal detector, and one stage of audio-frequency amplification.

The first consideration in the building of this receiver is the type of tuning device to be used. A double circuit is shown and should consist of a well made variocoupler. A variometer may be used and the circuit made a single circuit but the disadvantage of broad tuning to a slight extent will then be experienced. When purchasing this piece of apparatus it is not advisable to get one of the bank-wound, long-wave type, as the radio-frequency circuits will only respond to 600 meters anyway. Confine yourself therefore to buying a good coupler of the 600 meter variety. There are a number of *good ones* on the market. The condenser across the primary is optional, which means that it may or may not be used, depending upon the final degree of selectivity the builder wants. The condenser C1 shunting the secondary should be of .0005 mfd., which will be sufficient for all needs.

In the purchase of a variometer for the radio-frequency circuit be sure the one you buy does not use any binding agent whatsoever to hold the wires tight. There are several made incorporating a spider-web former to hold the wires. Some even recess the stator in such a manner that all that is necessary is to use a bracket of non-metallic material to hold the wires in place. To use a variometer which is coated with shellac or cement is to kill the effectiveness of the circuit and you will be disappointed in the working of the circuit.

The condenser in the grid circuit of the second tube is a fixed condenser, or what is known as a "stopping" condenser. Its value varies with the particular tube used. A good plan in buying the condenser would be to include a small 11-plate condenser and place it in parallel with the fixed condenser, thereby getting the advantage of a fixed variable condenser and one which you can vary to suit the conditions prevailing.

The radio-frequency transformer should be for all purposes one that works efficiently over a comparatively small band of waves, say from 200 to 600, and which does not depend upon taps or bridging apparatus to change its wave length.

The crystal detector may be any style, although a good synthetic crystal with heavy catwhisker is preferred. Galena is very sensitive, but has the bad habit of needing constant readjustment every now and then by reason of its being a rectifier which needs an extremely light contact. This contact is generally made with a No. 36 or 38 copper or gold wire and is very likely to jar out every time you tune your set. Obtain a good crystal detector, strongly made and dustproof and mount it on rubber or springy contacts so that it will not be subject to jarring out. Use flexible leads in this part of the circuit when hooking it up to lessen any chance of a jar affecting the contact and you will not have to worry about your concert being spoiled by hunting for a new "spot" every time you breathe too heavily.

Any good make of audio-frequency transformer may be used, but be sure you obtain one that is well suited to the tube you are going to use. Entirely too little attention is paid these days to the internal characteristics of tubes and therefore the transformers to use with them. The internal impedance of tubes varies greatly with each different type. Whenever a new tube comes out the manufacturer generally names some specific impedance and you should go to the trouble of investigating among the transformer manufacturers to see which one will suit your particular type of tube best.

Little can be said on the actual construction work that has not appeared in other articles. Solder your leads carefully, keep them well insulated and in general follow all the good rules laid down by the men who know how a set should be constructed.

Fans may run away from the idea of a crystal de-

tector for a receiver, but once you try this type, even though you have to use radio-frequency amplification, you will become a crystal fan. The absolute faithfulness of all the tones, and the crystal-like clearness of the spoken words will convert you into a believer in crystal rectification in five minutes, and you will wonder why you have been using the noisy regeneration with a tube that makes it hard to understand even local stations when the set isn't "perkin' just right." The loss in distance experienced by the use of the average crystal is made up for by the radio-frequency amplification tubes, and you really do not lose a thing. As a matter of plain fact, you gain that clearness which is so necessary to perfect loud speaker work.

A word as to the operation of the set will be of advantage to most builders. As a crystal detector is to be used, you will have to find a sensitive spot on the crystal before you can hear a thing. This is best accomplished by using a buzzer test as outlined in Fig. 2. This is nothing more than a 20-turn coil in the circuit of a buzzer as shown. When tuning up, place this coil in inductive relation to either the coupler, or the second radio-frequency circuit (preferably the first—the coupler) and start the buzzer going. Use close coupling on the circuit and "feel" around on the face of the crystal for a sensitive spot, at the same time varying the variometer. When the signals are as loud as possible, leave the variometer set, and continue to search for a real sensitive place. When the buzzing of the test circuit is clearly and loudly heard, leave the detector alone, turn off the test circuit and proceed to tune your primary circuit as you would normally. When you have finally tuned that, go over to your variometer and tune that circuit until the voice or music is loud, clear and crystal sharp. Then vary the coupling of your coupler and the condenser shunting until it is perfectly even and clear and with no interference.

The tubes used throughout must be amplifying tubes. If you want to use the UV199 it is perfectly easy to do it, but you must place a 3.5 or 4.5 volt grid battery in the grid lead of the last tube. This is always necessary when using these tubes for audio-frequency amplifiers.

It may take the average fan some time to get used to the operation of the circuit, as there will be no squeals to tune by, only the voice or music. The radio-frequency circuit can be made to oscillate by the re-radiated wave of a nearby receiver which heterodynes the carrier of the station being heard, which will cause a musical note of varying pitch, but this is not the fault of your receiver, but is caused by the improper operation of the tube receiver which is re-radiating.

Employ the best of apparatus throughout, use plenty of B batteries in the audio-frequency circuit and do not try to make the one 45-volt B battery supply both the radio and audio-frequency circuits, if you want real volume in the audio-frequency circuit.

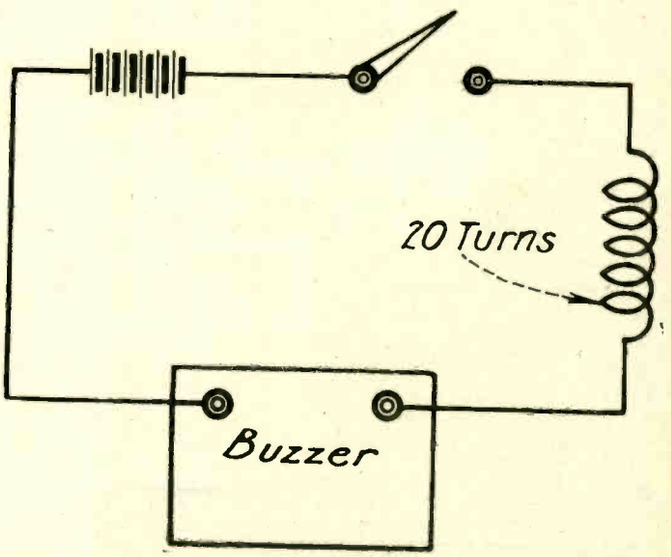


Fig. 2. Buzzer test to allow the builder to adjust his crystal to its best point. The coil may consist of any size winding, either small or large, and the buzzer should be of high pitch, preferably around 500 cycles. These devices may be obtained at any radio store under the name "high frequency buzzers."

Federal Radio Committees May Consolidate

THERE are today in the Capital two governmental inter-departmental committees on radio and allied electrical communication, but they may be combined. Besides the so-called State Department Committee, there is the one organized by Secretary of Commerce Hoover in April, 1922, to advise him pertaining to the administration of radio matters.

The Commerce Committee at first handled only radio broadcasting for the eight departments concerned and advised concerning governmental radio stations handling official and emergency public traffic. Later it broadened its scope to cover all radio activities of the government so that it could serve Secretary Hoover as a practical advisory committee similar to the committee authorized in the White Radio Bill.

The departments represented on the two committees are practically the same, except that the Departments of Interior, Justice and Labor, and the Bureaus of the Budget and Inter-State Commerce Commissions are not represented on the State Department Committee. The State, Treasury, War, Post Office, Navy, Agriculture and Commerce Departments, and the Shipping Board, have representatives on both committees, six officials serving on both committees.

Although some distinction in the work to be handled by the two committees is readily apparent, much of the departmental coordinating work to be undertaken by the State Department is understood to have been done or started by the Commerce Committee.

Solicitor S. B. Davis of the Commerce Department. presides over Mr. Hoover's committee, which has been functioning for nearly a year and a half, and has become practically a permanent coordinating board. Recently this body elected L. E. Whittemore, formerly a radio expert of the Bureau of Standards, as secretary. Mr. Whittemore has an office in the Department of Commerce building, where he devotes all his time to committee work.

The general problems before the two interdepartmental committees are so much alike and the personnel is so similar, that many experts and some governmental officials believe the two committees are duplicating work and should be combined or at least coordinated in the interest of efficiency. The time of six of the representatives who have to attend the sessions of both would at least be saved.

Annual Radio Show in New York Attracts Crowds

THE American Radio Exposition opened Saturday afternoon, October 6, to the greatest crowd ever assembled to witness a radio show. People stood impatiently in front of the doors for fully an hour before opening time.

(C. Photonews)
Lillian Gary and Mary Roberts listening in on one of the latest type console grand receivers designed and manufactured by the Colin B. Kennedy Co. The receiver is a three-tube regenerative enclosed in a Spanish walnut cabinet desk, with batteries, phones and loud speaker concealed in the side compartments. The receiver shown has gold plated controls.

There were 71 exhibitors in this year's show. Their exhibits were arranged more to signify comfort in the home than to bring out the technical points of radio.

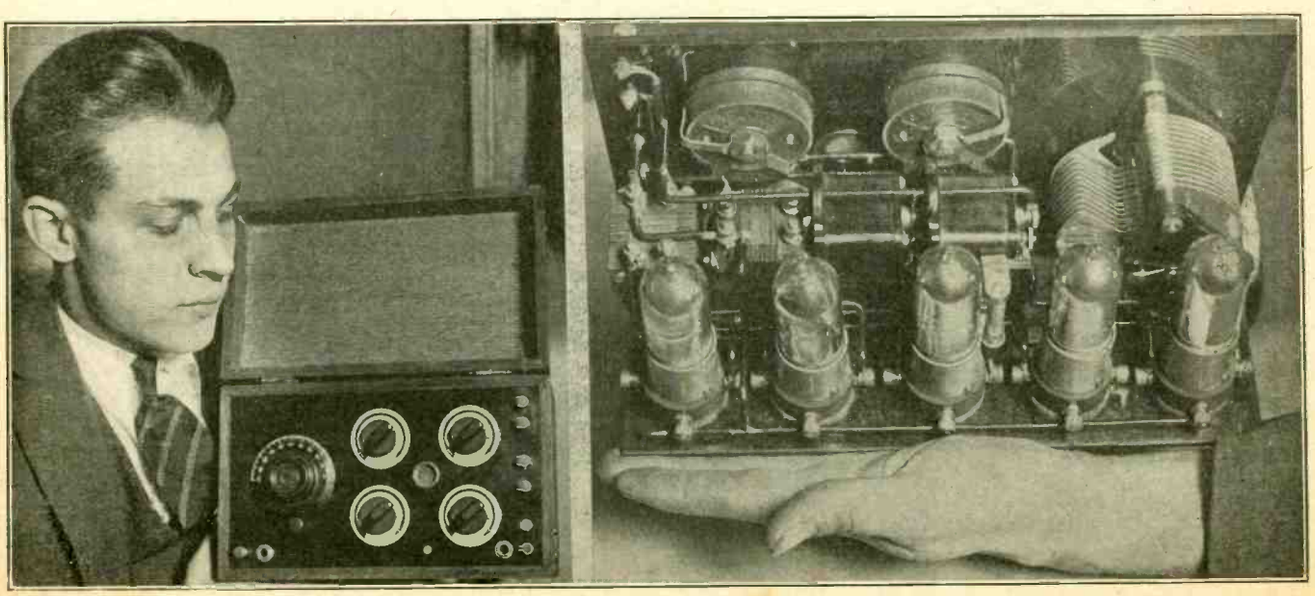
Probably one of the most interesting exhibits on the entire floor was the machine used to wind coils, magnets and honeycomb coils for sets. This exhibit was the Coto Coil company's, and constantly attracted a crowd.

Another of the big features of the exhibition was the amateur builders' contest. There were over thirty very fine specimens entered the first day. Most of the exhibits would stand out favorably against the manufactured work. Some used plate glass for panels.

The Radio Corporation of America had two interesting exhibits. One was a large relief map of the Japanese earthquake, with the radio station at Iwaki, as the only thing standing. Two Japanese girls dressed as geishas were there to explain the map in detail, and though people read page after page of it, the graphic representation of the disaster, with everything shown so realistically was sure to impress it more firmly upon their minds. The other was an exhibit of old-time apparatus.

From the exhibits of the manufactured sets, it was shown that the trend of the makers of high class standard goods is toward making radio receivers as near ornamental furniture as possible. Probably the best of these exhibits were those of Cutting & Washington and the Colin B. Kennedy Co. Comfortable chairs were placed to invite the curious to stop, rest, hear, and be convinced. Many an old hardened "ham" who likes to see the business-like appearance when considering radio apparatus, stopped to gaze in wonder at some of these works of art—gold dials, neatly finished cabinets, or console grand, period furniture. But more important, they were wonderful receivers as well.

The Western Electric exhibit also attracted much attention. A complete broadcasting equipment, motor-generator, transmitting panel, control panel, public address amplifier, everything as used by the companies



(C. Kadel and Herbert)
One of the amateur exhibits that attracted a great deal of attention. The receiver was constructed by Sydney Kasindorf, a Bronx, New York City, amateur. It consists of two stages of radio-frequency, detector, and two stages of audio-frequency, using five UV-199 tubes for operation on a loop. Observe that it can easily be carried on the palm of the hand. Even though crowded into a very small space there is no interference due to intercoupling, on account of the arrangement of the apparatus.

when broadcasting were shown. Several of the engineers were there to explain to the curious how everything was done in a broadcasting station, and how simple it all really is.

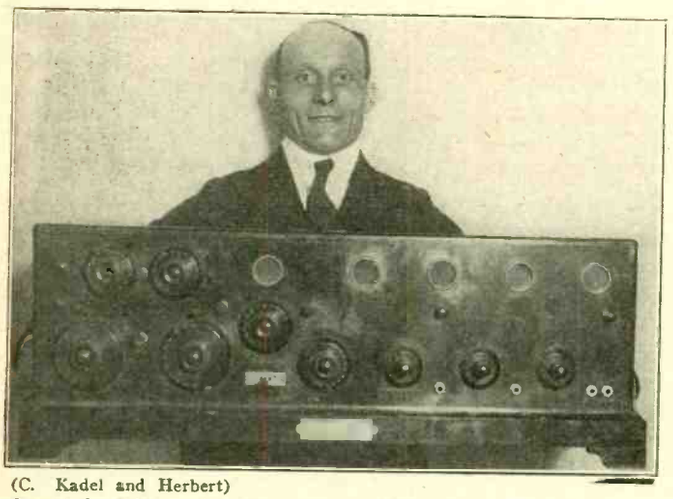
There was an interesting "movie show" held in the theatre on the same floor. It showed plainly the theory of radio and the manufacture of a vacuum tube by pictures.

The play-by-play description of every one of the World Series games was broadcast by means of the Western Electric public address system, during the latter part of the week.

Among many notables that appeared and spoke for the benefit of the spectators were: Major Andrew White, Alfred McCann, Dr. Lee De Forest, Benny Leonard, Babe Ruth, Eddie Cantor, Frank Tinney, as well as many of the officials of the A. R. R. L. and officers of the army and navy.

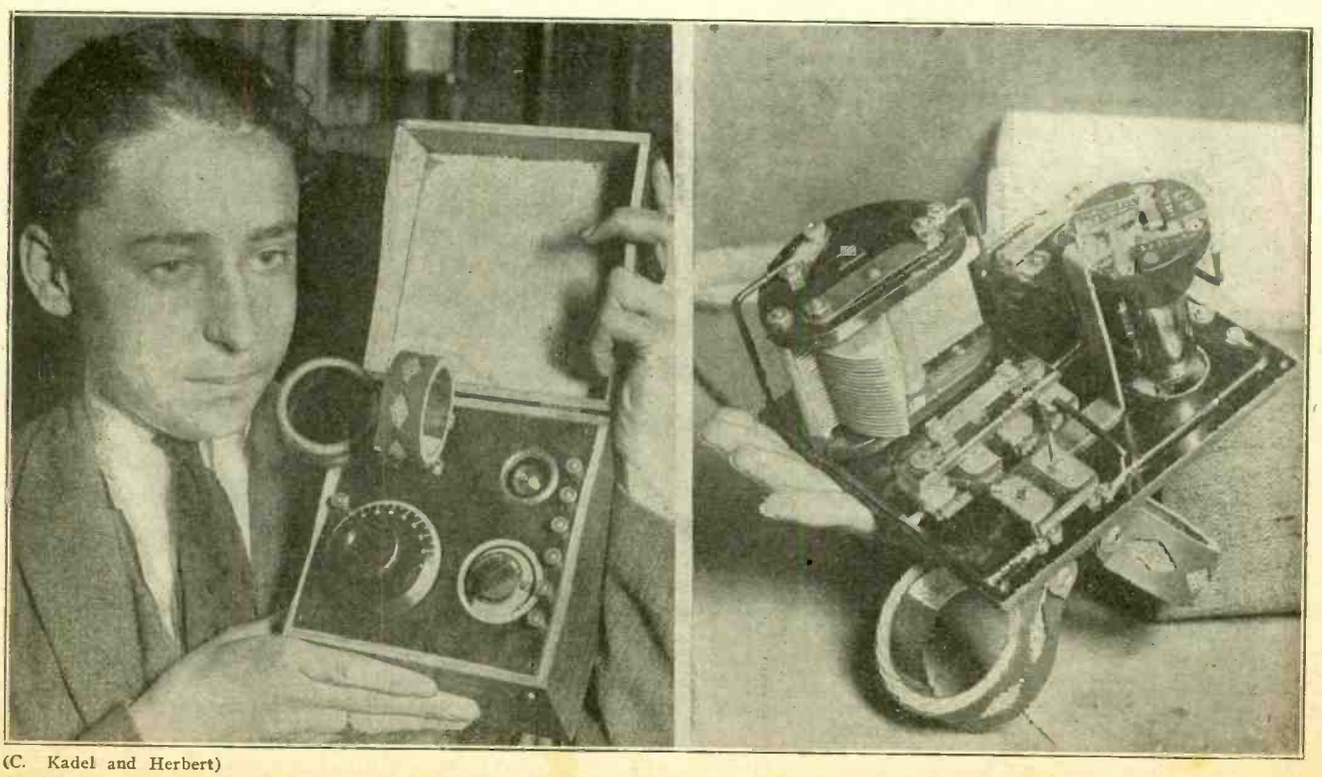
An exhibit which attracted the attention of everyone was the German field set captured during the engagement at Chateau-Thierry. This was at the U. S. Army Booth.

Donald B. MacMillan, the Arctic explorer, sent a telegram congratulating the management of the exposition on its efforts. This was put in a cake of ice and a light shining through it allowed every one to read it. Of course, the A. R. R. L. were busy as ever enrolling members and making friends.



(C. Kadel and Herbert)
One of the "big ones" at the amateur exhibit. The receiver shown is a three-coil honeycomb receiver with two stages of radio-frequency, detector and two stages of audio-frequency amplification. The honeycombs are mounted on the rear of the panel and are manipulated by means of a special gear arrangement. The set was made by John Willow, of New York.

(C. Kadel and Herbert)
One of the most interesting commercial exhibits at the exposition was this radio lamp. It is a combined table lamp and radio receiver, with the loud speaker in the base of the lamp. It is made in either the three, four or five tube combination, operates on either antenna and ground or small loop, and has but one tuning control no matter what system is used.



(C. Kadel and Herbert)
A miniature receiver made by Alexander Udoff, 16-year-old New York amateur builder. It is the Flewelling receiver, uses one UV199 tube and is a most complete and compact device. Take note of the very careful wiring and the manner in which the tube socket has been mounted to conserve space.

A Broadcast Receiver of Simple Design

By Raymond B. Gates

THIS article describes the construction and operation of a small regenerative set made entirely of standard parts.

Undoubtedly the single circuit regenerative circuit with unicontrol is the simplest type for the uninitiated and the easiest for the beginner to use. The design of such a receiver is comparatively simple and embodies all the desirable features of the average set.

All the apparatus used in the making of this outfit can be purchased on the open market. Only standard parts, to be found in almost every radio store, are listed in the following apparatus necessary for setting up the complete receiver, which will be the equal of many manufactured sets now available on the market; 1 cabinet, 7" x 10"; 1 panel, 7" x 10"; 7 binding posts; 1 variometer, with dial; 1 variable condenser, with dial; 1 dry cell tube socket; 1 dry cell tube; 1 grid leak and condenser; 1 22½-volt B battery; 1 dry cell; 1 rheostat; 4 lengths of bus wire and spaghetti;

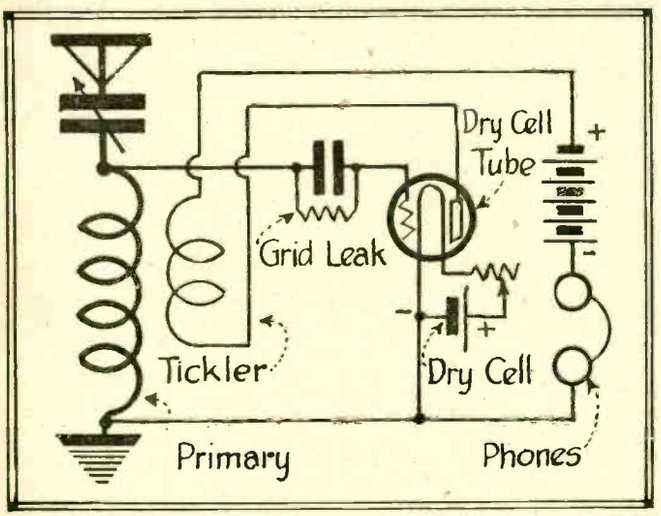


Fig. 1. The old reliable single-circuit receiver, utilizing the stator of the variometer as the antenna inductance and the rotor as the tickler. This method necessitates the separating of the leads, so it is best to purchase a plain ball-wound variometer instead of the split type.

1 coil antenna wire; 4 insulators; 1 lead-in insulator; 1 lightning arrester; 1 small coil lead-in wire; 1 ground clamp; 1 pair of phones.

The approximate cost of the above will be between $16 and $24. No actual prices can be given for any of the items listed, as they are subject to variations in different localities. A good set, however, complete in every detail, can be assembled for the price mentioned.

The panel should be of hard rubber or of some good insulating material, such as bakelite. The panel is laid out symmetrically. The dials of the variometer and the variable condenser are placed to the left and center of the panel. The knob for the rheostat is located 5½" up from the base and 6½" in from the left end to accommodate the variometer. Holes are drilled for the tube peepholes, the center one of which may be located three inches inside the edge. Binding posts are located on both the right and left hand sides, as follows: The top binding post on the left connects to the antenna and the lower one goes to the ground. On the right hand end the binding posts connect to the phones, plus and minus sides of the B battery, to the positive and negative terminals of the dry cell respectively.

After all the holes have been located they are center-punched and carefully drilled. A ¼" drill will be needed for the hole of the variometer and condenser shaft and a 3/16" drill will be suitable for the rheostat hole. The ¼" drill also can be used in drilling the peepholes. An ordinary ⅛" drill will enable the builder to complete the drilling for the binding posts and screwholes.

It is advisable to secure a piece of wood about 7" x 10" and about ¾" to 1" thick to be used as the base. This base is fastened by means of wood screws to the panel. It will provide the means of mounting the vacuum tube socket, the variometer and the grid leak and condenser. Of course, the clever constructor can find means of fastening the socket to the panel by using brackets and screws.

The base can be located conveniently back of the variable condenser and far enough in the back so that it will not allow the tube to interfere with its operation.

After all of the necessary holes have been drilled the variable condenser, rheostat and variometer should be put in place. Before the variometer is put into position, however, it will have to undergo a slight change in the wiring. A variometer is made up of a stator or stationary winding in two sections. Similarly there is a rotor or revolving winding which is placed on a rotor ball and revolves within the stator. Ordinarily these windings are connected in series.

Here are the essentials of a good tickler set: If the stator winding is detached from the rotor windings the stator may be used as a tuning coil and the rotor ball as the tickler coil of a regenerative feed-back set. It will be necessary, further, to trace the connections of the variometer, find the point where the stator is joined with the rotor and unsolder it. This will give two terminals for the stator and two for the rotor.

After these preparations have been made, wire the set with bus wire, as indicated in the diagram. It shows exactly how the various parts are connected together. Straight, short connections, over which can be slipped lengths of spaghetti tubing, complete a neat job.

The phones are connected to the two top binding posts on the right side. To the second and third are connected the positive and negative terminals of a 22½-volt B battery

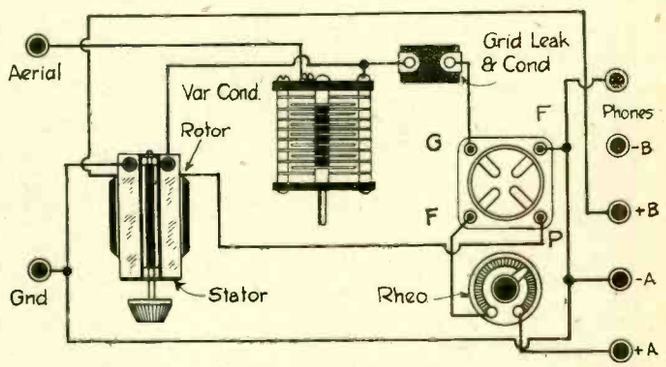


Fig. 2. Picture diagram showing the connection of the various instruments. Note the method of connecting the phones on the minus side of the B battery circuit, or rather between the B battery and the minus of the A. The layout should give some idea of the panel arrangement that can be planned.

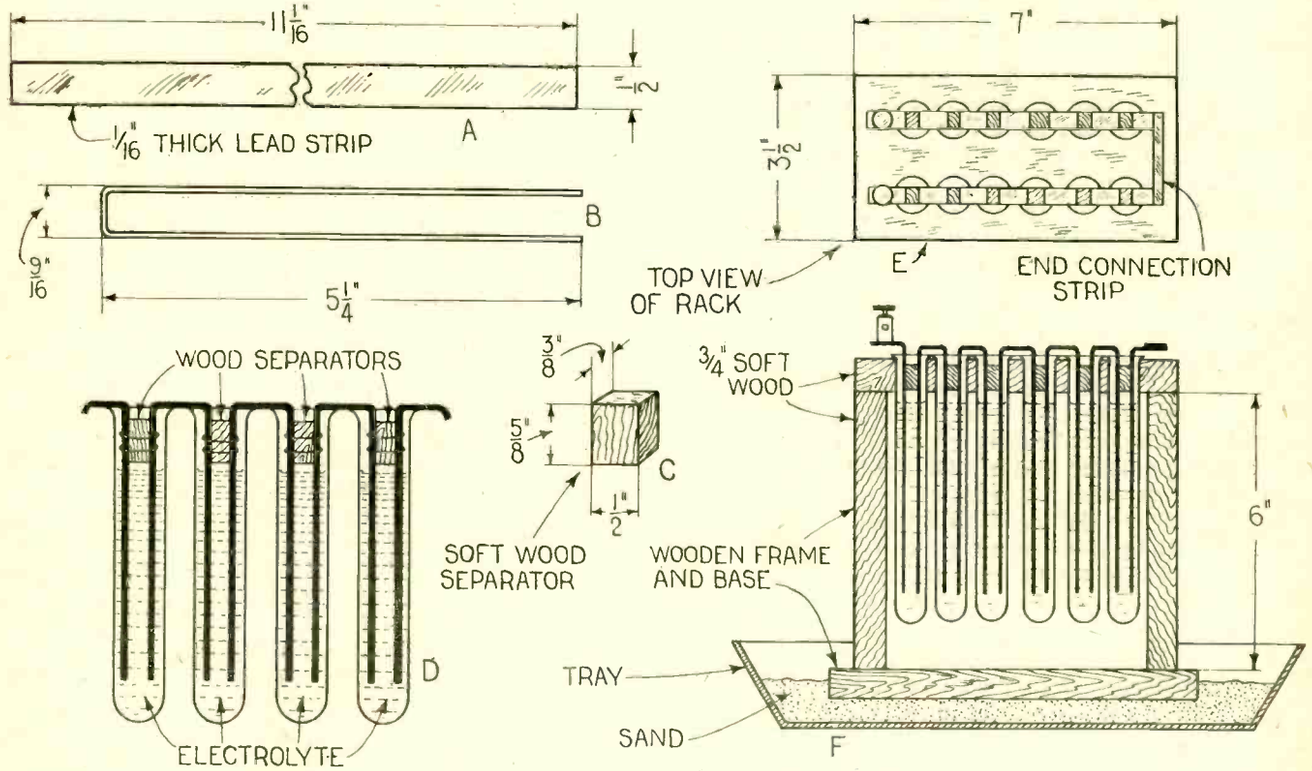
respectively. On the two bottom posts are connected the positive and negative poles respectively of a dry cell. The antenna then goes to the top left hand post and the ground to the bottom post on the same side. Next the tube is inserted in the socket and the rheostat gradually turned on until a dull-red light is seen. This is the correct operating point. To tune the set turn the variable condenser to tune the antenna system and then gradually adjust the tickler or rotor control. Signals will be brought in with the variable condenser and their loudness controlled by the tickler. By a careful and gradual adjustment of both controls it will be easy to find the position at which the best results may be obtained.

How to Make a Storage "B" Battery

By Leroy Western

CONSIDERING the simplicity of the proposition, it is surprising that very few amateurs undertake to make their own storage "B" battery. To purchase such a battery ready made is a rather costly proposition, especially if one desires to obtain a voltage up to 100 volts or even higher for power amplifiers. However, with some patience and diligence, even the most amateurish worker can succeed in turning out a storage "B" battery which will compare favorably with the finished product in performance and will be much less costly to him. If the following directions are carefully heeded, the best results will reward the maker for his time and trouble.

The first requisite is a quantity of lead strips, the exact number depending upon the voltage of the finished battery. We will consider one having a voltage of 24 volts and



Plans and specifications for the construction of a storage B battery. When constructing, use good hardwood for the standards and soak them in paraffin. Otherwise they will not last any length of time if acid gets on them. Keep the acid away from your clothes. Aqua ammonia is best to neutralize the action of the acid if it is used immediately.

9/16" from the end. These four are for the end connections.

Next, from soft wood, cut out as many blocks, 1/2" x 3/8" x 5/8" as there are to be cells. In our 24 volt battery 12 of these will be necessary. After cutting them up, they should be immersed in boiling paraffin until thoroughly saturated, then removed, allowed to cool and all excess wax scraped away. After these wood blocks are prepared, the various pairs of lead strips bent in U shapes should be arranged with their separators, as shown at D. The lead strips are held to the wood separators by means of rubber bands placed around the outside of the strips.

The next step is the construction of a suitable frame for holding the 3/4" x 6" test tubes used. If the builder has on hand a standard test tube rack, this may very readily be suitable for the operation of a single tube outfit. Several of these units can be made and connected in series to obtain desired voltages.

The strip lead necessary for the construction may be purchased from any hardware or plumber's supply store or direct from a plumber. It should be 1/16" thick and if bought in sheets can be cut up into 1/2" strips. These strips should then be cut to a length of 11 1/16". If the lead is purchased in sheet form, both surfaces should be thoroughly polished with fine sand-paper before cutting. If, however, it is bought in 1/2" strips, it will be necessary to polish each separate strip. This should be done carefully and if the metal is at all damaged, any dents should be hammered out, placing the lead on a soft wooden surface while so doing. After the dents are taken out, the metal should be polished. Great care should be taken in this process to assure a perfectly clean and smooth surface when finished. The strips are now bent as shown at B in the accompanying illustration. Four strips should also be prepared, 5 13/16" long with one end bent at right-angles pressed into service, but should be painted with melted paraffin before use.

If, however, such a rack is not available one may be very readily made as shown at E and F in the diagram. The top should be made of a strip of wood 7" x 3 1/2" x 3/4" and 12 holes should be drilled in the top as illustrated. These holes are to be 3/4" in diameter and should be spaced 1" between centers. The two rows of holes should be spaced 1 1/2" between centers. A suitable stand for this top is now made as well as a base and before assembling, the various strips are to be boiled in paraffin and then scraped in the same manner as the wooden separators. This feature is quite desirable as it will protect the wood from any chance acid that may be spilled upon the frame. The frame should next be fastened together with screws, whose heads are to be countersunk into the wood and then covered with melted paraffin. If care is taken in scraping off all excess paraffin the finished job will make a very presentable appearance.

(*Concluded on next page*)

The Radio Woman

A FRIEND of ours, who was badly injured in the war, recently came back from one of the large military camps where he was recuperating from his injuries. He could not engage in any business where he had to be really active, and as he did not want to work in an office all day, he opened a little radio shop in a suburban town near New York City. He and his wife take care of the place and they were telling me so much about it that I motored out to see them one day last week. They have a really nice little shop (really half a shop) and as luck would have it they are the only ones in the town catering to strictly radio business. I thought that I would give them a little holiday so told them to take the car for the rest of the afternoon and I would tend to the place. Well, everything went well until after school was out. Then the customers started coming in and——I never thought that a small boy in school could ask so many technical questions. I really couldn't answer over half of them, and of course I attempted some and they sounded so absolutely foolish that the boys laughed. Anyway, I was real glad when they returned and relieved me from my duties. Not that I didn't like it but——. I do not like to have questions flung at me from every point of the compass, and not be able to answer them. It makes one feel so foolish.

* * *

"Now that all the holidays are over for a while, and the big fight has happened, and America is still supreme in everything except prohibition, I guess I can afford to spend some time making up my new radio-frequency receiver," remarked F. H. one day last week. Well, I didn't say anything, because I know that between the time that he makes up his mind to make a set, and the time he actually buys the parts, that a dozen friends will advise him a dozen and one ways to get better results, with the final result that he will appeal to my final judgment as to who I think knows the most about it—that is, of his friends. A husband deciding to make up a set is worse than a dozen women deciding just what dress to wear at the euchre party and dance.

* * *

Doctors tell us that humans need excitement. Well, what can be more exciting than the following: Tuning in on a DX station that is very faint, hearing the end of the song, the beginning of the announcement, just up to the place "this is station——" and having some other set cross yours and go Wheeeeeeeeeee—hrumph—hrump wheeeeeeeeeee, and then hearing them say "Good night!"

Status of Broadcasting

SIXTEEN broadcasters closed down their stations during September, while fifteen new ones opened. This shows a loss of one broadcaster for the month, leaving 562 stations on the air. These stood as follows on October 1: 260 Class A; 45 Class B; 255 Class C, and 2 Class D (development).

Commercial Broadcasting Stations Deleted During September

Ten Class "A" Stations Quit

KFA	Doerr Mitchell Elect. Co., Spokane, Wash.
WLAZ	Hutton & Jones Elect. Co., Warren, Ohio.
WMAT	Paramount Radio Corp., Duluth, Minn.
KFHL	Penn College, Oskaloosa, Iowa.
KFHP	Radio Bug Products Co., Kearney, Wash.
KFDC	Radio Supply Co., Spokane, Wash.
WBAU	Republican Publishing Co., Hamilton, Ohio.
WKAC	Star Publishing Co., Lincoln, Neb.
WTAK	Swan-Bower Co., The Steubenville, Ohio.
WRAR	Thomas, Jacob Carl, David City, Neb.

Six in Class "C" Stop

WEAK	Abercrombie, Julius B., St. Joseph, Mo.
WDAJ	Atlanta & West Point R.R. Co., College Park, Ga.
KFAQ	City of San Jose, San Jose, Calif.
WHAY	Huntington Press, Huntington, Ind.
WPAF	Peterson's Radio Co., Council Bluffs, Iowa.
WRAB	Savannah Board of Public Education, Savannah, Ga.

Changes in Broadcasting Stations Last Week

Six New Class "A" Stations

		Meters	k/cs	Watts
KFKQ	Conway Radio Laboratories, Conway, Ark.....	224	1340	150
KFKV	Gray, F. F., Butte, Mont...	283	1060	50
KFKX	Westinghouse El. Co., Hastings, Neb.....	286	1050	500
KFLA	Wilson, Abner R., Butte, Mont.....	283	1060	5
WRAN	Black-Hawk El. Co, Waterloo, Iowa.....	236	1270	10
WTAP	Cambridge Radio & El. Co., Cambridge, Ill.....	242	1240	50

Four Transfers from Class "C"

WBAH	The Dayton Co., (B) Minneapolis, Minn.....	417	720	500
KMJ	San Joaquin Light & Power Corp. (A) Fresno, Cal..	273	1100	250
WKAY	Brenau College, (A) Gainesville, Ga.....	280	1070	10
WNAV	People's Tel. & Tel. Co., (A) Knoxville, Tenn.....	236	1270	500

(*Concluded from preceding page*)

The test tubes are now suspended from the holes, as illustrated at F, and filled to within 1" of the top with electrolyte. The latter should be prepared as follows: In a glass jar of sufficient capacity to hold enough electrolyte to fill all the cells, place a quantity of soft distilled water. If this is not available, carefully collected rain water will suffice. To this liquid, add about 30% by weight of chemically pure sulphuric acid. That known as "eighteen thirty-five" acid should be used. This merely means that a pint of the acid weighs 1.835 pounds. *The acid must be added very slowly and carefully to the water,* stirring the solution continually and allowing it to cool as much as possible during the mixing. Considerable heat will be evolved during the process and, therefore, everything should be done very slowly and carefully. *Never add water to acid* as a miniature explosion is liable to occur and acid may be thrown into your face. When the solution has cooled, it should read approximately 1.275 on a standard battery hydrometer scale. This solution is now poured into the cells and the entire assembly made as shown at F. On top of the electrolyte about ⅛" of paraffin oil should be placed to prevent evaporation. If evaporation does occur, a small quantity of distilled water should be added to the solution to bring it up to its former point. This can be placed directly on top of the paraffin oil and it will sink through the oil into the solution. After ascertaining how much of the lead will be above the surface of the acid and exposed to the air, coat those portions with vaseline.

After the assembly is made as shown, place the entire battery in a tray partially filled with sand. This precaution is taken so that if any acid spills from the cells or they become over-heated and boil over while charging or discharging, the acid will do no harm to surrounding objects.

RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS

Radio apparatus should be sold upon a merchandising basis and not as engineering equipment which costs so much money. —Powel Crosley, Jr.

* * *

A special amplifier for political spellbinders relieves the strain on the speaker's voice. What is really needed, however, is a device that will relieve the strain on the listener's intelligence.—Life, New York.

* * *

Jack Binns, radio editor of the New York Tribune, has written a novel called "The Flying Buccaneers." It is about piracy in the higher air strata. Whether radio is mixed up in the action is not known, but the probabilities are that it is.

* * *

Israel Zangwill, the well known Zionist, playwright, author and lecturer, on his arrival in New York from England last week, handed the waiting reporters a prepared statement most Philistinish in character. One of the gems of news it contained was: "Yes, I have never even heard broadcasting."

* * *

Jimmy—You take this wireless receiver I just finished makin' and go downstairs in the cellar; hold it close to your ear and listen.

Freddy (after waiting in suspense for several moments in the cellar)—Aw—it's a fake, I didn't hear a thing.

Jimmy—Good. That shows it's workin' right. I didn't say anything yet.—Boston Transcript.

* * *

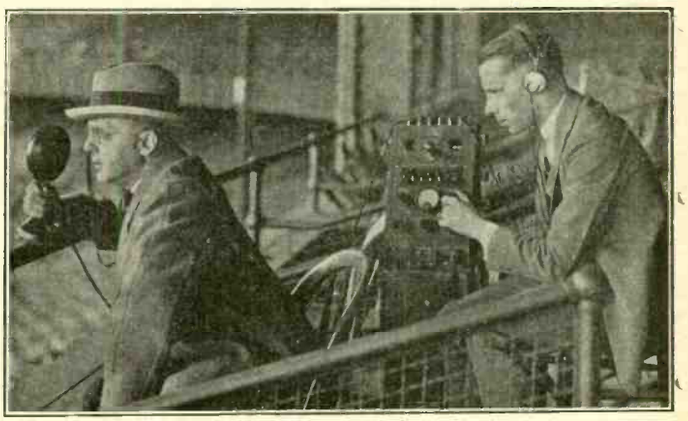
Several speeches to be made by the Hon. David Lloyd George will be broadcast by the American Telephone & Telegraph Company during the former British premier's tour of the country between October 6 and November 2. It is understood that speeches will be broadcast through stations of the telephone company or co-operating stations from Mooseheart to Chicago, St. Louis, Cleveland, Washington, D. C., and New York City.

Literally speaking, radio has the country "by the ears."—Station WOC.

* * *

Adam's original sin was purely mental, consisting of yielding to vanity aroused by Eve's presence, according to Pere Coupil, who recently broadcast a wireless sermon from Paris, France.

Radio Reports World Series



(C. Radio Corp. of America)

Major J. Andrew White, who announced the play-by-play returns of the World's Series for Station WJZ, is shown giving the fans one of the many thrills they received over their sets. Land lines connected the power speech amplifier direct with the station at Aeolian Hall, New York.

RADIO PRIMER

HOW TO MAKE PERFECT INDUCTANCE COILS

WHEN constructing a radio set in which the coils have to be home-made, the amateur is apt to dislike the job. Nine cases out of ten the coils are very badly wound and have numerous defects which can easily be overcome.

The first thing to avoid in the winding of coils is the use of any binding material such as shellac or anything which might cause the coils to have distributed capacity. If you wind a coil carefully on a proper former, you need have no fear of the winding loosening. To prevent any chance of this occurring always use a bakelite former, or else a cardboard former which has been well soaked in paraffin and the excess paraffin allowed to drip off. Then take two thin strips of adhesive tape and lay them lengthwise along the former, one on each side. When the wire is wound, they will groove and finally harden, holding the wire in place.

When winding a coil manually, it is a rather tedious job unless there is some means of holding the wire taut and at the same time arranging it so that it will fall into place as the next turn without manually guiding it. This can be accomplished, however, in the following manner: Select some large or fairly large place, where there is at least 12 to 15 feet space. Hang the roll of wire up on a string so that it can feed without tangling. On the floor about three feet from the spool, arrange three staples (sometime called U tacks) in a staggered manner. Place one directly under the center of the roll then about 3″ in front, and a foot off center and about 4″ in front place another tack. The third tack will be placed an equal distance to the opposite side of the first tack, and about 4″ in front of the second one. Run your wire through the three tacks, and take your place with the coil to be wound, across the room. Sit down in a chair, and holding the coil with both hands, commence to turn the coil counter-clockwise, feeding the wire over the top of the coil. The tacks will be found to exert enough of a drag on the coil itself to allow tight winding, and at the same time will straighten out any bends in the wire, making it absolutely straight.

You can easily guide the wire by turning the coil a slight bit. This allows you to get every turn right next to the first one and makes a neat looking job. The fact that you are working the wire under tension also makes a tightly wound coil that will not work loose.

If while you are winding the coil you desire to tap it, it should be done in the following manner: Holding the coil tightly around the last turn to prevent it slipping, make a loop with your free hand. This loop should be made in a section of the wire right near the coil. Take up the slack, before removing your hand from the last turn, and then continue winding. Any number of taps may be taken off in this manner, even to tapping each turn. The taps should be staggered so as to prevent more than one falling in the same line in the finished coil.

If when winding a coil the writer calls for a certain number of turns, wind on just that many. You may think that you are doing something great by winding on more, but the chance is that the dead-end losses involved will eat up the energy and cause you no end of worry. Large coils have great losses due to resistance and unless you have a definite idea in the winding, follow directions.

Bank winding cannot be done very well by hand, as a means of holding the coils rigid must be had, so the former is generally held in a simple winding jig.

Holland's New High-Power Radio Station

(*Concluded from page* 3)

tral pole 210 meters high, round which five poles of equal height have been installed 450 meters apart and in a circle of 450 meters' radius, so as to form four equilateral triangles constituting the four antenna sectors. This system is something like an umbrella antenna, open on one side with outer poles of the same height as the central pole. Each sector comprises an outside cable and carrying cable to which the four radial wires are fixed. In order to prevent the wires being torn by violent gusts or heavy hoar-frost load, the two outer angles of each triangle, so far from being fixed rigidly to the tops of the poles, have been attached there to cables running over pulleys and communicating with heavily weighted pulley blocks at the foot of the poles. Each antenna sector can be lifted within 1 to 1½ hours and lowered within ½ hour. The supply conductors of the antenna are arranged parallel to the central pole at about 20 meters' distance and each supplies two sectors. The capacity of the present antenna system is 30,000 cms., its natural vibration being 5,800 meters. After installing another pole, the umbrella antenna could be completed, thus adding another two sectors and raising the capacity to 40,000 cms.

Ground Connection System.—The ground connection system has been designed according to the latest results of scientific investigation and enables loss resistances to be reduced to a fraction of what they have so far been, the underlying principle being to introduce the antenna current into the ground as far as possible at those points where the electric flux from the antenna enters the ground. The ground connection system is made up of 24 bronze wire stars dug into the sandy soil and combined in three sets or rings, the outermost of which lies well beyond the antenna projection. Each of these rings communicates with the station building by an overhead connection of its own, fixed to wooden poles 20 meters high, with free spans of up to 200 meters. After radiating toward the central pole, they are thence in the form of a wire harp introduced into the interior of the concrete tower of the transmitting station, thus surrounding the antenna system inside the building with ground conductors in cage fashion and shielding the antenna field from the walls.

The Antenna Poles.—Each of the six steel girder poles 210 meters high has a weight of 90 tons and is retained by three sets of four staying cables. There are no intermediary joints, while the foot comprises the familiar ball joint. The iron structure has the cross section of an equilateral triangle. The retaining cables, which are branched out close to the points of fixation of the pole, are made up of parallel steel wires and terminate in concrete blocks inserted into the sandy soil and loaded with a sand-weighted masonry structure. The pole is insulated from the ground by six columns, each of four porcelain insulators placed above one another.

Source of Energy.—Kootwijk Station has no power house of its own, but derives its current from the 10,000-volt overhead lines of the Gelder Provincial Electric Central Station. Having been stepped down to a pressure of 3,000 volts, in a special transformer cabin situated at about 600 meters from the transmitting station, the electrical energy is supplied to the station building in a double cable.

The high pressure switchboard of the transmitting station is located in the basement and comprises six switching cells and spare switching cells as well as the usual oil switches, maximum switchouts, separating switches, etc. The 3,000-volt electrical energy is without any further transformation supplied to the asynchronous motors of the high-frequency generators. Two special transformers, each of 100 kw, have been provided to reduce the pressure from 3,000 volts to 220 volts for feeding the auxiliary motors, e. g., those of the oil pumps, ventilators, three-phase current-continuous current converters, etc. The asynchronous motors, which are coupled direct to the high-frequency machines, have an output each of 750 h.p., with 1,500 r.p.m., and comprise built-in ventilators providing ample air-cooling. Special attention has been given to the cooling of the high-frequency generators themselves, the stator as well as the casings of the two bearings being permanently rinsed by fresh water, while built-in ventilator blades carry away the heat from the interior of the entirely enclosed machines into the open air through amply dimensioned exhaust air channels.

Transmitter Plant.—Each of the two 6,000-cycle generators supplies 550 KVA at a pressure of about 900 volts between terminals, which is, first of all, doubled by an oil-cooled voltage transformer installed between the two machines. The current then passes through a separating switch into the first circuit, tuned to the fundamental frequency of 6,000 cycles by oil condensers and the self-induction of the first doubler. After being first doubled (to 12,000 cycles) in a second circuit, there is either effected a further frequency doubling in a third circuit (to 24,000 cycles) or a frequency tripling (to 36,000 cycles). Moreover, 18,000 cycles are obtained by immediate tripling of the fundamental period and 48,000 cycles by raising it to a figure eight times as much in another frequency transformer. An antenna-air transformer transfers this frequency to the antenna, which is tuned by acting on the variable self-induction. With short-circuited rotor resistance, the station thus has the following wave lengths at its disposal: 16.8 kms, 12.6 kms, 8.4 kms and 6.3 kms. These waves are adjusted simply by actuating the wave switch by hand, while the tuning of the antenna is effected by an electro-motor operating the contact arm of a variometer and which is controlled from the switch desk by push button control.

The sender key is operated by switching in and short-circuiting resistances in the first circuit, which is effected by a set of relays constituted by 12 series-connected electro-magnets. These are controlled by continuous current and cooled by an air current generated by a special blower in the cellar. An alternative method consists of actuating a choking coil whose self-induction is altered at the rhythm of Morse signals by means of a continuous current magnetizing coil. The passage from one method to the other is effected by simply reversing a switch lever. The frequency transformers are located in large oil-filled iron cases, special pumps throwing the heated oil into big cooling serpentines installed in the cooling tank above referred to, and drawing the cooled oil in again.

Water Supply.—Inasmuch as the ground-water level in the sandy soil is at the considerable depth of 25 meters, two shafts lined with concrete pipes 5 meters in diameter were sunk, the water being thrown into two elevated reservoirs by two electrically operated pumps installed immediately above the water level. Three lines of 5-inch pipes, starting from the elevated reservoir, supply water to the various points where it is required, e.g. to an elaborate fire-extinguishing system reducing the danger of fire to a minimum.

An electric searchlight installed on the water tower gives out an intense bundle of light-beams and warns airmen of the dangerous proximity of the high masts and antennae suspended therefrom.

Super-Selector Improves Reception

By C. White, Consulting Engineer

SOME radio fans are blessed with more broadcasting stations than their sets can amply take care of without interference. This is especially true in some very large cities where there are as many as two or three stations operating simultaneously. While it is true that the new allocations of wave lengths have done much to remove this kind of interference, still some who live right "under the nose" of a big station find that they are little benefited owing to the fact that their receivers cannot completely shut out the nearby station. High tension lines and high powered spark stations also add to the troubles of some to such an extent that they almost threaten to leave their neighborhood in order to get radio peace and freedom.

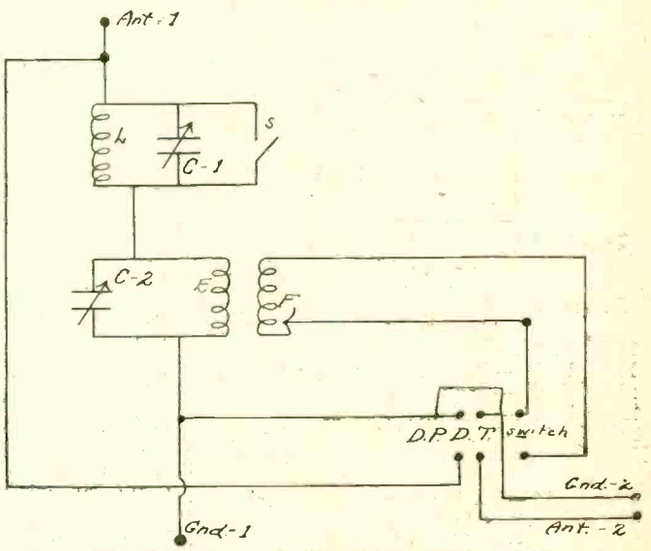
I have found that a great deal of interference can be cut out by using a much shorter aerial which adds to the selectivity of your outfit. Tuning in with the maximum inductance and the minimum amount of capacity also aids to greater selectivity. In fact, the general tendency in building high grade radio sets is to use the smallest size condenser wherever possible, and there are a great number of sets that have only seven plate tuning condensers in place of the old 43 plate condensers. If you have tried all the above mentioned dodges and still find that your condition is only improved slightly then build this super-selector and watch the improvement to be had.

The super-selector is nothing more than a double-circuit, doubly-tuned wave trap. Because it is a double-circuit and not a single-circuit trap it allows a great deal of low frequency noise such as AC hum to be tuned out by means of the coupling manipulation. Under the most extreme conditions of noise and interference it will be necessary to use the entire filtering system but normally the amateur will find that the switches can be closed and the tuning filter formed by the coil L and the condenser C-1 is virtually removed from the circuit. A double pole, double throw (D. P. D. T.) switch allows the set to be tuned in without the filter first and then tuned in with the filter. It is plain to see that by means of this lower tuning portion of the selector a single-circuit tuner is converted into a double-circuit affair thus gaining the advantages of the latter. If the amateur so desires he can place an anti-capacity switch of the D. P. D. T. style in place of the ordinary knife-blade type and improve the appearance as well as the quality of the filter if assembled in a cabinet. Of course, this filter can be built on the installment plan if you so desire; the coil L and the condenser C-1 can be omitted and the unit formed by the coil E and the condenser C-2 can be directly connected up to the Ant.-1.

The condensers C-1 and C-2 are each 23 plate variables. The coil L should be wound with No. 22 S. C. C. magnet wire on a 4" tube having 20 turns in all, which means that about 1½" of tubing will suffice for the coil. The unit E-F is a variocoupler, the coil E being the rotor and the coil F the stator. It will not be necessary to use a very expensive variocoupler for this purpose since one of the less expensive types will function just as well in this filter

To make a neat job of the whole unit it should be mounted in a separate cabinet from the set and the panel should be shielded in the vicinity of the condenser C-1 since this condenser is not at ground potential. The shielding material should be copper foil and must have electrical connection to the Gnd.-1 terminal of the filter. The terminals marked Ant.-1 and Gnd.-1 should be connected directly to the antenna and ground, while the terminals marked Ant.-2 and Gnd.-2 should be connected to the antenna and ground terminals so marked on your present receiver. In assembling the selector be sure to see that the movable plates of the condenser C-2 are connected to the ground side of the circuit in order that the shaft of the condenser will be at ground potential. This can not of course be done with C-1 since neither side of C-1 is ever at ground potential, but placing the movable plates nearest the coil E side of the circuit will help although this condenser must be shielded in order to completely remove body capacity when adjusting.

There are several ways to operate this filter and you will soon discover the fact. But, to start, it is better to follow some one routine method until the operation is carefully apprehended. Close the switch s, throw the D. P. D. T. switch to the left. This places the receiver directly to the antenna and ground and the filter is not in the circuit. Tune in your station and then throw the D. P. D. T. switch to the right placing the filter in the circuit. It is better to have the switch arm on the coil F so placed that only a few turns are functioning on that coil. Adjust C-2 and the coupling between E and F until the station is again heard clearly and without interference. It will most



Hook-up for White's super-selector which greatly improves reception.

likely be necessary to slightly retune the receiver to allow for change in impedance of the antenna circuit due to throwing in the filter. You will soon discover that AC hum and other low frequency interference will melt away by careful adjustment of coupling. As a matter of getting the best possible adjustment other taps can be tried on the coil F until the best position is found for your particular set. If you still get an interfering signal then the switch s should be opened and the condenser C-1 should be moved so as to remove the interference. This will also vary the tuning on the receiver and will make it necessary to retune to compensate for change in circuit constants. It is obvious that each adjustment depends upon another and no one is quite independent of all the others; hence, there are many ways of accomplishing the same end by different means and it is up to the operator to discover through experiment the best for his set and his local conditions. The selector not only makes tuning much finer but also adds quality to the received signal owing to the fact that a lot of extraneous noises are removed. With this filter it is possible to use your set with an extremely short aerial, in fact it can be operated with only ten or twenty feet of wire laid out on the floor. On strong local signals the filter will exhibit a remarkable pick-up quality and an aerial can be dispensed with altogether.

Here Are Good Broadcast Programs

Station WOR, Newark, N. J.

October 20—Eastern Standard Time—405 meters.

2:30 P. M.—Solos by Helen Louann, mezzo-soprano.

2:45 P. M.—Howard Forst, saxophone soloist of New York, in a request program.

3:00 P. M.—Continuation of solos by Helen Louann, popular soprano.

3:15 P. M.—Adolph Selvy, popular pianist.

3:30 P. M.—Howard Forst, saxophone soloist.

3:45 P. M.—Dr. Joseph F. Craigen, well-known psychologist, in his weekly talks on psychology.

6:15 P. M.—"Sporting News, Up-to-the-Minute," by Fred J. Bendel, sporting editor of the Newark Morning Ledger.

6:30 P. M.—"Music While You Dine," by the Apollo Country Club Orchestra.

8:00 P. M.—Program under the direction of Mme. Florence Wessell, celebrated accompanist and coach of New York City.

9:30 P. M.—Program under the direction of H. Emberson Yorke, of New York City.

10:15 P. M.—C. Carrol Clark, recording artist baritone, and assisting artists, in a program of negro spirituals, new and old.

Station WGY, Schenectady, N. Y.

Eastern Standard Time. 380 Meters.

October 19.

11:55 A. M.—Time signals.

12:01 P. M.—Stock market report.

12:10 P. M.—Produce market report.

12:20 P. M.—Weather forecast.

2:00 P. M.—Music and household talk, "How to Buy China" (Courtesy Modern Priscilla).

6:00 P. M.—Produce and stock market quotations; news bulletins.

6:30 P. M.—Children's program.

7:35 P. M.—Health talk, "Your Health Examination and Your Child's," N. Y. State Department of Health.

7:45 P. M.—Radio farce, "The Hottentot," by WGY Players.

Instrumental selection, "Vampire Galop" .....Gruger

WGY Orchestra

Farce, "The Hottentot".....

.....Wm. Collier and Victor Mapes

WGY Players

10:30 P. M.—Irish night program.

October 20.

11:55 A. M.—U. S. Naval Observatory time signals.

12:01 P. M.—Stock market report.

12:10 P. M.—Produce market report.

9:00 P. M.—Kenmore Hotel (Albany, N. Y.) Orchestra.

Station KYW, Chicago

October 20.

Central Standard Time. 536 Meters.

9:30 A. M.—Late news and comment of the financial and commercial market.

10:00 A. M.—Market reports.

10.30 A. M.—Late financial news.

10:58 A. M.—Naval observatory time signals.

11:00 A. M.—Market reports.

11:05 A. M.—Weather report.

11:30 A. M.—Late news and comment of the financial and commercial market.

11:35 A. M.—Table talk by Mrs. A. J. Peterson of Peoples Gas Company.

12:00 M.—Market reports.

12:10 P. M.—Final market reports.

12:20 P. M.—Final stock report.

12:30 P. M.—Late financial comment and news bulletins.

2:15 P. M.—Financial comment and news bulletins.

2:30 P. M.—Closing stock quotations, Chicago Stock Exchange.

3:00 P. M.—Late news and sport bulletins.

3:30 P. M.—News and sports.

4:00 P. M.—Late news and sport bulletins.

4:30 P. M.—News and sports.

5:00 P. M.—Latest news of the day.

6:30 P. M.—News, financial and final market and sport summary. Financial summary furnished by the Union Trust Company and Chicago Journal of Commerce.

6:50 P. M.—Children's bedtime story.

8:00 to 8:58 P. M.—Musical program:

Herbie Mintz and Harry Giese, pianists.

Wendell W. Hall, KYW's Music Maker.

Mary Lee, soprano.

Sallie Menkes, accompanist.

A. W. "Sen" Kaney, specialty act.

Other artists and program will be announced by radiophone.

8:58 P. M.—Naval observatory time signals.

9:00 P. M.—News and weather reports.

9:05 P. M.—"Under the Evening Lamp" service including stories, articles and humorous sketches furnished by the Youth's Companion.

News, sports and children's bedtime story furnished by the Chicago Evening American.

Station WBZ, Springfield, Mass.

Eastern Standard Time. 337 Meters.

October 20.

11:55 A. M.—Arlington time signals; weather reports; Boston and Springfield market reports.

7:00 P. M.—Dinner concert by the Hotel Kimball Trio, under the direction of Jan Geerts, direct from the Hotel Kimball dining room.

7:30 P. M.—Twilight tales for the kiddies.

"Bringing the World to America," prepared by "Our World Magazine."

"This Week's Judge."

8:00 P. M.—Concert by Mr. Bert Young, tenor; Mr. Loew, baritone; Mrs. Miriam M. Thomson, accompanist.

9:30 P. M.—Program of dance music by Bolton and Cipriano Orchestra of New Haven.

October 21.

11:00 P. M.—Church services from South Congregational Church, Rev. James Gordon Gilkey, pastor.

Station KYW Changes to 536 Meters

IN preparation for better transmission this Winter, Westinghouse Station KYW, Chicago, has been authorized by the Department of Commerce to transmit on 560 kilocycles (536 meter wave length). The station had been operating on 345 meters previously. The change was made in order to prepare for the broadcasts of the productions of the Chicago Civic Opera Association, the Conference football games at Stagg Field of the University of Chicago, and for the carrying on of KYW's extensive Winter programs.

Station WLW, Cincinnati

October 23—Central Standard Time—309 meters.

10:30 A. M.—Weather forecast, business reports.

1:30 P. M.—Business reports.

3:00 P. M.—Special music by Jennie Kehrt, Babson reports.

10:00 P. M.—Artistic program arranged by Miss Minnie Tracy with professional pupils.

Two songs by Ida Blackschleger.

Piano solo by Sam Morganstern.

Song with piano accompaniment and violin obligato, Mary Morrissey singing.

Aria: "Depuia le Jour," from opera Louise, Lillian Sherman.

Violin solo by Lorraine Fledkamp.

Inspirational talk by May Cornell Stoiber, from the series, "Life and Happiness."

Ida Blackschleger, soprano.

Sam Morganstern, piano solo.

Lillian Sherman, "Micaela's Air," from Bizet's opera Carmen.

Concluding vocal duets and ensembles.

Popular selections by the Circle Orchestra.

Station KDKA, East Pittsburgh, Pa.

Eastern Standard Time. 326 Meters.

October 20.

10:00 A. M.—Music. Union Live Stock Market Report furnished by the National Stockman and Farmer.

11:55 A. M.—Arlington time signals.

12:30 P. M.—Music. Weather forecast.

12:50 P. M.—United States Bureau of Market Reports furnished through the National Stockman and Farmer.

6:15 P. M.—Dinner concert by KDKA sextet, under the direction of Victor Saudek.

7:30 P. M.—"Bringing the World to America," prepared by "Our World."

7:45 P. M.—The Children's period.

8:00 P. M.—Feature.

8:30 P. M.—Concert by the trio composed of Clara Huhn, soprano; Roy Strayer, tenor; George Wahl, bass; Earl Mitchell, accompanist, with quintet from the KDKA Little Symphony Orchestra.

Program announced by radio.

9:55 P. M.—Arlington time signals. Weather forecast.

Station KHJ, Los Angeles, Cal.

Pacific Time. 360 Meters.

October 19.

12:30 to 1:15 P. M.—Music. News Items.

2:30 to 3:30 P. M.—Matinee Musicale.

6:45 to 7 P. M.—Children's Program.

7 to 7:30 P. M.—Organ recital, from First Methodist Episcopal Church, Arthur Blakeley, organist.

8 to 10 P. M.—Children's de luxe program, presenting Constance Jeanette Shirley, pianist, 6 years of age.

October 20.

12:30 to 1:15 P. M.—Program presented by pupils of Davis Musical College.

2:30 to 3:30 P. M.—Matinee musicale.

6:45 to 7:30 P. M.—Children's program. Bedtime story by "Uncle John."

8 to 10 P. M.—De luxe program, presenting Grace Senior Brearley, pianist.

Station KSD, St. Louis

Central Standard Time. 546 Meters.

October 19, 8:00 P. M.

Program by choir of Central Presbyterian Church.

October 20, 8:00 P. M.

Orchestral concert, organ recital

Corrected Official List of Broadcasting Stations in the United States

FOLLOWING is the second installment of a corrected list of commercial broadcasting stations in the United States as issued by the Department of Commerce. The list will be continued in next week's RADIO WORLD.

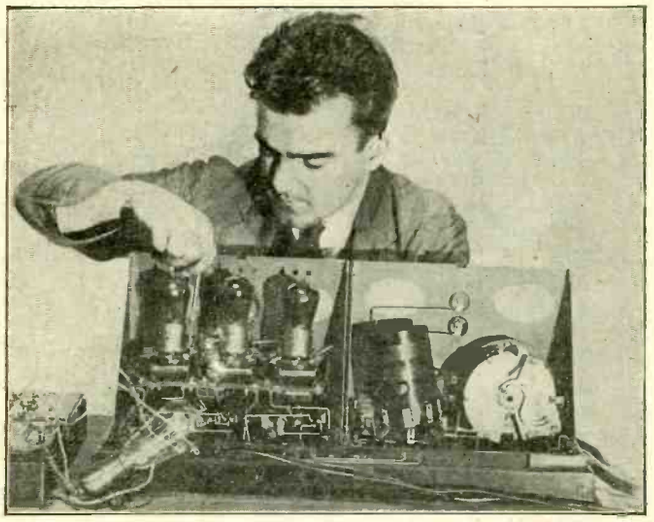
Call	Station	Frequency Kcys.	Wave Length Meters	Power Watts
KFKA	Colorado State Teachers' College, Greeley, Col.	1,210	248	50
WMC	Commercial Publishing Co., Memphis, Tenn.	600	500	500
WAAH	Commonwealth Electric Co., Inc., St. Paul, Minn.	833	360	500
WTAD	Compton, Robt. E., Carthage, Ill. (formerly WCAZ)	1,310	229	50
WPAU	Concordia College, Moorhead, Minn	833	360	20
WABL	Connecticut Agriculture College, Storrs, Conn.	1,060	283	100
WIL	Continental Electric Supply Co., Washington, D. C.	833	360	10
WIAH	Continental Radio Mfg. Co., Newton, Iowa	833	360	10
WEAI	Cornell University, Ithaca, N. Y.	1,050	286	500
WHAS	Courier Journal & Louisville Times, Louisville, Ky.	750	400	500
WHK	Cox, Warren R., Cleveland, Ohio	833	360	100
KFCQ	Crary Hardware Co., Boone, Iowa	1,330	226	20
WLW	Crosley Mfg. Co., Cincinnati, Ohio "B"	970	309	500
KFHQ	Curtis Bros. Hardware Store, Los Gatos, Cal.	1,240	242	5
WSAW	Curtice & McElwee, Canandaigua, N. Y.	1,090	275	100
KFDO	Cutting, H. E., Bozeman, Mont.	1,210	248	10
WLAG	Cutting & Washington Radio Corp., Minneapolis, Minn.	720	417	500
KFIZ	Daily Commonwealth, Fond du Lac, Wis.	1,100	273	100
WWB	Daily News Print Co., Canton, O.	1,120	268	200
WSAK	Daily News, The, Middleport, O.	1,160	258	20
WCAG	Daily States Pub. Co., New Orleans, La.	833	360	100
WNAX	Dakota Radio Apparatus Co., Yankton, S. D.	1,230	244	100
WCAK	Daniel, Alfred P., Houston, Texas	833	360	50
WFAA	Dallas News & Dallas Journal, Dallas, Texas	630	476	500
WEAU	Davidson Bros. Co., Sioux City, Ia.	833	360	20
WSAG	Davis, Loren V., St. Petersburg, Fla.	1,230	244	10
WBAH	Dayton Co., The, Minneapolis, Minn.	833	360	500
WIAF	De Cortin, Gustav A., 10 Marlborough Gate, New Orleans, La.	1,280	234	10
WJX	De Forest Radio Tel. & Tel. Co., New York City	833	360	500
KFJK	Delano Radio & Elect. Co., Bristow, Okla. "A"	1,290	233	100
KFKH	Denver Park Amusement Co., Lakeside, Colo.	1,330	226	10
KZN	Deseret News, The, Salt Lake City, Utah	833	360	500
WCX	Detroit Free Press, Detroit, Mich.	580	517	500
KOP	Detroit Police Dept., Detroit, Mich.	1,050	286	500
WCAV	Dice Electric Co., J. C., Little Rock, Ark.	833	360	100
KFJR	Dixon, Ashley C., & Son, Stevensville, Mont. "A"	1,160	258	50
KFHI	Dixon, Charles V., Wichita, Kan.	1,340	224	20
KFZ	Doerr-Mitchell Elect. Co., Spokane, Wash.	1,060	283	5
WABM	Doherty, F. E., Saginaw, Mich.	1,180	254	100
WPAC	Donaldson Radio Co., Okmulgee, Okla.	833	360	200
WPAJ	Doolittle Radio Corp., New Haven, Conn.	1,120	268	10
WRK	Doron Brothers Electric Co., Hamilton, Ohio	833	360	100
KQV	Doubleday-Hill Electric Co., Pittsburgh, Pa.	833	360	250
WMU	Doubleday-Hill Electric Co., Washington, D. C.	1,150	261	100
KFHS	Dow, Clifford J., Lihue, Hawaii	1,090	275	30
WSAR	Doughty & Welch Elect. Co., Fall River, Mass.	1,180	254	10
WMAJ	Drovers Telegram Co., Kansas City, Mo.	1,090	275	250
WCAS	Dunwoody Industrial Institute, Minneapolis, Minn. "A"	1,220	246	100
WCAU	Durham & Co., Philadelphia, Pa.	1,050	286	100
KFFE	Eastern Oregon Radio Co., Pendleton, Ore.	833	360	100
KNX	Electric Lighting Supply Co., Los Angeles, Cal.	833	360	250
WQAM	Electrical Equipment Co., Miami, Fla.	833	360	250
KFCH	Electric Service Station, Billings, Mont.	833	360	10
KYQ	Electric Shop, Honolulu, T. H.	833	360	40
KFAN	Electric Shop, Moscow, Idaho	833	360	50
WLAV	Electric Shop, Inc., Pensacola, Fla.	833	360	100
WFAH	Electric Supply Co., Port Arthur, Texas	833	360	10
KDEI	Electric Supply Co., Wenatchee, Wash.	833	360	50
KFGZ	Emmanuel Missionary College, Berrien Springs, Mich.	1,120	268	10
WCAH	Entrekin Electric Co., Columbus, Ohio	1,050	286	100
WTAS	Erbstein, Charles E., Elgin, Ill.	1,090	275	500
WBAV	Erner & Hopkins Co., Columbus, Ohio	770	390	500
WDAJ	Ervins Electric Co., Parsons, Kan.	1,160	258	15
WWJ	Evening News Ass'n, Detroit News, Detroit, Mich.	580	517	500
KUO	Examiner Printing Co., The, San Francisco, Cal.	833	360	500
WEAA	Fallain & Lathrop, Flint, Mich.	1,070	280	150
KFHJ	Fallen Co., Santa Barbara, Cal.	833	360	100
WTAB	Fall River Daily Herald, Fall River, Mass.	1,210	248	10
WDAY	Fargo Radio Service Co., Fargo, N. D.	1,230	244	50
WGR	Federal Tel. & Tel. Co., Buffalo, N. Y.	833	360	300
WTAH	Ferro, Carmen, Belvidere, Ill. "A"	1,270	236	10
WCE	Findley Electric Co., Inc., Minneapolis, Minn.	833	360	250
WMAN	First Baptist Church, Columbus, Ohio	1,050	286	20
KFFP	First Baptist Church, Moberly, Mo.	1,090	275	50
KFDX	First Baptist Church, Shreveport, La.	833	360	200
WABK	First Baptist Church, Worcester, Mass.	1,190	252	10
WDAX	First National Bank, Centerville, Iowa	1,120	268	100
KFGX	First Presbyterian Church, Orange, Texas	1,200	250	500
KFBG	First Presbyterian Church, Tacoma, Wash.	833	360	50
KTW	First Presbyterian Church, Seattle, Wash.	833	360	250
WRAX	Flexon's Garage, Gloucester City, N. J.	1,120	268	50
WKAP	Flint, Dutee Wilcox, Cranston, R. I.	833	360	200
WDAL	Florida Times-Union, Jacksonville, Fla.	833	360	500
KFCP	Flygare, Ralph W., Ogden, Utah	833	360	25
WWI	Ford Motor Co., Dearborn, Mich.	1,100	273	50
WSAD	J. A. Foster Co., Providence, R. I.	1,150	261	50

(To be continued. Readers who preserve these installments as they appear in RADIO WORLD *will have a complete and up-to-date list of broadcasters in the United States.)*

The Camera Continues to Do Its

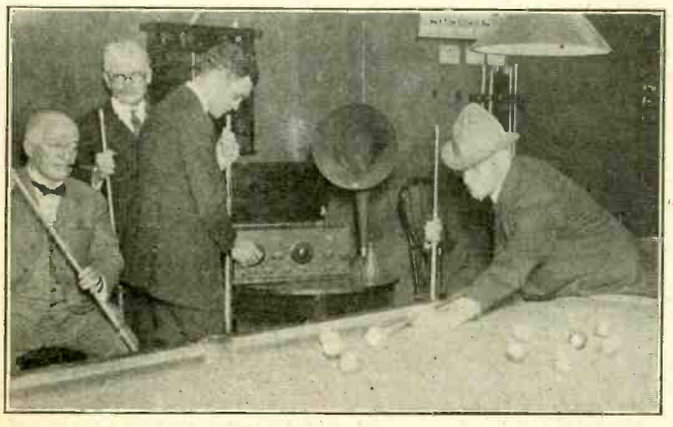
(C. Am. Tel. & Tel. Co.)

Thornton Fisher, famous sports writer and cartoonist, who is entertaining thousands of radio fans every evening with his talks of sports. His talks are of the informal sort that give listeners the impression that he is speaking directly to them and not to a soulless microphone. The colorful presentations of sporting events past, present and future have grooved a niche in the radio hall of fame for this well known writer.



(C. Foto Topics from K. V.)

This amateur has profited by experience and is not taking any chances with his tubes. Note that he has placed an ordinary 110-volt bulb in series with his plate circuit batteries while fixing his receiver. The bulb acts as a safety valve, allowing current to pass freely, but if there is a short circuit it will only allow 6 volts to pass—the result being that he has saved his tubes.



(C. Fotograms)

The New York Newspaper Club has installed a radio set in the billiard room for the use of its members. A Grebe broadcast receiver is used with a loud speaker, and the click of the balls mingles with the high "Cs" of the colorature soprano or the syncopation of the jazz artists, giving the newspaper men something to discuss between shots.

Keeping Home Fire

(C. Foto Topics from K. V.)

E. N. Pickerill, the chief radio officer of the S. S. "Leviathan," likes to play with radio in his spare time. Even though he is the man at the heart of the radio station of the largest liner in the world, he likes to fool around with the instruments in his off moments wherever he happens to have any.

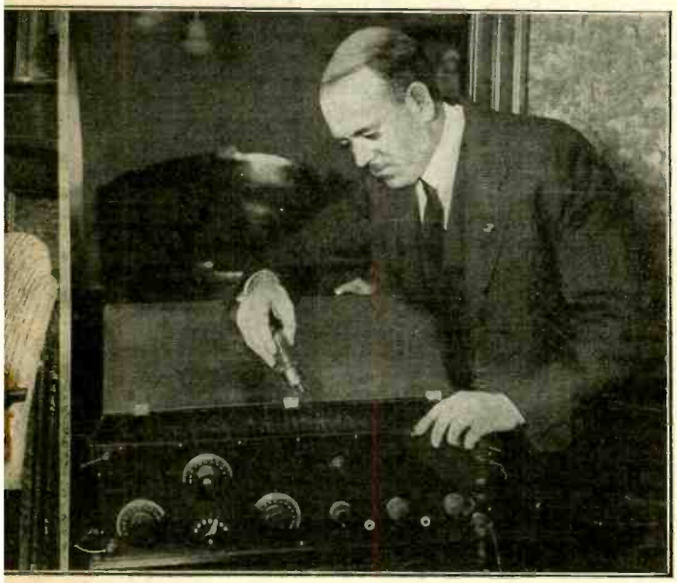
His wife is of course interested in radio, and keeps through his radio se a receiver at his hon York City. When h he drops her a line of the docking tim almost to the minu running up the front a nice "home cooke

(C. Kadel and Herbert)

The main reason that an amateur can never make a good job of engraving panels. Contrary to general opinion the work is not done by hand, but by means of this engraving machine. The brass matrix shown is placed on a machine resembling a pantograph, and the revolving drill point does the actual work, without troubling about the small details.

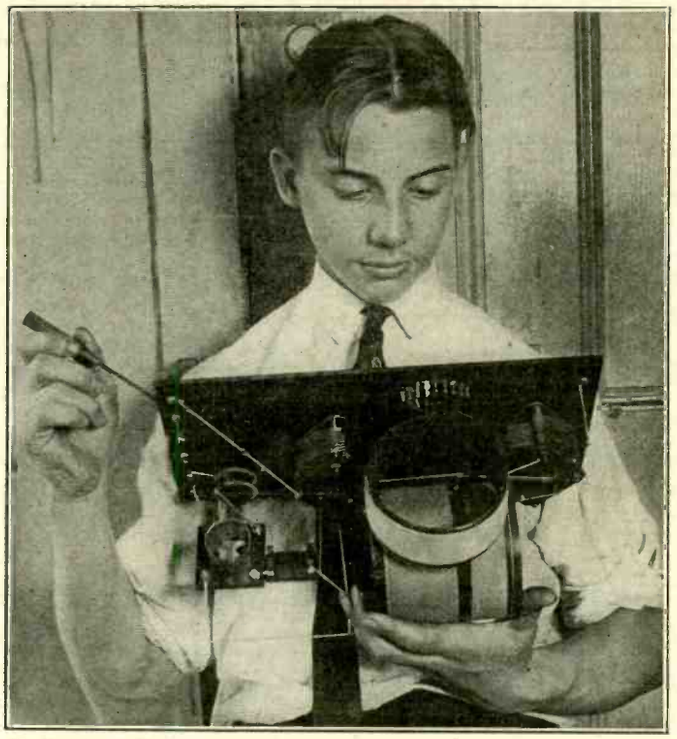
Duty for Radio World Readers

s Burning by Radio



n touch with him aboard the ship and e in the Bronx, New is homeward bound via radio telling her e, and she can tell e when he will be steps. Then she has l meal" waiting for him, and his comfy slippers and pipe all out and waiting.

Being a professional radio man and also interested in radio at any time is almost like the sailor who, after spending six months aboard a sailing vessel, devoted a three weeks' vacation to rowing around Central Park lake "just for some diversion."



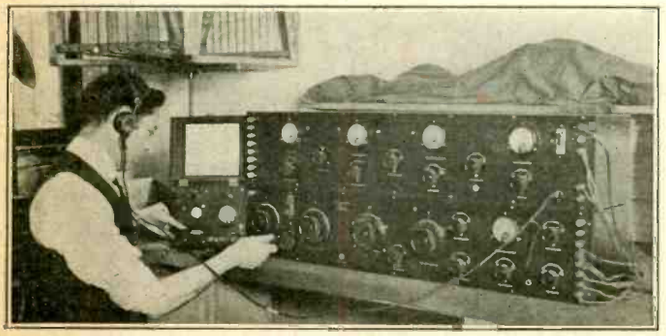
(C. Kadel and Herbert)

Bob Greer, a 15-year-old fan, certainly knows how to build a receiver and at the same time keep the cost down to a minimum. He built the Cockaday receiver shown for $10.00, not including the tube, which is going some, considering that he did not make anything but the coils.

Captions by Robert L. Dougherty

(C. Kadel and Herbert)

An exhibit at the recent chemical exposition showing the manner in which chemicals have helped to standardize the insulation of radio apparatus. Nowadays chemistry enters into every phase of the business, even the exhausting of tubes.



(C. Kadel and Herbert)

A receiver that is a "super-super," if such a thing can be. It is a fourteen-tube super-heterodyne receiver built for Mr. Claude Golden. Tuning has to be done by means of a wave meter. Looks like Mars will soon be heard from if people keep on making these multi-tube receivers. It really needs an electrical engineer to run the blame things.

(C. Foto Topics from K. V.)

Here is the manner in which Miss V. Wallace, a busy manicurist, keeps her customers happy and at the same time stops them flirting with her. While her customer's hands are in the hot water the radio headphones keep his mind anywhere between Newark and Chicago, as the case may be. Wonder how many other manicurists are going to follow this plan?

Answers to Readers of Radio World

Kindly advise me where I can obtain the best book on super-heterodyne receivers and their construction.—W. N. Vreeland, 62 Madison Ave., Jersey City, N. J.

We refer you to page 25 of RADIO WORLD for October 6, 1923, for information.

* * *

Would you kindly examine the enclosed diagram and tell me if you consider it a good distance receiver? What type of a receiver is it?—R. J. Howard, P. O. Box 113, Hyde Park, Mass.

The receiver pictured is the Colpitts oscillator and is a good distance circuit. It is a single circuit receiver using a variometer as the variable inductance.

* * *

Can you inform me how I can obtain French radio apparatus? I used it on the other side during the war and would like to experiment with it.—Francis DeLoy, Washington, D. C.

We do not know of any firms that import French radio apparatus. Suggest that you get in touch with an import house that handles scientific merchandise and find out from them.

* * *

Will you furnish me with a diagram or blue print of a reflex circuit using three tubes with two steps of audio and two steps of radio-frequency with a tube detector? If possible show a variometer and variable condenser to be used for tuning.—D. Boano, New York City.

We refer you to page 19 of RADIO WORLD for October 6. You will find the circuit you want under Fig. 10. It is the Grimes inverse duplex and works either on the loop or with the tuner and condenser you mention.

* * *

I built the lighthouse receiver which was described in RADIO WORLD *for Aug. 25, 1923. I am troubled with body capacity in the phone cords to such an extent that I cannot touch the phone cords with any part of my body and have to tune in by the hit and miss or guess method. What is the trouble? I am enclosing a diagram of my amplifier and detector.—C. R. Olson, 40 Spring Road, Santa Barbara, Calif.*

We note that you have a series fixed condenser between the plate of your amplifier and your phones. Remove it—this is what is causing your trouble. The diagram calls for a fixed condenser shunting the B battery and the plate side of the phones, not in series with the plate lead.

* * *

I am located 1,000 miles from the nearest good broadcast station. I am using a three-tube regenerative set similar in principle to the Aeriola, Sr. I get music from WGY and all the other powerful stations clearly. What I want, however, is a five-tube radio-frequency circuit employing good apparatus. Where can I obtain the diagram? What tubes do you consider as most efficient to go with the circuit you are giving me? How does one stage of audio-frequency compare with a two-tube push-pull amplifier?—F. F. Peach, Bay Roberts, Newfoundland.

We refer you to the Answers to Readers department in RADIO WORLD for October 13, where you will find a five-tube radio-frequency, detector and audio-frequency amplifier receiver, as well as an explanation of the tubes that are best suited for use in this circuit. There is no comparison between a stage of audio and a push-pull amplifier. The push-pull amplifier is much more efficient and about three to five times more volume is possible.

Can you furnish blueprints on the article, "The Old Reliable Variometer Hook-up," by C. C. Hermann?—R. Taylor, 636 East 67th Street, Chicago, Ill.

We do not furnish blueprints. The article was most complete, even to giving panel measurements and layouts, and you should not need a blueprint to construct this receiver.

* * *

On page 6 of RADIO WORLD *for Nov. 25, 1922, you describe an ossiphone, invented by S. G. Brown of London. What is the patent number of it? Is it being manufactured? By whom? Is any firm in the United States handling it?—Swain Solon, Shenandoah, Iowa.*

For details write to the British Patent Office. No such article is being manufactured in the United States at the present time to our knowledge.

* * *

I have constructed the set described by P. F. Albright, in RADIO WORLD *for March 17. I have had good results using an inside antenna. Would adding a potentiometer to this circuit be of any help?—Joe P. Harner, 1013 N. Main St., Nevada, Mo.*

You would not gain anything by the use of a potentiometer in this particular circuit as there must be a direct lead feeding back from the grid side of the inductance. This is one case where a potentiometer is of little value.

* * *

What is the purpose of the taps on the B battery? My set seems to work as well on the tap marked 16 as it does on the one marked 22½. What do these numbers signify, if anything?—J. Cohn, 221 Bleeker St., New York City.

The purpose of the taps is to vary the voltage in the plate circuit. Some tubes will work on 16 or even as low as 12 volts, but the general practice is to place 22½ volts on the plate. The numbers signify the voltage.

* * *

I have constructed the receiver described by Ortherus Gordon in RADIO WORLD *January 20, 1923, and have had wonderful success with it. I now desire to get a circuit of the same thing, incorporating one stage of amplification. What plate voltage should I use on my detector and amplifier when the one stage is added?—H. M. Del Veechio, 7 Yarrington Court, Bridgeport, Conn.*

The additional stage of amplification to any of these one tube sets is identical, and you will find such circuits in almost any of our back issues. The voltage on the detector varies from 16 to 35, and that of the amplifier should be from 45 to 60.

* * *

How long should the average B battery last? Is there any guarantee that goes with any of them? Are the storage B batteries superior to the dry cell B batteries?.—Daniel Kilterman, 14 River Avenue, Trenton, N. J.

It all depends upon the use to which it has been put. A B battery should never be used after its voltage falls below 16-17 volts for a 22½ or 30-32 volts for the 45-volt type. Do not try to figure out how long you can make them last, but rather how efficient will they be so many hours of actual use. No firm guarantees the life of a battery. The advantage of the storage B battery is the fact that it can be charged whenever necessary. With the dry cell battery, you have to throw it away when it is exhausted.

Will the fact that my roof is tin and my antenna directly under it strung on the rafters prevent me from getting distance? I have a two-tube set and as yet my distance is only 150 miles and not with any great volume.—Kenneth Lindsay, Freehold, N. J.

The fact that your antenna is under the tin roof would shield the antenna to some extent. Suggest that you try an outside antenna.

* * *

Enclosed please find a diagram of my circuit. What type of circuit is it? How can it be improved? I cannot seem to get any real distance on it.—Julius Gerich, Meyer Ave., Jamaica, L. I.

You are using the Colpitts oscillator. It can be improved by placing a small 11 or 23 plate condenser in the antenna lead. Wait for cooler weather before expecting distance.

* * *

I constructed the set described by H. S. Potter in RADIO WORLD *for Sept. 15. It works fine on detector, but I cannot get it to work on the two stages. Why is this?—Christian R. Miller, 120 West 97th St., New York City.*

In order to get two stages to work with this receiver you will have to make them as a separate unit. Use separate A and B batteries for the amplifier and detector and simply use a plug to switch from detector to one or two stages, finally plugging your phones in the desired stage. Do not use the same batteries. This is what is causing your howling, as the circuit is a peculiar type of feedback and the phones are not located in the direct plate lead.

* * *

I have built the "Long Distance Crystal Receiver" by R. B. Wilbur, described in RADIO WORLD *for July 28, and have had excellent results. I get KDKA easily, but I find that comes in loud, then faint, then loud, etc., all the time during the operation of the station. My friends tell me this is due to re-radiating sets tuning in and out the station during my reception of the particular station. How can this be when my set is not a tube set and therefore cannot regenerate?—D. A. Timmons, 2 Willow Place, Nutley, N. J.*

The phenomenon you note is fading. The stations in Philadelphia and around that section all fade more or less. Your trouble is not due to re-radiation, and the tuning of regenerative sets in your neighborhood cannot cause your set to "do tricks." It might heterodyne your receiver when the carrier wave of the station and the re-radiated carrier of the receiver nearby cross, but this would not cause fading.

* * *

Enclosed please find a diagram of my regenerative receiver. Is it possible to add radio-frequency amplification to this circuit? If so how should I do it? Is the hook-up as it stands correct? The second stage of my amplifier howls quite a bit. How can I stop this?—Marion A. Miller, Box 203, Windsor, Colo.

For the circuit you wish, we refer you to the Answers to Readers columns in RADIO WORLD for Sept. 29, where you will find the diagram you wish. The hook-up is correct with the exception of the transformers. Place the 10-1 transformer in the first stage and the low ratio one in the second. It is not enough to simply separate the transformers, but their fields must be at right angles to one another. We suggest the use of a "C" battery in the grid leads of the amplifiers.

Latest Radio Patents

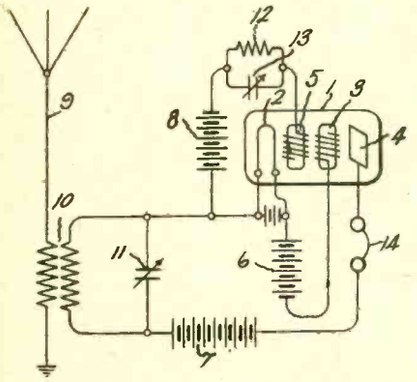
Electron Discharge Apparatus

No. 1,469,075: Patented September 25, 1923. Patentee: H. E. Dunham, Schenectady, N. Y.

My present invention relates to electron discharge apparatus and more particularly to that type of apparatus the operation of which depends upon producing and varying the emission of secondary electrons from a cold electrode.

One of the objects of my invention is to provide a simple and efficient means and method for operating a device of the type mentioned.

A more specific object of my invention is to provide a simple and efficient apparatus and method for receiving continuous wave signals whereby an audible indication of desired signals which are normally incapable of giving such an indication may be obtained. In attaining the more specific object of my invention I include in the circuit upon which signaling currents to be detected are impressed, an electron discharge device so that the signaling current flowing in the circuit is carried through this device by means of electrons. By varying the number of electrons which can flow between the electrodes of this device the resistance of the circuit may be varied in any manner desired. In the present case I prefer to vary the number of electrons flowing by means of an electrostatic field produced upon a grid electrode which is properly positioned to vary the flow of electrons. If the potential of this grid electrode is varied periodically between certain positive and negative values at a frequency somewhat different from that of the signaling currents to be detected, the resistance of the signaling circuit will be varied periodically between maximum and minimum values and the current in the circuit may be caused to vary at an audible frequency. I also preferably arrange the electron discharge device in such a way as to produce a negative resistance between the cathode and the controlling grid. By tuning the circuit between the cathode and controlling grid oscillations will be produced in that circuit and the potential of the grid will automatically be caused to vary periodically at the frequency of the oscillations produced.



New vacuum tube especially adapted to detection and audio-frequency circuits.

The specific form of electron discharge device which I prefer to employ comprises an electron emitting cathode, an anode, a third electrode and a discharge controlling grid. A constant positive potential is impressed upon the anode and a smaller positive potential is impressed upon the third electrode. If these potentials are properly chosen secondary electrons will be emitted from the third electrode which will be attracted by the anode. It has been customary in the past to operate devices of the type described in such a way that a negative resistance is produced between the cathode and the third electrode. If under this condition of operation signals are impressed upon the circuit between the cathode and third electrode by means of the usual tuned receiving circuit, the circuit has a tendency to oscillate continuously at the signaling frequency. To overcome this tendency special means must be provided which tend to complicate the operation of the system.

In detector systems of the class to which my invention belongs, it is desirable that a circuit be employed in which the current can flow in either direction. An inspection of the usual characteristic curve of the device described shows that there are two points where this last condition may be fulfilled, the first point being where the resistance of the circuit is negative and the potential of the third electrode is appreciably lower than that of the anode, and the second point occurring where the potential of the third electrode approaches that of the anode, and an increase in the potential of the third electrode is accompanied by a decrease in the number of secondary electrons which will be emitted and which will reach the anode. I have found that this second point on the characteristic curve is an especially suitable point to use for carrying out my invention and since the circuit has a positive resistance characteristic when operated with the potential of the third electrode chosen to fall at this point on the characteristic curve there is no tendency for the circuit to oscillate.

Condenser and Method of Making

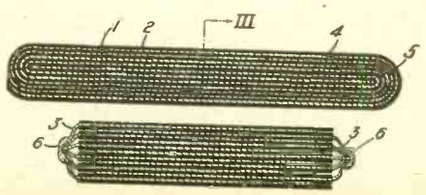
No. 1,467,777: Patented September 11, 1923. Patentee: P. E. Demmler, Pittsburgh, Pa.

My invention relates to condensers, and it has, for its primary object, the provision of a method by which a product of high efficiency and exceptional durability may be formed.

One object of my invention is to so wind alternate sheets of foil and an insulating material as to form a condenser of desired capacity and to so dispose the windings as to provide an exceptionally large contact area for the terminals thereof.

Another object of my invention is to construct condensers in which the conducting material shall be disposed in as close relation as possible and thereby obtain a high efficiency.

A still further object of my invention is to construct a condenser of material which will insure a good product and which is readily available and comparatively inexpensive.



Improved method used in the construction of a fixed condenser.

With these and other objects in view, my invention will be more fully described, illustrated in the drawings.

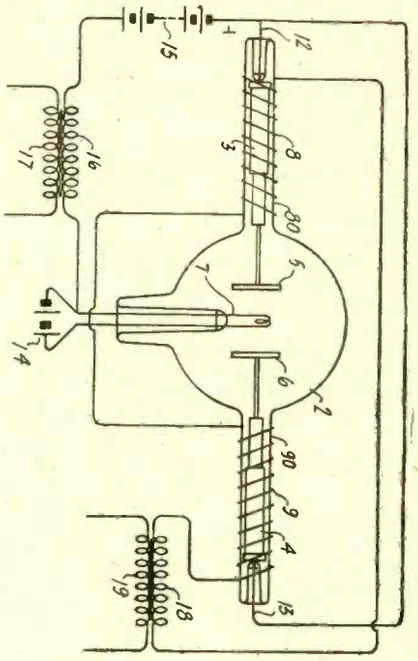
Electron Discharge Device

No. 1,467,318: Patented September 11, 1923. Patentee: W. J. Herdman, Toronto, Canada.

My invention relates to electron discharge devices and pertains specifically to that class of such devices which are adapted chiefly to use in radio telegraphy and telephony and manual telephony.

The principal object of my invention comprises, producing a two electrode tube or valve of novel form, in which the internal resistance of the tube or the impedance of the gap between the cathode and anode may be varied to achieve a modulation of the space or thermionic current without necessitating the interposition of a third electrode or grid between the anode and cathode.

I accomplish this and other very desirable features that will hereinafter be pointed out and described, by a novel construction of tube and elements therein, whereby the property of magnetostriction is utilized to effect a movement of the anode or plate with respect to the cathode or filament, to thereby decrease or increase the distance between the filament and plate, and to likewise decrease or increase the effective plate area, to produce an extremely wide variation of the plate current.



Vacuum tube in which the internal resistance of the tube or the impedance of the gap between elements may be varied.

Magnetostriction is a phenomenon of ferromagnetic bodies, discovered by Joule in 1842, since which time experiments have proven that all magnetic metals and magnetic alloys when magnetized, are subject to changes in length and volume. Some nickel steels exhibit the greatest coefficient of magnetostriction, or in other words, the greatest change in length and volume when magnetized and these changes are in the nickel steels proportional to the magnetizing force. It has been found that steel alloyed with 46% of nickel exhibits when magnetized, a marked extension of length. Steel alloyed with 25% of nickel shows practically no increase of length when magnetized, while pure nickel contracts or shortens when magnetized. In carrying out my idea, I employ moving members composed of rods, wires or tubes of nickel steel, preferably in combination with corresponding rods, wires or tubes of nickel or non-magnetic metal and attach these members to the plate of the vacuum tube in such manner, that the plate may be moved relative to the filament from without the tube when the moving members are influenced to exhibit the property of magnetostriction.

The Future of Radio Broadcasting

By Martin P. Rice

Director of Broadcasting, General Electric Company

ELECTRICITY as a servant of man was almost unknown fifty years ago and its conspicuous achievements in lighting, traction, power, ship propulsion, and communication are all within recent years. So the word "electric" has almost become a synonym for speed, progress, and accomplishment. Unlike other new developments which are frequently held back by their own limitations, the progress of electric application is limited chiefly by human inertia and conservatism.

Thus, while the incandescent lamp was invented by Edison in 1879 and has since been so perfected that it furnishes the best light available and more economically than kerosene or candles, yet it is now used in less than half the houses in the United States. Electric locomotives capable of exerting greater power than any steam locomotive and operating so efficiently as to save enormously in coal consumption have been available for many years, yet only two per cent of our railroad mileage have been electrified. The complete utilization of water power which is practicable through electrification would be a tremendous factor in conserving our country's fuel resources, yet only one-fifth of our available water power has been developed.

In spite of the great strides which electricity has made, we must admit that with one notable exception, we have been relatively slow in realizing its full possibilities. The notable exception is, of course, radio broadcasting. Never in the history of the world has any invention been so eagerly, so rapidly, and so universally adopted. Three years ago it was an almost unknown art. Today, there are six hundred broadcasting stations, and the receiving sets are numbered in millions. As a method of communication it has taken its place with the telephone, telegraph and post office, but it is more than a method of communication. With the printing press and the moving picture it is one of the three greatest factors in forming and influencing public opinion.

What of the future of this marvelous invention which makes it possible for a speaker to address an audience of millions, reproducing sound so faithfully that a whisper or the rustle of a sheet of manuscript is projected hundreds of miles and so rapidly that the voice may be heard across the continent before it reaches a hearer at the end of the room?

Forecasts may be of two kinds: first, the natural and logical developments of an art according to its known principles and laws; second, the imaginary extension of the art beyond these limits. We may readily, although reluctantly, dispose of the latter by predicting that the most fanciful flights of the imagination are probably inadequate pictures of the future of radio just as the fairy tales of the last century fell short of the actual accomplishments of the present day. In other words, we may consider the future of broadcasting as an economic force rather than try to foretell how invention may add to its further development.

The ability to communicate instantly and simultaneously with millions of people is not a power which will be lightly discarded as a fad or a passing fancy. It suggests, with no strain on the imagination, a universal language and the vehicle for complete mutual understanding among the peoples of all civilized nations. Music is a universal language and fortunately music is the foundation of all broadcasting today. Undoubtedly it will continue to occupy an important part of the programs, but it will be used with more artistic taste. The best in music will always be available so that public appreciation will become more exacting and the inferior and mediocre will be eliminated. To music will be added the radio play, a form of drama introduced by WGY at Schenectady having characteristics as distinctive in the radio field as the screened play in moving pictures but preserving at the time the complete realization of literary form.

Religious services will continue to inspire the vast radio audiences and particularly to cheer and comfort those who are incapacitated through age or infirmity. In spirit they will assemble regularly "to meet the Lord in the air" and there will grow up a religion in which shades of creed will be subordinated to belief in great fundamental principles. Then there will be established a unity of religious peoples which has never before existed.

Graded educational courses will be available at times convenient to those who labor in factories or fields so that the world's educational standards may be greatly advanced by providing opportunities even for those isolated from educational centers or otherwise prevented from attending school and college.

The use of radio for broadcasting news, market, stock and weather reports will be greatly extended supplementing these functions of telephone, telegraph, and newspaper.

These are some of the obvious developments of radio broadcasting which may be expected in the immediate future as they do not demand any radical advance in our present technical knowledge. They do, however, necessitate some consideration of the question, "Who will undertake to broadcast?" because broadcasting today involves a serious responsibility.

Whether broadcasting develops along the line of its technical possibilities or remains stationary depends largely on those who undertake the job. The inquiry is particularly pertinent now when a score or more broadcasting stations are relinquishing their licenses every month and about an equal number of new stations are coming "on the air." This condition, which was predicted a year ago, results largely from a lack of understanding as to the cost and responsibility of broadcasting.

A modern well-equipped high power station costs not less than $150,000 and the annual cost of operation is approximately $100,000. Obviously a department store, newspaper, or other enterprise supported largely by local trade cannot afford to broadcast far outside of the area it serves. Such stations will naturally be short-lived unless they limit themselves to low power and short programs. Even then it is probable that better results for all concerned would be obtained in such cases by renting broadcasting facilities from those established to render such service.

We may therefore assume that the number of broadcasting stations will decrease rather than increase, and that the high-power stations with daily programs will be operated by interests of national scope. The Radio Corporation of America and the great electrical manufacturing companies will continue to broadcast on a large and expensive scale because the sale of receiving sets is dependent on the continuance of good broadcasting and also because of the friendly relations which broadcasting may establish with the public.

Another development worthy of mention is the distribution of broadcasting over telephone or electric lighting systems. This plan is entirely practicable and may be employed to a considerable extent in metropolitan areas, but will never supersede general broadcasting. The one quality of radio broadcasting which has gripped public interest is its universal freedom. It reaches everywhere and is free for all who supply themselves with receiving sets.

Thus, while broadcasting involves an enormous expense without any direct returns, it may be expected to continue on an improved and more comprehensive plan, becoming an established means of disseminating news, music, education, entertainment and religious services. Fortunately most of the important broadcasting stations are quite conscious of the great responsibility they have accepted and they are seriously studying the problems involved with the view of rendering the listening public a real and permanent service.

Radio Industry Assists Red Cross Roll Call

THE radio industry in New York City is co-operating actively with the Red Cross in its annual Roll Call, which opens Armistice Day, November 11, and continues until Thanksgiving, for the enlistment of new memberships to maintain the organization's manifold peace-time program of relief and public health work.

David Sarnoff, of the Radio Corporation of America, 233 Broadway, heads as chairman a special radio group, formed in accordance with the campaign plan of organizing the entire city into various industrial, mercantile and professional groups to facilitate the Roll Call effort. A special Roll Call committee of representative leaders in the radio industry will function under the chairmanship of Mr. Sarnoff to secure the maximum response to the Roll Call throughout the industry, and plans are already under way to reach every person in the industry directly with the Red Cross appeal.

Help for the ex-service man and his family, including legal assistance, loans of money, advice on domestic matters and medical care constitutes a major part of the work in New York for whose maintenance the annual Roll Call is conducted. The Red Cross activities in the city also include disaster relief and a public health program among whose features are the supplying of surgical dressings to 22 local hospitals, nursing service, first aid, and work in home hygiene and care of the sick.

KYW to Broadcast from Stagg Field

ARRANGEMENTS have been made by Westinghouse station KYW in Chicago to broadcast the running stories of the games of the world series and the city series in baseball, and to broadcast from Stagg Field all of the big football contests staged there, together with the results and high lights of all games played. These are only a few of the many features prepared for the radio fans.

Willard Introduces a New Radio Battery

ONE of the latest and most progressive strides in the radio field is marked by the introduction of Willard's new single cell radio battery.

It is a rechargeable storage battery cell which possesses several new and unique features not hitherto claimed for storage batteries for radio use.

For "A" battery use on receiving sets using peanut tubes it appears in units of one cell just as dry cell batteries are used. For "B" battery use it is assembled in trays of high voltage combinations.

In assemblies of 10 or 20 cell combinations, it makes a super "B" battery which the makers assert is unrivaled in the radio field today; in high voltage combinations, this battery is even now being used by some of the largest and best equipped broadcasting stations in the country in place of motor-generator transmission.

In addition to the advantages that have long been acknowledged for storage batteries in radio, this cell is small, easily recharged at home and inexpensive.

The Willard CTR type battery is the answer of skilled and long experienced radio engineers to the demands of radio set owners. Many thousands of radio set owners aided T. A. Willard and his radio engineers in designing and perfecting this battery.

The container is a cylindrical jar of colorless, annealed glass, practically unbreakable. Its screwed-on cover is of hard rubber with a gasket which makes the cell water tight. There are three plates in the cell, one thick positive and two thinner negatives. They are separated and insulated with the well known Willard threaded rubber insulation.

The advantage of a radio battery of this sort is that the solution may be easily seen. After the battery has been in use for some time the solution gradually recedes and must be replenished with distilled water. When recharging this cell, it is easy to tell when it is fully charged by the appearance of tiny bubbles which rise to the surface of the electrolyte.

Due to the fact that threaded rubber insulation is used and plates are treated by a special charging process, these batteries are kept in dealers' stocks in a charged, bone-dry condition, another exclusive feature of Willard batteries. They require only filling with electrolyte to be ready for actual use on the radio set. Thus the purchaser loses not one moment of possible useful life.

The greatest and most desirable feature in radio reception is constant voltage. This is the feature that makes the Willard CTR cell the perfect peanut tube. There is no variation in voltage or ampere capacity in these cells such as is the case with dry cells. There is absolutely no loss of capacity due to local action or shelf deterioration. The discharge curve of this battery is a straight and unvarying line sloping off abruptly only at the very end of its discharge. From this it is seen that with the Willard CTR cell it is not necessary to adjust the receiving set constantly to compensate for the change in voltage that is usual in the case of dry cells.

This battery used in the single cell unit readily takes the place of dry cell batteries used in connection with WD11, WD12, UV199 and C299 tubes.

For each WD11 or WD12 tube one dry cell battery is necessary. With the ordinary peanut tube sets three tubes are used. Therefore, three cells are required, one for each tube. The current consumed by these tubes is approximately ¼ ampere and the regular No. 6 dry cells when used for this work will last approximately from four to six weeks, after which they are consigned to the junk heap.

When these dry cells are used they are either connected to each tube individually or the three dry cells are connected in parallel for the operation of the three tubes in parallel. The type CTR cell may be used in exactly the same set-ups.

These cells may also be connected in parallel for greater capacity and with a single cell of type CTR better results, it is claimed, will be obtained than with three dry cells because of the greater capacity of the CTR cell as compared to the ordinary dry cell.

In the case of UV199 and C299 tubes which are designated as dry cell tubes, two CTR type of storage batteries will replace three dry cells and give five times the capacity of the dry cells on one charge.

It is not only for "A" battery purposes that the CTR type is ideal. A set of these battery cells arranged in trays and used as "B" battery produces the most perfect results of any combination that has ever been made, say the manufacturers. The Willard "B" batteries with smaller cells have up to the present time occupied this unparalleled position in the radio battery field and for most purposes and most sets are quite sufficient. But there are many people who want the best and nothing but the best. The best, state the makers, is a set of CTR cells giving constant and unvaried voltage and giving service from six months to a year without recharge. This combination is recommended to those who wish to get the maximum results with the minimum of inconvenience.

The average radio fan no doubt is ignorant of the fact that, while he is so vitally concerned over the problems attached to improving his set, the broadcasting stations are also engaged daily in coping with their own great problems.

While the Willard company has been constantly experimenting and perfecting storage batteries of the highest efficiency for use on radio receiving sets, it has by no means ignored or neglected the problems incident to good transmission.

Accordingly, after long and careful experimentation, after having assiduously studied the individual problems of practically all the largest broadcasting stations in the United States, the Willard company found that this same cell in high voltage combinations makes an ideal broadcasting battery.

Radio authorities throughout the United States have for some time recognized the fact that the storage battery has many advantages over the motor-generator for transmitting purposes, but owing to the bulk and price of the usual form of storage batteries it has been impractical to use them for this purpose heretofore.

With the introduction of the Willard CTR type these objections have now been swept away. For broadcasting purposes these cells are assembled in a standard tray of ten cells of 20 volts. The dimensions of this tray are $6\frac{3}{32}$" wide, $15\frac{3}{16}$" long and $9\frac{3}{16}$" high over the top of terminals.

New Announcer at WOO

A NEW departure in radio broadcasting is announced by station WOO, the Wanamaker store in Philadelphia, which has just engaged Ralph Bingham, celebrated American humorist, as its chief announcer and entertainer.

Mr. Bingham took charge of station WOO October 1, and it is slated in his arrangement of programs that at least one night a month will be a "Ralph Bingham night," when the announcer himself and a few chosen friends will provide entertainment after their own ideas.

National Radio Week, November 25 to December 1, 1923

Radio Merchandising

Advertising Rates: Display, $5.00 an inch, $150.00 a page. Classified Quick-Action Advertising, 5 cents a word. Telephone Lackawanna 6976

Radio Trade Notes

Southern Radio Co., Alfalfa, La., states that it is in the market for nearly everything in the radio line.

* * *

A. Z. Radio Supply, 102 Baldwin street, Newark, N. J., informs RADIO WORLD that it is in the market for good specialty numbers and standard merchandise at right prices for cash. The firm jobs through the mail to the western and southern trade and is interested in a good cheap jack as well as coil mountings and phone cords.

* * *

Stoddard B. Colby has been appointed receiver for Sabco Products Corporation, jobbers in electrical supplies, 6 Murray street, New York City.

* * *

G. F. Schuneman, 194 West Central Ave., St. Paul, Minn., announces that he is going into the retail mail order radio business and would like to receive agents' propositions.

K. G. Schlicher, 703 Tenth avenue, Bethlehem, Pa., is starting a small retail radio business. He will handle parts and supplies and also build sets.

* * *

Wm. A. Stafford, 507 Michigan Ave., Kalamazoo, Mich., is considering selling radio equipment on time payments and would like to hear from manufacturers.

* * *

William McLane, P. O. Box 183, Lansdowne, Md., requests wholesale and retail prices on radio parts and complete receivers.

New Magnavox Catalogue

THERE has just been published by the Magnavox Company a very careful and attractive catalogue for the information of radio users.

It takes the form of a very handy little booklet measuring 3⅛" x 6" which permits being easily slipped into the pocket or handbag. The cover is attractively printed in three colors.

It is not quite fair to use the word "catalogue" in describing this booklet because the contents go far beyond the more or less dull, technical descriptions usually characteristic of catalogues.

In addition to very adequate illustrations and descriptions of the Magnavox radio line, there is also an entire section devoted to correct hook-ups and general information, which even the very experienced radio enthusiast will find helpful. These hook-ups contain diagrams which show the connection scheme for all types of separate unit combinations of Magnavox radio reproducers and amplifiers in conjunction with all types of receiving sets; and also connection schemes of Magnavox combination sets for all types of radio receiving sets, which enable even the inexperienced user to get the utmost from his apparatus.

It has occasionally happened that wrong hook-ups, or poor arrangement of detector, tuner and amplifier units produces unfavorable results which are attributed to Magnavox apparatus whereas, in fact, the trouble is merely revealed by it; and this section will obviate any such difficulties on the part of the purchaser.

There are also pages devoted to illustrating and explaining the fundamental principle involved in the Magnavox electro-dynamic and also the Magnavox semi-dynamic types of reproducer, the latter type having been evolved in order to meet the requirements of dry battery receiving sets.

Copies of this Magnavox radio catalogue will be sent on request by the Magnavox Company, Oakland, Calf., or 30 Seventh avenue, New York City. They are also obtainable from radio dealers who handle the Magnavox line.

Another Helping Hand

THE Acme Apparatus Company, 186 Massachusetts Avenue, Cambridge, Mass., have published a second edition of their pamphlet, "Amplification Without Distortion."

It deals primarily with radio-frequency and audio-frequency amplifiers, their faults, how to remedy them, and how to get the most out of your receivers by the use of the proper amplification circuits. It has 19 circuit diagrams in picture form, illustrating different types of radio-frequency, audio-frequency and reflex circuits using their transformers. There are several half-tone illustrations as well.

A discussion of the common faults of receivers is gone into, and remedies for each are plainly set forth. The book also tells the functions of the different transformers and why certain types should be used in certain circuits.

It is a discussion of amplification that will open the eyes of most amateur builders to many faults that they did not know existed, and will help them to obtain good amplification—as the title suggests.

New Radio and Electric Firms

Unisabel Electric Co., New York City, $25,000; S. Abel, C. O. Nelson, H. Feld. (Attorney, J. Harris, 1545 Broadway.)

Radio Service, Peekskill, N. Y., $5,000; S. J. Oxenburg, B. Finkelstein, C. A. Hovel. (Attorneys, Holley & Oxenberg, 50 East 42d St., New York City.)

Clark & Tilson, New York City, make radio goods, $20,000; R. Cohen, A. N. Grussner (Attorney, B. A. Javitz, 49 Chambers St.)

Square Deal Electric Co., New York City, electric machinery, $10,000; S. Goldberg, G. F. Baitinger, B. R. Timaris. (Attorneys, S. Riegelman & Rosenson, 291 Broadway).

J. C. Olsen Cabinet Company, Cohoes, N. Y., radio cabinets, $5,000; J. C. and A. A. Olsen, N. Sorenzon. (Attorney, F. C. Filley, Troy, N. Y.)

Manhattan Electrical Bargain House, New York City, $1,000; R. and J. Hurwitz, M. Gelb. (Attorney, A. J. Wolff, 206 Broadway.)

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:

R. S. Foster, 1604 Laurel Ave., Bridgeport, Conn.

J. Faulhaber, 2463 Grand Ave., New York City.

Harry Armstrong, 1244 Second Ave., New York City.

Lloyd Stultz, Middletown, Maryland.

K. B. John, 5529 Vernon Ave., St. Louis, Mo.

Louis Atwater, P. O. Box 783, Bridgeport, Conn. (Will spend up to $100 for a receiving set.)

W. C. Kruger, 525 Cleveland Ave., Monett, Mo.

Paul Blakeslee, 601 Ninth St., Monett, Mo.

Harry B. Rollison, 2443 Ontario Road, N. W., Washington, D. C.

Reuben Abraham, Van Dyne, Wis. (Interested in long distance sets.)

The Wireless Shop, Commerce at First, Fort Worth, Texas. (Wholesalers, retailers, repairers.)

Southern Radio Co., Alfalfa, La.

A. Z. Radio Supply, 102 Baldwin St., Newark, N. J.

Harold Wetherbie, Fort Hancock, N. J.

A. F. Santoleri, 339 North 64th St., Philadelphia, Pa.

Home Furniture Co., Milford, Ill. (Retail radio dealers.)

Ellis Bahma, 3419 East 40th St., Minneapolis, Minn.

G. B. Carnes, 5342 N. Camac St., Philadelphia, Pa. (Distributor and retailer.)

Frank L. Busch, R. F. D. 2, Box 43, Udall, Kansas. (Wants a receiver.)

Harold Brophy, 293 Clifton St., Brooklyn, N. Y.

Wm. A. Stafford, 507 Michigan Ave., Kalamazoo, Mich.

Carl Filsinger, 70 Lexington Ave., South Norwalk, Conn.

S. R. Winters, District National Bank Bldg., Washington, D. C.

Roy A. Duffus, 1179 Genesee St., Rochester, N. Y.

H. E. Crankshaw, 1125 Foulkrod St., Frankford, Philadelphia, Pa.

William McLane, P. O. Box 183, Lansdowne, Md.

T. C. Murray, 526 Cottage St., New Bedford, Mass.

Coming Events

NATIONAL RADIO WEEK, November 25 to December 1, 1923.

SECOND ANNUAL RADIO SHOW, Coliseum, Chicago, November 20-25.

MERRIMAC VALLEY RADIO SHOW, Lawrence, Mass., November 8, 9 and 10, under the auspices of the Lawrence Radio Club. For particulars address J. C. Dowd, 354 Essex Street, Lawrence, Mass.

Perfect One Radio Corp., New York City, wireless equipment, $50,000; W. E. Lippert, P. E. Hand, M. N. McCullough. (Attorney, F. J. Knorr, Albany, N. Y.)

Precision Coil Co., Queens, N. Y., radio apparatus, 50 shares preferred stock, $100 each; 400 common, no par value; C. Moffett, W. L. Eccles, A. Hadden. (Attorneys, Curtis, Mallett, Prevost & Colt, 80 Broad St., New York City.)

The Value of Courtesy in a Retail Store

ALTHOUGH the standard dictionaries do not define it as such, courtesy might well be described as something of which there is too little in the business world, especially the retail section of it. Large sums of money are spent annually by retail merchants for the cultivation of good-will, yet a large part of this expenditure is wasted through carelessness or ignorance on the part of those who, to the public, represent the store.

"One of the hardest things we have to do here," said an executive of a well-known local store to a New York Times reporter, "is to get our people to realize that courtesy, which costs nothing in itself, is one of the finest business builders there is. Sometimes I think I shall go mad trying to preach it to them. If I had my way I would make discourtesy to a customer the blackest crime on the store calendar, and penalize the offender accordingly.

"Nor is the clerk always at fault. I have seen too much of the 'hell-cat' type of customer not to sympathize down deep with the girl or man who has to face one of them. Yet, outwardly, my feeling must all be in favor of the customer. There is no use trying to lav the blame at the door of the shopping public, but the fact remains that business would be better and life a lot easier for all concerned if they brushed up a little on the Golden Rule."

From other quarters came similar complaints of a lack of courtesy to customers, both actual and prospective. One of them was related by a well-known advertising man. It appeared that this man was one of two customers who entered a drug store one morning recently just as it was being opened by the proprietor. The advertising man waited while the other man made known his wants. The latter asked for two nickels in change for a dime, and with the air of the most abused person in the world the druggist gave them to him.

"The man thanked him and went into one of the telephone booths," the advertising man said, "but he had scarcely closed the door of it when the druggist turned to me with a tirade. 'Thank you,' he snorted. 'Thank you. You can't pay rent with 'thank yous.'

" 'That's the kind of thing that makes this a fine business,' he went on. 'You wake up in the cold gray dawn, rustle out of bed when others are turning over for another nap and open up your store so you'll be ready to make change for the first sap who comes along or to sell some other boob a two-cent stamp. Take a tip from me, young fellow. Don't let any one tell you that a druggist doesn't earn his money. He's just a goat for the public, that's all.'

"As it happened, I had been up late the night before discussing a plan for getting more people into one of the stores I do work for, and I was not in the mood for sympathizing with a man who got them in with no effort at all and then grumbled about it.

" 'Look here,' I told him, 'do you know that hundreds of retailers are paying big money to get what you get here for nothing?' He apparently thought I was crazy, but decided that it would be safer to listen than not. So I went on: 'I mean what I just said. Hundreds of retailers spend big money annually, in one way or another, to get customers into their stores, while you get them in for nothing by offering them little conveniences like a place to telephone or to buy a stamp in a hurry. Yet, when they come in, you complain instead of seizing your chance to make a sale. Even if you don't succeed at the time, there is no telling how many times they will be back if you make them feel welcome.'

"The druggist looked thoughtful; then, with a sheepish expression on his face, asked me what I would have. Although I had come in to get some shaving cream, I could not resist answering, 'A two-cent stamp.' Without a word of protest he got me the stamp. I took it, and then, to see what he would do, I thanked him and made as if to leave the store. As I neared the door he called after me, 'How about some new razor blades?' I burst out laughing, and then told him of my original need. He seemed to appreciate the point. So I bought some new blades along with the shaving cream.' "

In many of the smaller cities and towns of the country, the lack of courtesy toward customers that is shown by both the retailers and their employes is particularly noticeable. In dealing with the transient customer, the transaction is frequently looked upon by the retailer as if he were doing the customer a favor to sell him goods.

Radio & Electrical Business Opportunities

Rate: 40c a line. Minimum, 3 lines.

FACTORY representation wanted by a thoroughly experienced radio sales executive who can introduce a new product and build sales; twelve years' technical and sales experience. A, Radio World.

ELECTRICAL jobber doing business best department stores, good profits, established 7 years, will sell ($5,000) actual cost stock to quick buyer; owner has other business requiring all his time. Telephone Lexington 2539. Store, 9 West 29th St., New York City.

DISTRIBUTORS

Wonderful new invention by German chemist charges batteries in 10 to 20 minutes; territory open to hustlers with ability to handle men. See Charles Hirsch, Room 1023, Knickerbocker Building. New York City.

GO INTO RADIO BUSINESS

Big opportunity this fall; wanted factory man; also men open branch offices; $500 required. B, Radio World.

SOMETIMES a little money can accomplish a great deal; such a time has arrived in our business; we are building on a broad, sound plan of operation made possible through our exceptionally wide and thorough experience in electrical and general business, both from the manufacturing and marketing ends; we require only $3,000 and services of third partner with electrical-mechanical sales record. C, Radio World.

OPPORTUNITY knocks but once; well-established firm located in New Jersey needs $15,000 additional capital for the expansion of their radio department; exceptionally fine returns guaranteed on the investment and to one with selling experience, who could take active interest, still greater returns assured; will stand strict investigation. D, Radio World.

Exhibitors at the New York Radio Show

The following is a list of exhibitors at the second annual Radio Show, Grand Central Palace, New York, October 6-13.

A. C. Electric Mfg. Co., U. B. Building, Dayton, Ohio; Acme Apparatus Co., 1270 Broadway, New York City; Adams Morgan Co., Upper Montclair, N. J.; Alden Mfg. Co., 52 Willow St., Springfield, Mass.; American Radio Journal, 116 West 39th Street, New York City; A. R. R. L., Hartford, Conn.; American Radio Research, 203 College Avenue, Medford Hillside, Mass.; American Transformer Co., 180 Emmett Street, Newark, N. J.; Automatic Elec. Devices Co., 120 West 3rd Street, Cincinnati, O.; N. Baldwin, 3474 South 23 East Street, Salt Lake City; C. Brandes, Inc., 237 Lafayette Street, New York City; Bristol Co., 144 Liberty Street, New York City; Burgess Battery Co., 50 Church Street, New York City; A. D. Cardwell & Co., 81 Prospect Street, Brooklyn, N. Y.; Coto Coil Co., 877 Willard Avenue, Providence, R. I.; Crosley Mfg. Co., 154 Nassau Street, New York City; Cutler Hammer Mfg. Co., 50 Church Street, New York City; Cutting & Washington, 35 Water Street, New York City; De Forest Tel. & Tel., Central Avenue and Franklin Street, Jersey City, N. J.; Dictograph Prod. Co., 220 West 42nd Street, New York City; Dubilier Cond. Co., 48 West 45th Street, New York City; Eisemann Magneto Co., 32 West 33rd Street, Brooklyn, N. Y.; Electric Storage Battery Co., 25 West 43rd Street, New York City; Engravers & Printers Mach. Co., Sag Harbor, N. Y.; Experimenter Publishing Co., 53 Park Place, New York City; Federal Radio Service Co., 6 Murray Street, New York City; Fiber Prod. Co., 240 North 10th Street, Newark, N. J.; H. H. Frots Co., 30 Church Street, New York City; Gilfillan Bros., 225 West 57th Street, New York City; Goldschmidt Corp., 15 William Street, New York City; Gould Storage Battery Co., 30 East 42nd Street, New York City; Graham & Co.; Grebe & Co., 70 Van Wyck Boulevard, Richmond Hill, N. Y.; Holtzer Cabot Electric Co., 125 Armory Street, Boston, Mass.; Horne Electric Mfg. Co., Mercer and Colgate Street, Jersey City, N. J.; C. B. Kennedy & Co., 50 Church Street, New York City; L. W. Spring Co., 161 Grand Street, New York City; Le Fax Co., 9th and Sansome Street, Philadelphia, Pa.; Magnavox Co., 370 Seventh Avenue, New York City; Malone Lemmon Lab., 342 Madison Avenue, New York City; Mfrs. Patent Co., 520 Fifth Avenue, New York City; Marko Storage Battery Co., 1402 Atlantic Avenue, Brooklyn, N. Y.; R. Mitchell & Co., 255 Atlantic Avenue, Boston, Mass.; Moon Radio Co., 12 Diagonal Street, Long Island City, N. Y.; National Airphone Co., 16 Hudson Street, New York City; National Carbon Co., Thompson Avenue and Orton Street, Long Island City, N. Y.; Neon Lamp World, 62 West 14th Street, New York City; Evening Journal, 238 Williams Street, New York City; National Radio Products, 509 Fifth Avenue, New York City; Novo Battery Co., 424 West 33rd Street, New York City; Pacent Electric Co., 22 Park Place, New York City; Pacific Radio Pub. Co., 17 West 42nd Street, New York City; Pathe Phonograph & Radio Co., 30 Grand Avenue, Brooklyn, N. Y.; Popular Radio, Inc., 9 East 40th Street, New York City; Post Electric Co., 30 East 42nd Street, New York City; Precision Equipment Co., 30 Gilbert Avenue, Cincinnati, Ohio; Radio Corp. of America, 233 Broadway, New York City. Radio Deal Pub. Co., 1133 Broadway, New York City; Radio Digest, 123 W. Madison Street, Chicago, Ill.; Radio Industries Co., 131 Duane Street, New York City; Rocky Mountain Co., 9 Church Street, New York City; Sec-tron Radio Co., 1819 Broadway, New York City; Simplex Elec. Lab., 144 Livingston Street, Brooklyn, N. Y.; Sleeper Radio, Co., 88 Park Place, New York City; J. S. Timmons & Co., 335 E. Tulpshooken Street, Philadelphia, Pa.; Tune Sharp Radio Equip. Co., 6220½ So. Vermont Avenue, Los Angeles, Calif.; Western Elect. Co., 195 Broadway, New York City; Weston Elect. Inst. Co., Waverly Place, Newark, N. J.; Willard Storage Battery Co., 4 La Salle, Street, New York City; Radio Improvement Co., 29 West 35th Street; Shepard-Potter Corp., 56-60 Lafayette Street, New York City.

When Do DXers Sleep?

WHEN does the radio fan sleep? This question is being asked by officials of the Willard Storage Battery Company which recently opened its powerful new broadcasting station at Cleveland, Ohio. They have good reason for wondering about the nocturnal activities of radio fans for this company while testing out its transmitting apparatus every night for a month previous to opening regularly, received thousands of letters from night-owl radio fans,

In order to have the air at a time when no other stations were broadcasting, it was found necessary to test after midnight. Accordingly, WTAM, the call letters assigned to the new Willard station, tested either shortly after midnight or from five to eight o'clock in the morning. As the station was merely testing, it used its former amateur call letters, 8XG, and asked all who heard the programs to write in as to the quality of their reception.

Willard officials knew that they would get many such reports but did not anticipate the flood of them which literally poured in from all over the United States and Canada. Many radio fans over a thousand miles distant from the broadcasting station, not knowing that they were receiving from one of the most powerful stations yet built expressed their curiosity as what equipment the amateur station was using to get such distances.

The mystery was finally solved for them, however, when Willard began broadcasting regular programs on Wednesday and Saturday evenings, using the newly assigned call letters WTAM.

But the question still remains—when do radio fans get their required sleep?

Radio a Communal Force

THE real radio fan enjoys his radio concert most when he has a number of friends with him to enjoy the treat he has landed after fishing around in the air for a while. The loud speaker enables large numbers of people to get the benefit of reception from a single instrument. In some communities where there is no motion picture theatre or other form of entertainment to bring people together, where church services or gatherings are practically the only communal affairs, radio has proved a real boon.

Many letters have been received by Station WGY telling of the pleasure which groups of people have received as the result of invitations of friends. A correspondent living at Alstead, New Hampshire, tells of installing his radio set in the post office where farmers from the neighborhood and residents of village enjoyed the Farmers' Night program. The "Boys of No. 4 Engine House," Racine, Wis., tell of giving a public radio program in the fire house. A correspondent at Shamokin, Pa. says that of all the radio stations he picks up WGY is best and that they broadcast over "Main street to from 200 to 5000 listeners every night." Werner Savela, of Tapiola, Mich., says that he has the only radio receiving set within a 20 mile radius and that he is always sure of company when he is listening in.

A somewhat different example of community reception is that revealed in a letter from Arnold S. Hage, president of the Trudeau Club at the Glen Lake Sanitarium, Oak Terrace, Minn. Mr. Hage explains that the sanitarium is for the treatment of tuberculosis. They have a large receiving set and each patient who is confined to his bed has a pair of headphones. "In all we have approximately 150 pairs of phones connected to the one receiver and we have no difficulty in tuning in your station loud enough to be heard ten feet away from the phones."

American Marine Congress Planning Extensive Radio Program

COINCIDENT with the calling of the first American Marine Congress in New York City during the week of November 5 to 10, it is planned to have sixteen or eighteen of the principal high power broadcasting stations distributed over the country take part in a general program prepared and directed by the Radio Committee of the American Marine Congress. At the meetings of the Congress Hon. Herbert Hoover, Secretary of Commerce, will preside, and many executives, prominent in their respective fields, will join in the discussions to unite the interests of the country in the formation of a constructive shipping policy.

To disseminate the thoughts and opinions of the leaders in various industries, associations and other institutions composing the congress, radio will be used for the first time in an organized nation-wide program.

E. B. Mallory, Chairman of the Radio Section of the Associated Manufacturers of Electrical Supplies, one of the 78 national organizations participating in and endorsing the congress, is Chairman of the Radio Committee of the congress. To insure the successful and broad dissemination of an adequate knowledge of the needs of the nation, prominent government and industrial executives are contributing their support and effort toward the success of the plan by serving as members of the Radio Committee. The membership includes:

Hon. Herbert Hoover, Secretary of Commerce; General Pershing, U. S. A.; Hon. Theo. Roosevelt, Assistant Secretary of the Navy; Admiral Benson, United States Shipping Board; Rear Admiral Reynolds, United States Coast Guard; A. H. Griswold, Vice-President American Tel. & Tel. Company; Major General Harbord, President, Radio Corporation of America; H. P. Davis, Vice-President, Westinghouse Electric & Manufacturing Co.; J. G. Barry, Vice-President, General Electric Company; Powel Crosley, Jr., President, Precision Equipment Company; Eugene McDonald, President, Chicago Radio Laboratory.

The chairman has appointed subcommittees of the general committee in charge of programs, broadcasting stations and publicity, and sectional committees in each broadcasting center to have immediate charge of the activities at those points. Plans are rapidly being formed to use radio for the first time as a means of disseminating knowledge to the entire nation.

Morse Code for Inter-Office Communication

INTER-OFFICE communication by means of telegraph keys and buzzers has been adopted by the radio engineers of the General Electric Company as a means of expediting business and saving steps.

Throughout Building 77, in which is located the radio department of the General Electric Company, 25 telegraph keys and buzzers have been installed. All the engineers know the international Morse code and each man has been assigned a call letter. If a telephone call comes into his office while he is in some part of the factory, the stenographer sounds his call letters which are buzzed throughout the plant. Upon hearing his call the engineer goes to the nearest key and sends out his location and the telephone call from outside the building is transferred to a convenient phone.

One of the first duties of a new stenographer in the radio department is to learn the code as this is just as important as a knowledge of shorthand characters. One unaccustomed to the sound of buzzers might find the repeated calls distracting but the ear of the radio department engineer is pitched only to his own call.

The Romance of the Radio Business

IN the popular mind, the romance of radio signifies the marvel of communication between distance points without wires, the flash of a distress signal at sea and the dramatic rescue of a burning ship, or the broadcasting of an opera program to a lonely mountain hamlet thousands of miles away.

Or it may be expressed in such spectacular incidents as a physician on land listening to the heart beats of a patient far out at sea, or the miracle of amplification whereby the footsteps of a fly in the amplifying apparatus of the laboratory are magnified till they sound like thunderclaps.

"But the real romance of radio," according to Pearce W. Mack, vice-president of the Acme Apparatus Company, "is in the tremendous new industry which has sprung up almost over night. Its extent in terms of capital invested, persons employed and product manufactured, cannot as yet be accurately stated. The developers of radio from the stage of an interesting experiment to a world-wide business have been so busy sawing wood that the statistician hasn't sensed the proportions of the dramatic new development or hasn't caught up with the job of measuring it.

"Two years ago there probably were not fifteen manufacturers of radio apparatus in the United States. Today there are literally thousands, with an annual business totalling millions of dollars. In the manufacturing end of the industry new records for expansion and output, even in American industrial growth, have been made.

"In all phases of the development of the radio industry are to be seen the romance of remarkable success on the part of pioneer individuals and firms producing the magic new utility.

"The new industry has grown so rapidly that the old-timers in it are still young. Their careers are characteristic of its development. Take, for example, the case of the inventor of the third element in the audion tube which has made radio possible. A few short years ago he was living in a $6 a week room. Today he is internationally famous as an engineer and manufacturer.

"Five years ago two men, just out of college, started a little radio plant in rooms over a doughnut factory in Cambridge, Massachusetts. Their work was done amid the fumes of fried cakes. The rent for their entire 'factory' was $18 a month. Now these young transformer engineers and their product are nationally known and their business is a million dollars a year.

"Another example is that of a New York lawyer named as receiver of a small phonograph distributing company which had gone on the rocks. He saw the opportunity in radio and started a small retail store. He had less than $3,000 capital, and didn't know a variocoupler from an amplifying transformer. When a customer came in and asked for an amplifying transformer, he had to look in the catalogue of the jobber from whom he bought his stock, find the picture of the article and then look on his shelves until he found the container with the same picture. Today he operates twelve stores and before January 1 will have thirty. His monthly business is a quarter of a million.

"There is the case, too, of the rise of a well-known Eastern manufacturer of telephone receivers who had started in business twenty years ago and had made a mediocre success. When the radio boom came he was making radio headsets, and the public was soon bidding for his product. Today his plant covers acres of ground.

"These are only a few chapters from the romance of radio, and the potentialities of the new industry are as yet only partially revealed or realized."

RADIO WORLD
TELEPHONE, LACKAWANNA 6976
PUBLISHED EVERY WEDNESDAY (Dated SATURDAY OF SAME WEEK)
FROM PUBLICATION OFFICE,
1493 BROADWAY, NEW YORK, N. Y.
BY HENNESSY RADIO PUBLICATIONS CORPORATION
ROLAND BURKE HENNESSY, President and Editor
M. B. HENNESSY, Vice-President
FRED S. CLARK, Secretary and Manager
1493 BROADWAY, NEW YORK, N. Y.
Boston Representative: Chas. H. M. White, 1367 Commonwealth Avenue, Allston, Mass.
European Representatives: The International News Co., Breams Bldgs., Chancery Lane, London, Eng. Paris, France: Brentano's, 37 Avenue de l'Opera.

Managing Editor: Stephen L. Coles
Technical Editor: Robert L. Dougherty

SUBSCRIPTION RATES
Fifteen cents a copy. $6.00 a year. $3.00 for six months. $1.50 for three months.
Add $1.00 a year extra for foreign postage. Canada, 50 cents.
Receipt by new subscribers of the first copy of RADIO WORLD mailed to them after sending in their order, is automatic acknowledgment of their subscription order.

ADVERTISING RATES
One page: One time—$150.00.
Half, Quarter, Third and Two-thirds pages at proportionate rates.
One inch, one time—$5.00. Per agate line $0.40.
On four consecutive issues, 10% discount.
On thirteen consecutive issues, 15% discount.
Cover and preferred-position rates made known on application.
Terms: 30 days net. 2% 10 days.

CLASSIFIED ADVERTISEMENTS
Five cents per word. Minimum, 10 words. Discount of 10% on 4 consecutive issues—15% on thirteen consecutive issues. Cash with order.

Entered as second-class matter, March 28, 1922, at the Post Office at New York, New York, under the act of March 3, 1879.

IMPORTANT NOTICE
While every possibee care is taken to state correctly matters of fact and opinion in technical and general writings covering the radio field, and every line printed is gone over with a scrupulous regard for the facts, the publisher disclaims any responsibility for statements regarding questions of patents, priority of claims, the proper working out of technical problems, or other matters that may be printed in good faith and on information furnished by those supposed to be trustworthy. This statement is made in good faith and to save time and controversy in matters over which the publisher cannot possibly have control.

World's Series Games Generally Broadcast

STATION WBZ, beginning October 10, broadcast the results of the World Series baseball games play-by-play during the progress of the games at the Polo Grounds and the Yankee Stadium, New York City. The results were received in the office of the Springfield Republican by telegraph and broadcast directly from there. A microphone and amplifier was installed in the Republican office which connected with the radio station at East Springfield, four miles distant.

By means of telephone lines between Schenectady and New York City, WGY, the General Electric Company radio station, broadcast the world's series. Listeners tuned in to WGY not only got an instantaneous report of every play but the shouts, jeers and cheers of the crowd. William McGeehan, sporting writer of the New York Herald, who reported last year's series and the Yale-Harvard football game of 1922 for WGY, was WGY's radio reporter.

McGeehan's reports from New York were broadcast by WEAF, the Bell Telephone System station, which besides being connected with WGY was also hooked up with WCAP, the Washington, D. C., station of the Chesapeake & Potomac Telephone Co. WMAF, South Dartmouth, Mass., also was connected in on the World's Series service of WEAF.

St. Louis Radio Show

THE second annual Radio Week in St. Louis was held at the Missouri Theatre from October 13 to 20. The lobby and mezzanine floor were used as exhibit space. Special radio films and acts were shown in the theatre.

Station WLW Offers Monthly Prizes for Radarios

THE real customs of a people are those which, like unwritten laws, govern most their actions. In order that the whole world may know the various conceptions of what American customs are and as a further step in the struggle to reach the ultimate in Americanism, the Crosley Manufacturing Company operating Station WLW is offering a monthly prize for the best radario dealing with this vital subject, Americanism.

Radarios, or radio plays, originated at the WLW studio and Fred Smith, director, conceived the idea. The radario is a new form of dramatic art and requires special preparation in writing and in presentation. The voice must convey to the listening audience what the eye and ears see and hear in the theater.

There is to be a prize of $25.00 given every month to the winner of the contest for that period. The rules governing this unique offer are:

1. The plot and locale should be distinctively American.
2. Playing time no longer than 20 minutes.
3. Brief synopsis must accompany radario.
4. Must be typed double space on one side of paper.
5. Return address on all manuscripts.
6. Short biography of author may be included.
7. Return postage must be sent with manuscript.
8. Address radario department, Crosley Manufacturing Co., Cincinnati, O.
9. All rights of winning radario belong to Crosley Manufacturing Co.
10. Crosley Manufacturing Co. will not be responsible for manuscripts but every effort will be made to return immediately after selection of winning radario.
11. Judges: Helen Schuster Martin, of the Schuster Martin Dramatic School; T. C. O'Donnell, editor of "The Writer's Digest," and Fred Smith, studio director WLW.
12. Monthly contest closes on the first of every month.

Station WRW, Tarrytown, N. Y.

Standard program for Monday, Wednesday and Friday, 273 meters.

7:30—Star Spangled Banner, Monday; America, Wednesday; Stars and Stripes Forever, Friday.
7:35—Agriograms.
7:40—Selections on the Steinway Duo-Art Reproducing Piano.
7:45—Baseball scores.
7:50—Latest phonograph selections.
7:55—Late news.
8:00—Children's stories.
8:15—Vocal solos.
8:30—Radio for the beginner, by Frederick Koenig, Wednesday; Educational talk, Monday and Friday.
8:45—Vocal solos.
9:00—Westchester County Police reports.
9:15—Instrumental solos.
9:30—Prize contests, Wednesday only; Monday and Friday, Boy Scout activities.
9:45—Vocal solos.
10:00—Program of dance music by the WRW Orchestra.

Sunday evening church services direct from the Second Dutch Reformed Church of Tarrytown, N. Y. Rev. James M. Dixon, pastor; Miss Iona See, organist.

Radio World is $6.00 (52 issues), $3.00 six months, $1.50 three months, 15c. single copy. Radio World, 1493 Broadway, New York City.

Back numbers of Radio World supplied at regular price of 15c. a copy. Any 7 copies for $1.00. Radio World, 1493 Broadway, New York.

What You Want, When You Want It

EDITOR, RADIO WORLD:—I am interested in commercial radio telegraphy and I am trying for a first-class commercial license. I have looked for some time for a magazine that would give me some practical radio knowledge instead of the eternal broadcasting bunkum. I tried many but was disappointed for they hadn't even the sense to give the radio call of ships—they were plainly broadcast magazines.

Then I read the RADIO WORLD. This satisfied me immensely, because hearing of the "Leviathan's" fine radio set, I tried to find the call for that ship. Sure enough, it was in RADIO WORLD together with many other interesting commercial features!

I am now a convinced RADIO WORLD reader for I know I will find what I want in it. Hoping to be ever satisfied, as I am now,

Your truly,
D. GREGORY.
1437 Mathewes St., Vancouver, B. C.

Heaven Couldn't Be Sweeter If—

BUSH TERMINAL didn't butt in every time they had a good concert on at WEAF, or some very interesting announcement was being made.

They would broadcast fights like the Dempsey-Firpo every week.

The "kid" next door wouldn't run over every night with a new set of troubles and questions.

A certain feminine person would take an interest in radio and be willing to listen to radio concerts instead of going out to the theatre and restaurant.

They had penny sales on radio goods—like they have at the druggist's.

Every one that knows something about radio would decide that one circuit was best, instead of each one having its favorite. Think how much easier the novice would sleep!

You can make money by using the Classified Dept. of Radio World.

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

This department is intended for everybody who wants quick action on short announcements covering the buying, selling, exchanging or general merchandising in the radio and other fields. Readers of RADIO WORLD will find that it pays to read these columns every week. Advertisers will get an eight-day service here—that is, copy received for this department will appear in RADIO WORLD on the news-stands eight days after copy reaches us.

The rate for this RADIO WORLD QUICK-ACTION CLASSIFIED AD. DEPT. is 5c. per word (minimum of 10 words, including address), 10% discount for 4 consecutive insertions, 15% for 13 consecutive insertions (3 months). Changes will be made in standing classified ads. if copy is received at this office eight days before publication. RADIO WORLD, 1493 Broadway, N. Y. C. (Phone, Bryant 4796).

WHILE THEY LAST—Crosley No. V1 Receivers, $19.50; De Forest Reflex Receiver, $75.00; UV-200 Detector Tubes, $3.90; UV-201 Tubes, $5.00; WD-11 Tubes, $5.25; Airway Variometers, $3.00; Moulded Variometers, $5.75; Atwater-Kent Coupler on Panel, $9.50; Atwater-Kent Two Step Amplifiers, $9.50; Marshall-Gerken Amplifiers, $7.50; Detroit Amplifier Horn, $7.50; R-3 Magnavox, $20.00; Dictograph Loud Speaker, $14.50; Dictograph Headsets, $5.75; Frost Phones, $3.75; Rheostats, 75c; Moulded Dials, 40c. N. E. RISTEY, Spring Grove, Minn.

HYPNOTISM, MESMERISM, ASTOUNDS, controls others, wants gratified, mind reading (any distance), wonderful illustrated Book of 205 pages $1.00 postpaid. R. W. COLLINS CO., 197 Fulton Street, Brooklyn, N. Y.

ONE KENNEDY SHORT WAVE RECEIVER with two step, $100.00. One Twin Variometer with two step. new WD-12's and Brandes, $75.00. D. L. THOMPSON, 766 Kalamath St., Denver, Colo.

BUILD yourself a Storage "B" Battery from Edison elements that will last you a life time. Complete units for making 100 volt 1500 milliampere battery, consisting of a cabinet, switch, elements, glass tubes, separators, nickle wire, electrolyte and blue print for assembly, $12.50. Assembled battery, $17.50. Drilled elements, 6c a pair; glass tubes, 2c each; separators, 1c each; nickle wire, 1c each; rubber covered wire, 2c foot. W. Roberts Storage "B" Battery, 41 Jefferson St., Brooklyn, N. Y.

FOR SALE. Single Variometer Circuit with WD-11 tube, phone and batteries, price $45.00. Radio Storage 6 volts, like new, price $10.50. EDWARD BRYAN, Gard Ave., North Arlington, N. J.

PATENTS—SEND DRAWING OR MODEL FOR EXAMINATION AND OPINION. Booklet free. Watson E. Coleman, Patent Lawyer, 624 F Street, Washington, D. C.

DO YOU WANT A POWER AMPLIFIER?—You can build one from complete details given on page 6 of Radio World, dated June 9, 1923. Send 15c., or start your subscription with that issue. RADIO WORLD, 1493 Broadway, New York City.

EDISON STORAGE BATTERIES, $2.50. Worth $48. 824 North Fifth, Philadelphia, Pa.

VACUUM TUBE RESULTS FROM A CRYSTAL SET! A "PT" Ultra-Sensitive Contact will increase the range and audibility of your crystal receiver. The most sensitive catwhisker in the world. It will not jar out. Thousands in use. Record, 1,000 miles on phone; 3,300 miles on spark. Price twenty-five cents in coin. "PT" CRYSTAL CONTACT COMPANY, Box 1641, Boston.

A BARGAIN, 6 Homechargers Rectifiers, brand new, at $16.00 apiece. 8 R. C. Sets, new, at $90.00 each. C. H. ANDERSON, Lewistown, Montana.

SPIDER-WEB INDUCTANCES wound with double covered green silk wire and void of all compounds. Type C for Reinartz circuit, $1.50. Type D for modified Reinartz circuit, $1.25. Type M wave trap filter coil, $1.25. Directions free with all coils. NOLTE MFG. CO., 61 Gautier Ave., Jersey City, N. J.

MAGNAVOX R3 or M1. Latest nationally advertised reproducers. List $35. Introductory $25. The factory sealed carton is your Guarantee. Radio Central, Dept. W, Abilene, Kansas.

LONESOME! MAKE NEW AND TRUE FRIENDS. Confidential. Write DOLLY GRAY AGENCY, Box 186B, Denver, Colo.

WANTED—Scientists to furnish money to develop an electrical discovery. Opportunity for the right parties to make some unusual investigations. P. O. Box 12, Ft. Collins, Colo.

DO YOU WANT to build a two-stage, three-circuit, regenerative set, with complete plans and all details to guide you, and nothing to guess at? Send for Radio World of June 30, 1923, and see the article by C. C. Hermann, E.E. Send 15c., or start your yearly subscription with that number. RADIO WORLD, 1493 Broadway, New York City.

DOES TUNED RADIO FREQUENCY PUZZLE YOU?—If so, and you want to build a set incorporating this very efficient means of getting long distance volume on either crystal or tubes, send 15c for issue of July 14, 1923, or start your subscription with that number. RADIO WORLD, 1493 Broadway, New York City.

MAGNAVOX TYPE R3. Latest nationally advertised reproducers. List $35. Introductory offer, $25. The factory sealed carton is your guarantee. Radio Central, Dept. W, Abilene, Kansas.

15c. LETTERED BINDING POSTS, complete set eight, 60c; two sets, $1.00. Prepaid, same day. Stamps accepted. Everything in radio. Ask for quotations. List for stamp. Kladag Radio Laboratories, Kent, Ohio.

GENUINE EDISON ELEMENTS (new) for making "B" Batteries. Obtained from U. S. Government. A positive and negative element—6c.; glass tube—3c; all other parts at reasonable prices. Postage, etc., 50c. extra per order. Free instructions. TODD ELECTRIC COMPANY, 103 West 23rd Street, New York.

THE SHEBOYGAN COIL tunes sharper than any other. Only the turns needed are in the circuit—no dead ends. It can be made in tube, spider-web or any other form. Fine for loading. Drawings sent for $1.00 M. O. E. GUEHNA, 118½ North 8th Street, Sheboygan, Wis.

DRACO Tube Protectors, 15 cents each, postpaid. DUANE RADIO APPLIANCE CO., 31 Liberty Street, San Francisco, Cal.

DON'T RISK TIME, MONEY and PLEASURE! Get radio for you, for your home, for money-making or science, complete. Radio Encyclopedia and Directory Illustrated; 20th Century Illustrated Radio, picture entire radio of the whole world best of all. Price for the whole thing only $2.75. Address E. JULIUS & COMPANY, 2309 West Grand Avenue, Chicago, Ill.

EDISON STORAGE BATTERIES—350 amperes. Worth $48. 824 North Fifth, Philadelphia, Pa.

EXCHANGE JOLLY, INTERESTING LETTERS THROUGH OUR CLUB. Betty Lee, Inc., 4254 Broadway, New York City. Stamp appreciated.

ARE YOU AFTER DISTANCE THIS YEAR?—If so, get a copy of Radio World of July 7, 1923, and see the article by J. E. Anderson, M.A. Simple to operate and sure as shootin'. Send 15c., or start your subscription with that issue. RADIO WORLD, 1493 Broadway, New York City.

ARMSTRONG, FLEWELLING, REINARTZ, GRIMES, COCKADAY, HAZELTINE, SATTERLEE AND OTHER POPULAR STANDARDIZED CIRCUITS DESCRIBED AND ILLUSTRATED IN RADIO WORLD'S FALL BUYERS' NUMBER, DATED OCTOBER 6, 1923. SENT ON RECEIPT OF 15c. OR START YOUR SUBSCRIPTION WITH THAT NUMBER.

WHAZ Advance Programs

NOW that station WHAZ has celebrated its first anniversary coincident with the opening of the new college year at Rensselaer Polytechnic Institute the regular winter schedule of weekly Monday evening concerts, continued without break during the summer, will be supplemented by the late monthly transcontinental concerts by the Radio Owls on the second Tuesday morning of each month, beginning at midnight. The weekly concerts are broadcast at 9 p. m., Eastern Standard time, on a 380-meter wave length. The programs during the cooler season will be about equally divided between popular and classical music groups and on the last Monday night of each month the programs by students of the Troy Tech will be resumed. There will be presented in the series of weekly addresses a monthly talk on some modern phase of engineering by members of the Institute faculty. Literally thousands of letters and messages of congratulations on the quality of the broadcasting from WHAZ have been received since the celebration of its first birthday on September 10.

October 22—Albany Railroad Y. M. C. A. night, concert program and address.

October 29—Rensselaer Polytechnic Institute students' night.

November 5—Middlebrook's Women's Society Orchestra in popular music program.

November 12, 9 P. M.—Program of quartets and solos, Mrs. Harry Glass, soprano; Miss Margaret Dexter Babbs, contralto; John C. Dandurand, tenor; C. Albert Cook, bass; Harry J. McCreedy, pianist; assisted by violin soloist. Late program at midnight—R. P. I. Radio Owls.

November 19—Another program of old-time songs and melodies by the Radio Male Quartet and Empire Mixed Quartet. Will H. Wade, director, presented by request of many listeners.

November 26—Rensselaer Polytechnic Institute students' night.

Station WGI, Medford, Mass.

Eastern Standard Time. 360 Meters.

October 20.

6:00 P. M.—New England weather forecast furnished by the U. S. Weather Bureau. New England crop notes furnished by V. A. Saunders, statistician. Late news flashes—early sports news.

6:15 P. M.—Code practice, Lesson Number 141.

6:30 P. M.—Boston police reports, Boston Police Headquarters.

7:30 P. M.—Evening program. 1. Twenty-ninth of a series of talks on New England Business Problems by Arthur R. Curnick, of the New England Business Magazine. 2. Musical program to be announced.

October 21.

4:00 P. M.—Twilight program. 1. "Adventure Hour," conducted by the Youth's Companion. 2. Concert program by the Edison Laboratory Phonograph. 3. Stories by Arturo.

8:30 P. M.—Evening program. 1. Talk on World Unity under the auspices of Mass. Federation of Churches. 2. Musical program.

Sleeper's Two Latest Radio Books

Two new and remarkably good radio books by M. B. Sleeper —one is entitled "Six Successful Radio Sets," with design data and instructions for receiving sets specially selected for exceptionally long distance reception. The other is "101 Receiving Circuits," being a most complete compilation of diagrams including circuits for a regenerative, superregenerative, Reinartz, Flivver, Flewelling, super-heterodyne, reflex and radio frequency sets. Each book mailed on receipt of fifty cents and ten cents extra for postage. Both books for $1.00 and no extra charge for postage. The Columbia Print. 1493 Broadway, New York City.

SPECIAL OFFER
TO NEW RADIO WORLD SUBSCRIBERS:

Send $6.00 for yearly subscription for Radio World (52 numbers) and these two Sleeper Radio Books will be sent you free, parcel post prepaid. This offer good only until October 25, 1923. If you are already a subscriber, send $6.00 NOW for a renewal and books will be sent you.

IF YOU ARE INTERESTED IN RADIO YOU NEED THESE BOOKS

Radio Books for Your Vacation

Telling How to Operate a Radio Set—How to Build a Set—Principles of Vacuum Tubes and Other Radio Problems

Wireless Telegraphy and Telephony Simply Explained

By ALFRED P. MORGAN

One of the most complete and comprehensive treatises on the subject ever published. A study of its pages will enable one to master all the details of the wireless transmission of messages. The author explains in simple language the theory and practice of wireless telegraphy and telephony. 154 pages, 156 engravings.....PRICE $1.50

The A B C of Vacuum Tubes Used in Radio Reception

By E. H. LEWIS

Assoc. I. R. E., and Radio Instructor

Written particularly for the person who "knows nothing about radio," but who would like to gain an understanding of the elementary principles of operation of vacuum tubes and various circuits in which they are used for the reception of radio-telegraph signals and radio-telephone music and speech. Illustrated.....PRICE $1.00

Experimental Wireless Stations

By P. E. EDELMAN

Tells how to make apparatus to not only hear all telephoned and telegraphed radio messages, but also how to make simple equipment that works for transmission over reasonable long distances. Then there is a host of new information included. The first and only book to give you all the recent important radio improvements, some of which have never before been published. 392 pages, 167 illustrations.....PRICE $3.00

☞ **The 3 Books for $5.00 to One or Different Addresses**
Any of These Books Sent Prepaid on Receipt of Price

ADDRESS **THE COLUMBIA PRINT**
ROOM 326, NO. 1493 BROADWAY, NEW YORK