UP-TO-DATE LIST OF BROADCASTERS

MORE ABOUT THE WHITE SUPER-AMPLIFIER—(See Inside)

15c. a Copy

Vol-4 No-99

February 16

1924

RADIO WORLD

Title Reg. U. S. Pat. Off.

ILLUSTRATED *EVERY WEEK*

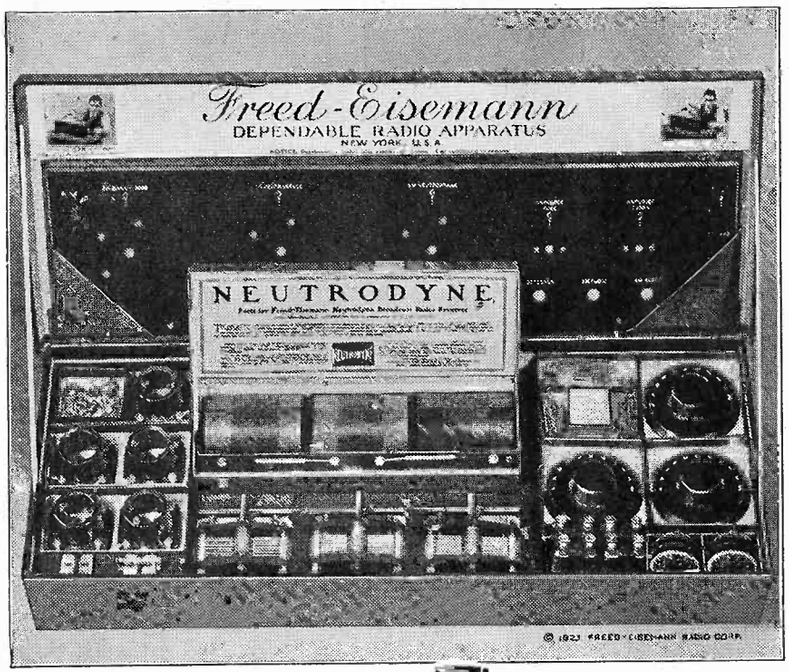
GENERAL BUTLER ENLISTS RADIO IN PHILADELPHIA CRUSADE

(C. Keystone View Co.)

Brig.-Gen. Smedley D. Butler, of the Marine Corps, who is on a year's leave of absence to serve as Director of Public Safety of Philadelphia, has made a great "clean-up" in the City of Brotherly Love since January 1. His latest move was to broadcast an address from Station WDAR asking the public's co-operation. Gen. Butler is shown at the right. His assistant, George W. Elliott, is at the left.

FURTHER DETAILS OF THE ULTRADYNE RECEIVER—(See Inside)

A *Freed-Eisemann* KNOCKDOWN NEUTRODYNE RECEIVER



Unassembled, Model KD-50
Freed-Eisemann Neutrodyne Receiver

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Complete
With Full Instructions

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Front View KD-50 Neutrodyne Being Assembled

FREED-EISEMANN RADIO CORPORATION
LICENSED BY
INDEPENDENT RADIO MANUFACTURERS, INC.
NEUTRODYNE
UNDER HAZELTINE PATENT NO. 1450080
DATED MAR. 27, 1923
AND PATENTS PENDING

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SPERRY BUILDING **MANHATTAN BRIDGE PLAZA** **BROOKLYN, N. Y.**

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]

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Further Notes on the Ultradyne Receiver

By B. C. Caldwell

SINCE the publication of the Ultradyne receiver the writer has literally been flooded with letters from the builders. Almost every one commented on the fact that the Ultradyne was the ideal set. Among all of the letters, I have found but three who have had trouble. In the first case, the builder could not tune the set to the higher wave lengths. If this happens to be the case with you, wind about 25 per cent. more wire on each secondary coil.

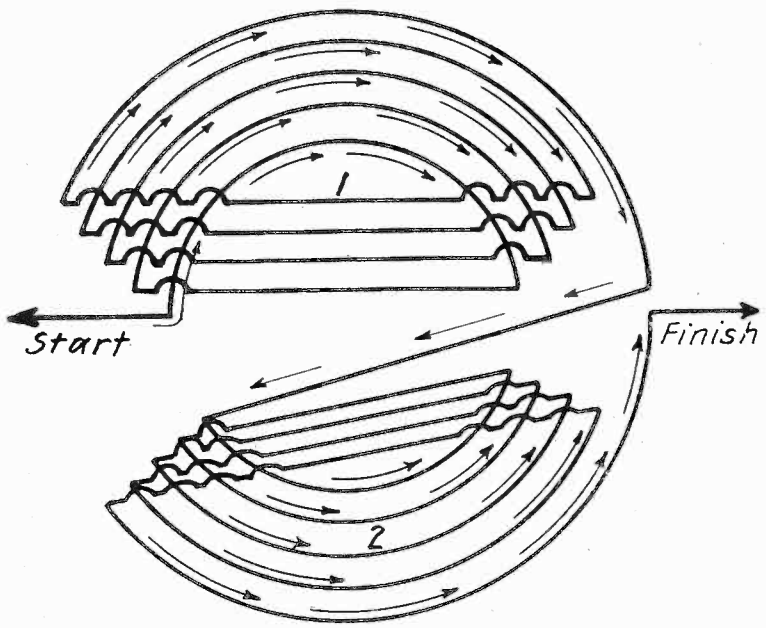


Fig. 1. Diagram showing the manner in which the wire is wound on the forms to make the transformers for the Ultradyne circuit. Arrows show direction of winding wire.

In the other two cases, the sets would not work at all, except for a rushing or a clicking sound. The trouble here is simple. The primary coils are not placed in the proper relation to the secondary coils. In the first description of the set, I stressed this point. However, I will admit, that it is a hard task to get them right the first time, as even if you do get the wires running in the same direction on each coil, there is a chance that the opposite fields will be placed together. In this case, of course, there will be absolutely no sound in the phones. Placing these coils together is very much like getting the proper connection for a honeycomb coil. When you buy one of these, there is a fair chance that you will have to take the coil apart and change the connections yourself. Getting these coils placed properly is the only difficult thing about the Ultradyne, and when you realize that there are three pairs, you will see that this is a good evening's work in itself. However, don't let this bother you, for the Ultradyne is a wonderful receiver when once these coils have been placed together properly.

The inside diameter of the coils used by the writer is 1½". They were wound with No. 22 double silk covered wire.

The paper that is placed between the coils need be of no particular kind, brown or heavy wrapping paper will suffice. If double silk covered wire is used, no paper is necessary.

The best forms to be used are radion or formica. These come in the standard size, with a center of approximately 1½". These may be cut down to an outside diameter of about 3½". Cardboard forms in this size may also be

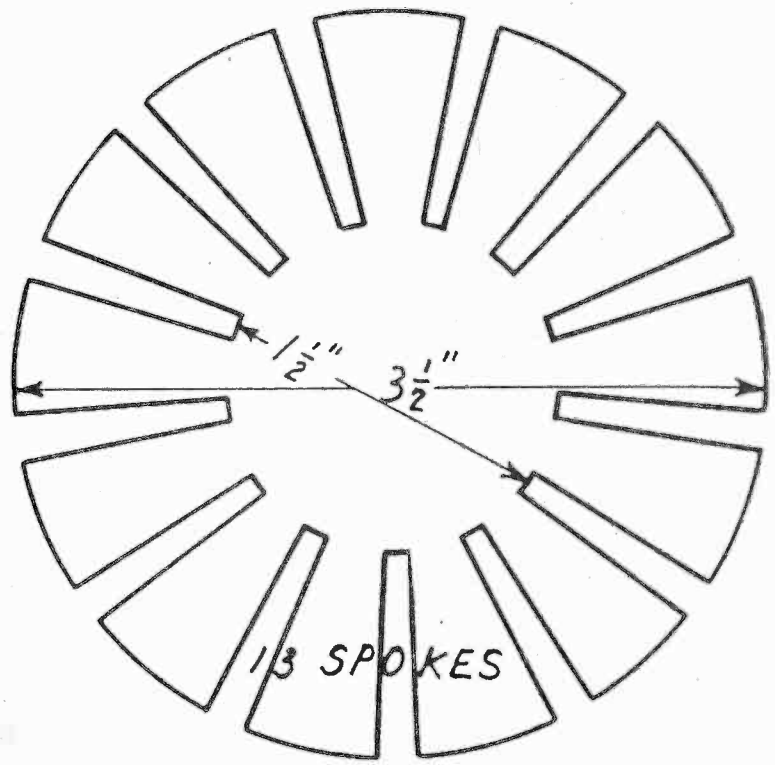


Fig. 2. Former to be used for winding coils for the Ultradyne circuit. This illustration may be used as a cutting template.

obtained in most localities and will work satisfactorily. The original coils made by the writer were wound on cardboard, so if you cannot obtain radion forms, do not be afraid to cut them from heavy cardboard.

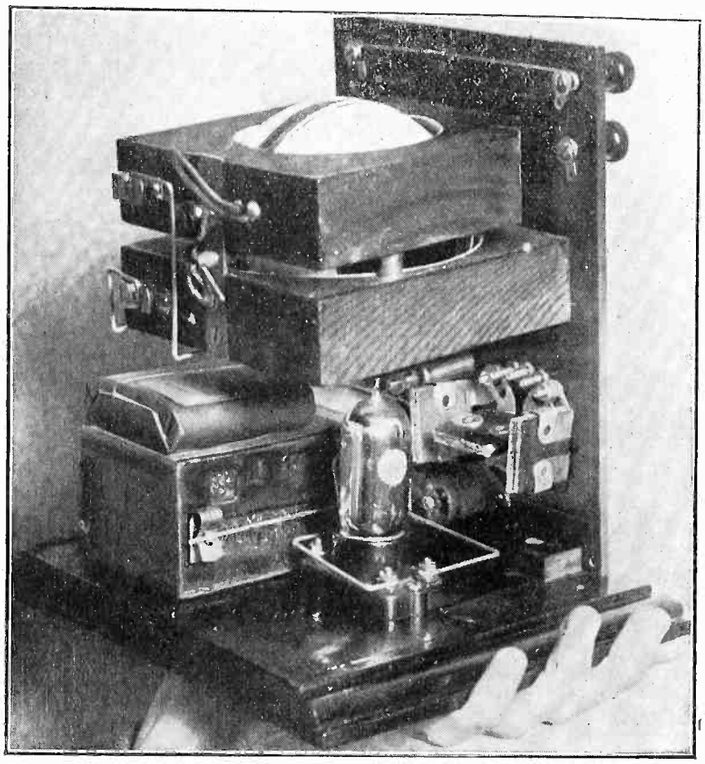
One question that cannot be answered by writing, is

(*Concluded on next page*)

This Receiver is Compact and Highly Efficient

By Charles Bucher

PROBABLY the greatest fun of radio is realized by the man who constructs his own receiver. Many fans who never thought that they had mechanical ability in any line are now surprising themselves and others by building highly satisfactory and powerful receivers. However, no matter what circuit is used, the general rule of construction seems to lie in spreading a little apparatus over a great big panel, and using leads that could almost wire up a house for electricity. This is basically and electrically wrong. You can limit your leads and place your apparatus so that it will not interfere electrically and yet will be small or compact to a high degree.



(C. Kadel and Herbert)

Interior view of an interesting little one-tube receiver which is so small that it can be easily held in the palm of the hand. Note the very exact and neat construction.

A good example of this compact arrangement is shown by the accompanying illustration, which depicts a single UV199 receiver build by Raymond Chassevent, a Bronx, N. Y., amateur who, to say the least, is a very good workman and a most careful observer. Mechanically the set is a positive wonder. Electrically it is a marvel of careful placement of apparatus and wiring. Besides that, the builder included several points novel in themselves which it would do well for other amateur builders to observe.

The foremost point is the arrangement of the apparatus. Note the manner in which the entire set was planned. The panel is just a little larger than the wood forms of the variometer in width and depth. It is just twice the height of the UV199 and socket, or 6", which makes the entire panel square. Some of the leads are but 1½" in length, and the longest lead used is not over 7". This cuts down the internal resistance of the circuit wonderfully, and makes much louder and clearer signals possible. If people who construct home-made sets would only realize this point, as Chassevent surely must have before making the receiver, there would be far less complaints from disappointed builders of receivers.

One other novel point is the method used in tuning. The receiver is not regenerative, and simply uses the variometer across the grid and filament leads of the tube as an inductance. However it was found necessary to incorporate a condenser or rather a variable bank of fixed condensers to give sharp tuning. On the lower right hand corner of the panel, directly in front of the tube will be seen three fixed condensers. If you look real sharp, you will see that they are joined to switch points or taps, which lead through the panel to the front of the set. They are of different capacities, which were first tested out. One condenser allows perfect reception from WHN the second from WOR and WJZ and the third from WEAF and higher. Another good point about the circuit is that it is only necessary to attach a good ground, and no antenna, and signals can be plainly received.

A single 22½ volt dry cell supplies the B battery voltage, and a three-cell flashlight battery supplies the current necessary for the filament. These are neatly placed on the base under the variometer as shown. Directly in front of these, and under the variometer, can be seen the grid leak of the small variable type which is used. Back of that is the 30 ohm rheostat necessary to control the filament of the tube.

This should prove a good example for some of the amateur fans who like to "roll their own." The point that should be stressed, and *which is not in most home made receivers,* is to make your leads short, and of good heavy wire. Resistance in any part of a circuit that connects apparatus cuts down the efficiency to a great extent, so build it over now, using this as a model for the wiring, and make your leads short, of good heavy bus wire, and do not bring leads 18" in length around a tuning coil, with nice right angle bends, to reach across a 6" space.

(*Concluded from preceding page*)

the manner of actually winding the coils. This is easily shown in the diagram accompanying this article. It is the five-turn coil, and to make things clearer, the direction of the wires is shown by arrows, with the start and finish clearly marked. Wind the large or secondary coils in the same manner, being sure that no binding material of any sort is used on either the coils themselves or the formers.

Like most of all supersensitive circuits, this one is critical, and in most cases is more critical than the well known neutrodyne. By this I mean that it is critical as to the wiring of the leads. In the neutrodyne, there are the neutrodons to neutralize the internal tube capicitance that causes the oscillations. In this receiver we rely upon the turns ratio and the manner of winding and connecting the coils to do the same thing. This makes the coils the one factor that determines the correct operation of the circuit, and if they are not wired up just so, there will be no results at all. It is not a circuit that can be wired up in an hour or five hours, as time and care must be taken. Wires should be short as possible.

How to Make a CW or Radiophone Transformer

By Leroy Western

TO the experimenter who has available 110 volts 60 cycle A. C., a step-up transformer capable of delivering both a high voltage and a low voltage is invaluable. Such a transformer is useful in both radio telephone and CW or ICW transmitting sets. The manufactured ones are quite expensive, although those made by reliable companies are very efficient. Still the amateur with the construction "bug" often desires to make his own but hesitates because of lack of definite and authentic data.

To supply this want and furnish the required information, the transformer described below and illustrated herewith was designed. It was made after standard engineering practice using the regular formulas which can be found in any electrical engineering handbook and when completed was found to be equal in performance to a standard manufactured transformer which unfortunately had been burned out.

In order to make the transformer operate at as low a temperature as possible, a core of generous dimensions was used. Furthermore, it was made up of the best quality of silicon steel obtainable and it is advisable to procure this material from a company specializing in the sale of transformer steel. The material can in some cases be bought already cut in 1½" strips, but if not, it should be bought in sheets and cut up. This will require a little careful work in order to get the edges smooth and to prevent bending the metal when cutting. However, a little perseverance will accomplish the feat quite satisfactorily. Any of these strips which are bent can be readily brought back to shape by careful manipulation. The steel used should be of two sizes, 8" and 6". The actual assembling of the approximately .014" thick, and should be cut into lengths c1e is done after the coils are wound, but beforehand the core should be assembled by overlapping the corners of the strips which can be readily seen by referring to Fig. 1.

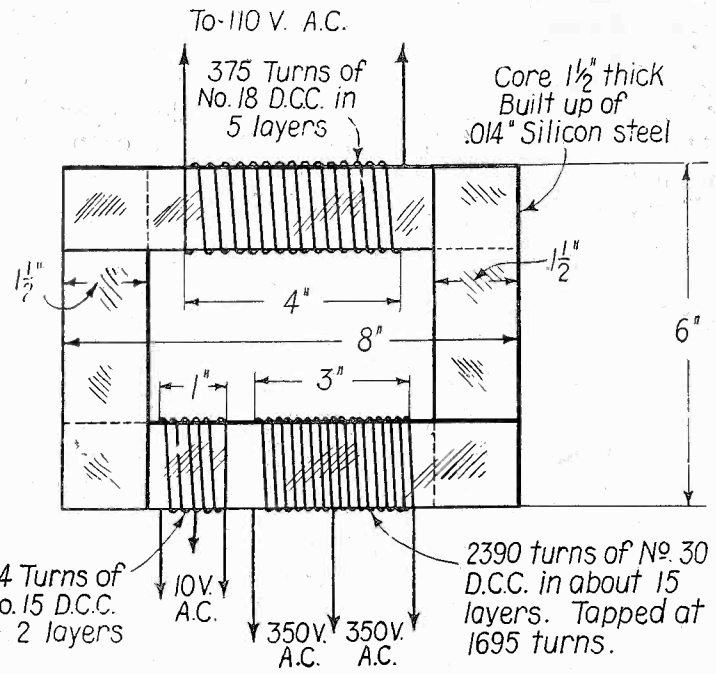


Fig. 1. Diagram showing location and winding of coils on the transformer. The manner of constructing the core is also shown.

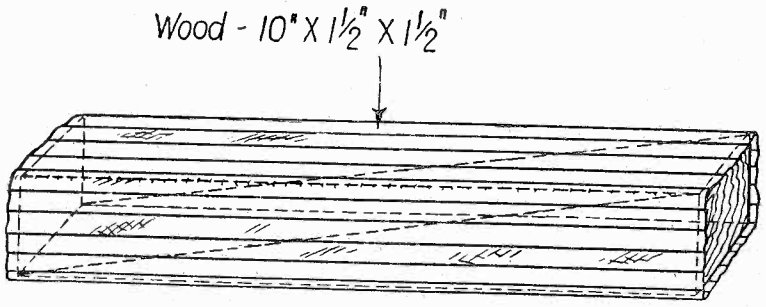


Fig. 2. Wood former used to wind the coils of the transformer. It is easier to wind it on the wood block than on the laminated leg.

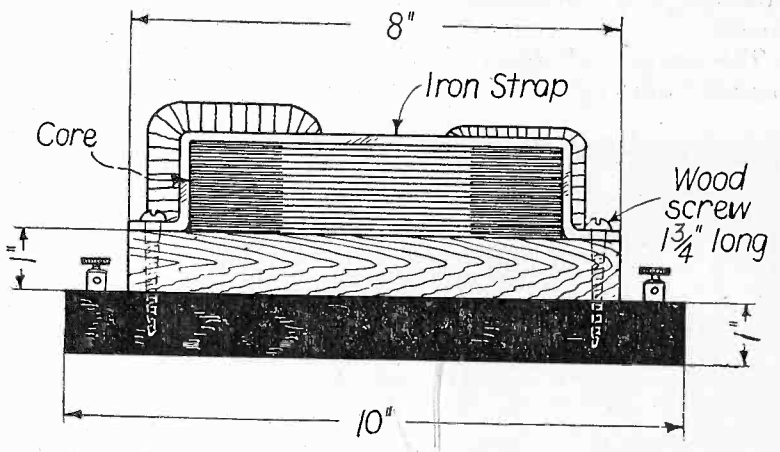


Fig. 3. Side view of the completed transformer showing manner of mounting.

It should be assembled in this manner just for practice so that the builder will be able to go ahead and place the core within the coils in the easiest possible manner.

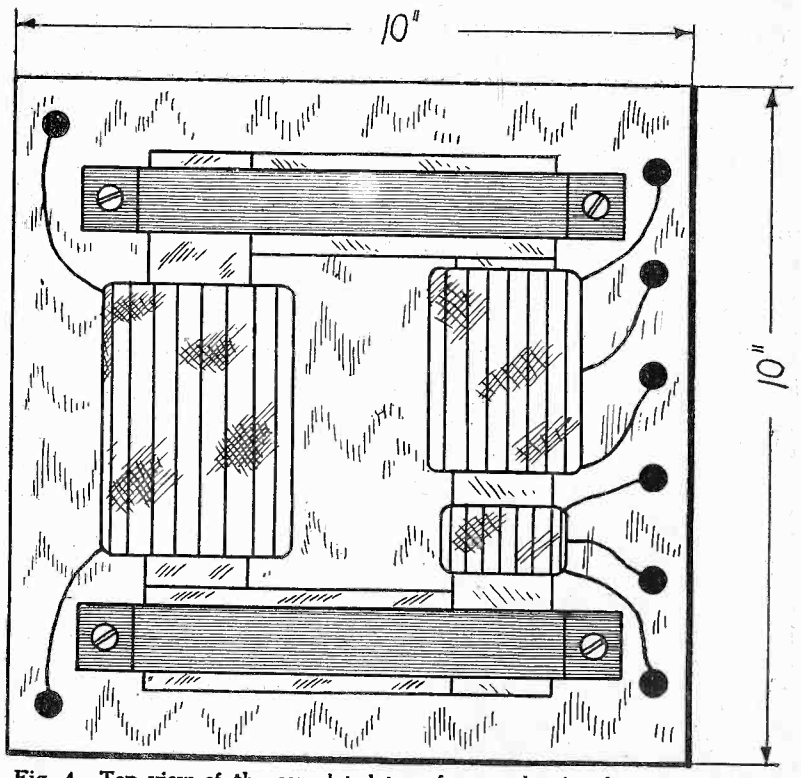


Fig. 4. Top view of the completed transformer showing location of binding posts and also the final placement of the coils.

The next step is the winding of the coil. The primary or input winding is to consist of 375 turns of No. 18 DCC or asbestos insulated wire. The actual winding should cover a space of 4" of the core and five layers will be required. This winding is to be placed on one leg of the transformer as indicated in Fig. 1 while the other leg is to have wound thereon two windings, one of sufficient size

(Concluded on next page)

Here Is a Mexican Station You Can Get in the U. S.

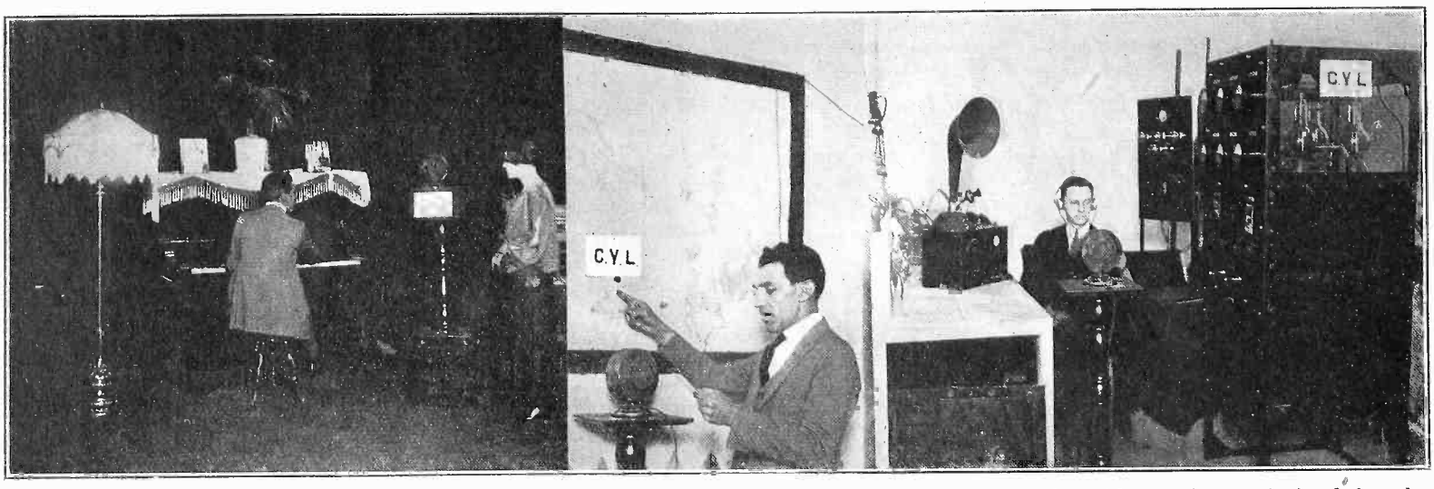
By G. Obregon, Jr.

AMATEURS and broadcast listeners throughout the United States have seen the interiors of the larger broadcasting stations, through the columns of RADIO WORLD. The illustrations herewith show one of most powerful broadcasting stations in Mexico. It has been heard in every state in the United States and has also received cards from Canada, Cuba, Central and South America, and numerous ships on both the Atlantic and Pacific.

The station, whose call is CYL, is operated by "El Universal," one of Mexico's leading newspapers, and La Casa del Radio, the house of radio. It is situated at Av. Juarez 62, Mexico, D. F.

The transmitter is a 500-watt tube set constructed especially for this station by a Texas radio manufacturer. It operates on 500 meters (600 kilocycles) on Tuesdays and Fridays from 9:00 to 10:30 P. M. It is the most complete and powerful station used for the broadcasting of entertainment south of the Rio Grande and enjoys a wide popularity due to the interesting type of programs that it transmits.

Programs in both English and Spanish are broadcast.



Three views of the powerful Mexican broadcasting station CYL. On the left is shown the interior of the studio, with a performer singing before the microphone. In the center is shown the announcer (who is also the pianist, by the way) acknowledging some telegraph and telephone calls from the station. The announcer has to be somewhat of a linguist, as the range of the station makes announcements in both Spanish and English necessary. On the right is shown the operating room, with the chief operator listening in and checking up on the programs.

(*Concluded from preceding page*)

to supply the necessary current for two 5-watt tubes and the other to supply a total of 700 volts in sections of 350 volts each. Such windings will readily take care of two 5-watt tubes and may be used either for placing voltage directly on the plates of the tubes or it may be fed through a 10 or 12 jar electrolytic rectifier and thence to the plates.

For winding the coils, the writer found it advisable to obtain a strip of wood 10″ long by 1½″ square. The corners were first rounded off slightly and then the block was cut diagonally from end to end so as to form two long wedge-shaped pieces. The pieces are to be placed so as to form a 1½″ square block and a couple of turns of cord or fine wire may be put around each end to hold the blocks in position. Strips of tape about 10½″ long are then cut and placed overlapping each other lengthwise on the block as illustrated in Fig. 2. As an example in winding we take the primary. Measure off 4″ at about the center of the coil and start the winding leaving about 8″ of wire for a connection. Proceed with the winding, placing on the required number of turns. Cut the wire, leaving another 8″ or so for the other terminal. The winding should be done smoothly and evenly. Now fold back one end of one strip of the tape over the winding and bring over the other end of the same strip so as to overlap. Proceed in this manner all the way around in this coil. The wooden blocks can now be removed and a perfectly formed and insulated coil will be found. It is advisable before placing the tape on the wooden blocks to coat the latter with talcum so as to allow them to slide out of the form.

This same procedure is followed for the winding of the other two coils, the data on the number of turns being given in Fig. 1. It is advisable when winding the filament coil, to take off a tap at the center, as it will be found useful in many circuits.

When the coils are all wound and formed, the core is built up within the winding. First a strip of steel is inserted within the primary and another within the two secondaries. Elevating the coils on two blocks two 6″ side pieces are placed, overlapping as illustrated in Fig. 1. Two other 8″ strips are then placed within the coils and another pair of strips added. In this manner the core is built up to the required size. It should be seen that the core is quite rigid in construction and that the coils are not loose.

After constructing the transformer it will be necessary to mount it in some manner so as to at least partially protect the windings. This can be accomplished by providing a base of hard wood thoroughly boiled in paraffin or a slate or marble slab 1″ thick by 10″ square. Two strips of wood are also required, each being 8″ long by 1″ square. These are to be the supporting blocks for the core. Two pieces of scrap iron are then cut and formed, as yokes as illustrated in Fig. 3. Holes are drilled in each end of the two yokes and the entire assembly is made as shown in Figs. 3 and 4. In the base-board are drilled eight holes for mounting binding posts. The connections from the three coils are brought out as shown in Fig. 4. The entire unit is then rigidly assembled and can be handled quite roughly.

Navy Thanks WOR for Assisting "Shenandoah"

TWO highly prized letters addressed to Louis Bamberger, president of L. Bamberger & Company, who operate Station WOR, Newark, N. J., have been received from Hon. Edwin Denby, Secretary of the Navy and Commander J. H. Klein, Jr., U. S. N. They were sent in official commendation of the service rendered by Joseph M. Barnett, studio manager, and Jack Poppele, chief operator, on the night of January 16, 1924, when the giant air craft "Shenandoah" after breaking away from its moorings at Lakehurst, New Jersey, hung suspended in midair and storm-tossed over the control room of Station WOR on the roof of the Bamberger Building.

The dramatic scene enacted at that time with Barnett and Poppele broadcasting to the crew of the "Shenandoah," giving them location and reassuring words, following which hundreds of thousands of radio listeners-in were kept informed of the progress of the runaway airship has been epitomized by Secretary Denby as "unselfish and patriotic service."

Barnett with tense nerves and voice quivering with emotion broadcast to the crew of the "Shenandoah": "You are now over Newark, New Jersey. The lights you see below are on the tower of the Prudential Building." The answer came back. "Thanks, old man." This thrilling conversation marked the beginning of the safe return of the "Shenandoah" to its hangar at Lakehurst. Secretary Denby wrote:

"I desire to express to you the appreciation of the Navy Department and of the Naval Service for your valued assistance on the occasion when the 'Shenandoah' was cast adrift from her mooring on the night of January 16th.

"The ready response with which Station WOR met the request of the officers at Lakehurst to broadcast the fact of the 'Shenandoah's' escape, and the close cooperation that was maintained by your station throughout the night are worthy examples of unselfish and patriotic service."

Commander Klein, who is executive officer at the Naval Air Station at Lakehurst, N. J., sent this letter:

"On behalf of the officers and crew of the U. S. S. 'Shenandoah' I wish to express my appreciation to you and the operating force of WOR for the assistance given us on the night of January 16, when the 'Shenandoah' broke away from her mast and sailed out over New Jersey.

"I understand that you ceased operations entirely during this period and devoted your entire attention to getting in touch with the 'Shenandoah' and thereafter maintained uninterrupted communication from us to the ship. As a result of your efforts we were constantly notified in regard to the ship.

"Will you please also express to your radio audience our appreciation for the many telephone and telegraphic communications sent during the night from those who saw the ship in flight?

"This cordial cooperation and unselfish devotion to the air forces is something which we particularly appreciate because should any misfortune ever overtake us in the air, we shall always feel that we have a multitude of friends on the ground who are constantly helping us as you and your people did.

"Captain McCrary, commanding the 'Shenandoah,' is absent from the station at this time and I know that he, as well as all the officers and men on the station, subscribes to these views and we all hope that if we can be of any assistance to you that you will not hesitate to let us know."

Radio at Palm Beach Interests the Dog

(C. International Newsreel)

Miss Betty Queen, of New York City, and her Pekinese "Ming Toy" listening in to a radio program at Palm Beach, Florida. Judging by "Ming's" expression, something to eat is being discussed over the air.

A Radio Rhapsody

By Henry D. Cheney

UPON a crystal mounted high,
In a box all by itself,
A lordly tube with brilliant eye
Gazed from off a shelf.

"Behold my wonder plate!" said he,
"And filament and grid,
And tell me, crystal, what you see
Of greatness in me hid."

The crystal scratched his shining head,
With a wire short and stout,
And in a tiny voice he said:
"O royal bulb, don't shout!

"Of greatness much there is no doubt,
And mystery galore,
Concealed in you and round about,
Especially your roar.

"But look at me, O prideful one,
Who also secrets hold,
And see what great things I have done
In the many years that rolled!

"Clear as crystal, like my name,
I snatch the ether wave,
And ride upon the wings of fame,
That history to me gave.

"Admit I will that you are grand,
Most noble of detectors,
And in DX or broadcast band
The king among reflectors.

"So let us both go hand in hand,
Reflex or otherwise,
And see how much we can command
Of this ether of the skies."

Amateurs Radio Alarm While Convicts Flee

BALTIMORE, Md. — Amateur radio stations all over the United States and remote sections of Canada recently sent out on the air the description of two convicts who escaped from the local penitentiary soon after the police and the radio department of the "Baltimore American" had been notified of their disappearance.

The first alarm was sent by Martin Porter, operator of amateur station 3DQ. Immediately the message was picked up by other operators in the vicinity and in a few minutes had spread throughout the East, amateurs in each city notifying their local police authorities and turning in the descriptions.

Far into the night, while the two fugitives were fleeing, amateurs here listening at their receiving sets heard stations connected with the American Radio Relay League in the Mississippi Valley and on the West Coast sending the alarm one to another by telegraph code and amateur phones. Within four hours the entire country had been completely covered.

Referring to the incident, the "Baltimore American" said: "A tribute, indeed, to A. R. R. L. efficiency, organization and co-operation and a real joy to the amateur."

The Captain and Four Radiomen "Stand By"

WASHINGTON, D. C.—Captain Herbert G. Sparrow, U. S. N., commander of the U. S. S "Tacoma," and four radio men were the last to leave this vessel wrecked off Vera Cruz recently—and, at the end, four of them were dead and the other injured. Old naval traditions obtained, not alone through the action of the gallant skipper, but through the four radiomen who stood by with him in an effort to keep radio communication open.

While the details of the accident which killed Captain Sparrow, Radiomen Lusser, Herrick and Sivin, and injured Chief Radioman J. V. Cooper are not available, Admiral Eberle, Chief of Operations, says he believes all five men were in the radio shack trying to maintain radiophone communication with the U. S. Consulate on shore, which had been established the preceding day on batteries, as the dynamos were out of action. Then the hurricane struck the old cruiser, whose bow was on a reef, and threshed her unmercifully, washing her with terrific seas and pounding her to pieces. Either a falling mast or an extremely heavy sea is believed by the admiral to have crushed in the radio shack, formerly the captain's emergency cabin, located on the main deck just below and aft of the bridge. The only dispatch bearing on the death of these four men states: "They were all killed on the main deck on January 21, having been struck by heavy wreckage and seas."

Naval officers picture the captain, who was an authority on electrical matters and a radio enthusiast, and the radio operators, as crowded around the ship's radio apparatus trying to send a last message to the Vera Cruz Consulate, when the crash came.

Investigations, scheduled as soon as the "Prometheus" reaches Charleston with the survivors, may reveal that the navy has developed a new type of hero, the radioman, who remains aboard even in extreme danger, continuing to "stand by" with his skipper until ordered over the side or relieved by a Higher Power.

Radio to Be Used Only on Last Leg of Army Plane World Flight

WASHINGTON, D. C.—The army aerial world tour will be attempted without the use of radio, except on the last leg, across the Atlantic from Hull, England, due to the conservation of weight, the Chief of the Army Air Service has announced.

Radio experts and some fliers believe that this is an unfortunate decision, since through the use of radio in connection with aviation, greater assurance of successful flights and the safety of pilots has resulted generally. But the projectors of the flight do not consider radio essential.

Weather conditions, orders, and emergency calls can be received immediately by pilots on radio-equipped craft, and they, in turn, can send messages as to progress, position, and changes in routes, as well as requests for assisttance, position reports, and desired information.

One plane, it is now planned, will be equipped with a transmitter and a receiving set at Hull, England, but what would happen if that plane should crash is not announced. The radio-telegraph transmitting set is a 200-watt nonsynchronous, rotary spark, with a plane-to-ground range of about 100 miles. The antenna will be a single weighted trailing wire, and the whole set will weigh approximately 100 pounds. Six hundred meters will be the wave used.

A super-heterodyne receiving set will also be carried in the communication plane but no radio compass. The transmitting set is capable of being transferred to another plane if necessary. Spares and some replacement apparatus will be carried across the Atlantic.

While the country at large, particularly radio fans, are interested in the flight scheduled to leave Los Angeles, Cal., on March 15, and circumnavigate the globe westward, some anxiety for the fliers is felt by those who have come to place great confidence in radio communication and position finding, such as will be possible when the naval airship "Shenandoah" sails north to the Pole, fully equipped with all radio facilities.

White's Radio Bill Ready to Submit

By Washington R. Service

WASHINGTON, D. C.—The revised White Radio Bill is now understood to have been generally approved by the Department of Commerce, except that the final draft has not been read by radio officials there. A last conference between Congressman White, of Maine, and Solicitor Davis of the Commerce Department is expected in a few days, following which the bill will be introduced in the House and referred to the Merchant, Marine and Fisheries Committee. Public hearings will then be held, for suggestions and complaints from the interests affected. It is also believed a similar bill will be presented in the Senate.

In general, the bill will provide for the continued inspection and licensing of all American ship and shore transmitting stations, including commercial, private, broadcasting and amateur stations, as well as the examination and licensing of all operators by the Department of Commerce. General regulations of all sending stations and operators, together with license fees, location of stations, the assignment of wave lengths, power and hours, will be placed in the hands of the Secretary of Commerce. Existing licenses, however, will be permitted to run until they expire. An advisory committee of 15 experts, commercial and governmental officials will also be authorized to aid the Commerce Secretary. Assurance is given that receiving stations will now be required to secure licenses.

In view of the recent action by the Federal Trade Commission, some advocates of the bill do not believe the "monopoly" question should be included in the projected legislative measure, but others say it may be.

The C. White Super-Power Amplifier

More About a Device Which Appealed to 10,741 "Radio World" Readers

By C. White, Consulting Engineer

ISSUE - 63

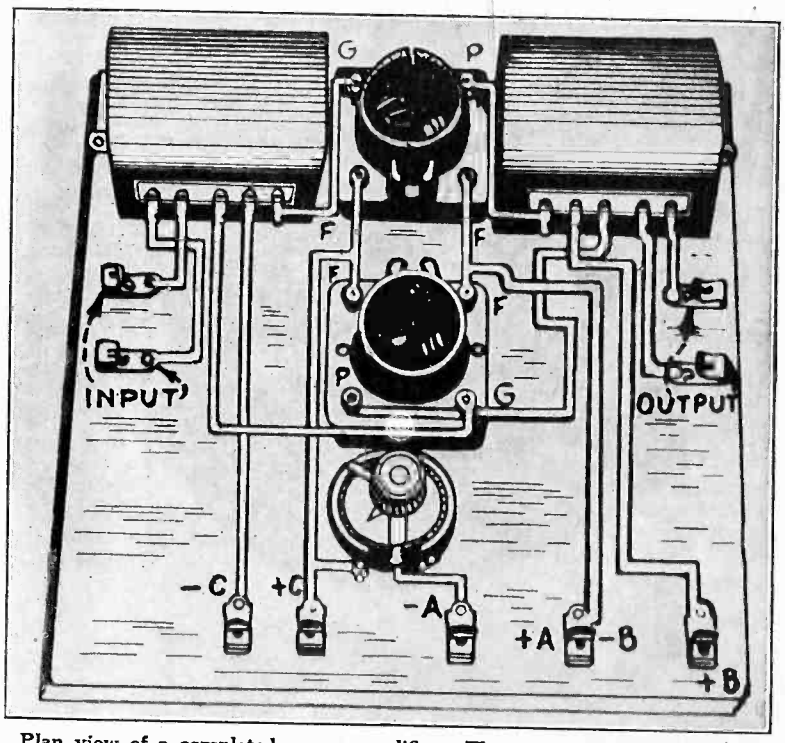
IN RADIO WORLD for June 9, 1923, I wrote up the "Super Amplifier." At that time I had no idea that the circuit would be so widely adopted. Almost instantly, however, I received letters from nearly every part of the world asking for more information concerning this amplifier. Letters concerning this amplifier have never ceased to come in and at the request of more than 10,741 readers, by actual count, I have decided to repeat the original article in a slightly different form.

Push-pull amplification was by no means new when it was first introduced for amateur use, and it was through the efforts of the author that the Como Apparatus Company of Boston, decided to build a pair of duplex transformers for amateur use. The only transformers of this type that were on the radio market were not available for home construction and were not designed to go with the amateur tubes now in common use. The actual design of these transformers for amateurs was not an easy problem. Many calculations were involved as well as a great deal of careful laboratory research to bear out conclusions reached on paper. The problem of coil insulation, moreover, was a serious one. These transformers to be of any value must be able to withstand high voltage surges such as are very common in the third stage of audio-frequency amplification when high plate voltages are employed.

What is the advantage of duplex amplification? This is a most common and regular question that is being asked almost daily in radio stores and elsewhere. Push-pull amplification is the only well known method of amplifying a loud signal to a great extent. If a signal is fairly loud and it is desired to boost it up to still greater volume without adding an undue amount of distortion, a stage of duplex amplification is the logical thing. It is the one form of amplification for audio frequencies that can be successfully applied to act as a third stage. The reason for this is that there is an actual push and pull action of the two tubes, similar to that of a double action steam engine. As the plate current of tube No. 1 in the push-pull stage increases, the plate current of No. 2 is decreasing. This causes a filtering out of a large amount of tube noise and distortion. Then again the output transformer of the duplex stage effectively prevents any of the direct current plate supply from passing through the field coils of the loud speaker. The passing of a high value of direct current through the coils of a loud speaker causes it to be biased in one direction, thus putting a stronger pull on the diaphragm in one direction than in the other. This means that the diapragm more readily responds to an impulse in one direction than an impulse in the opposite direction. In turn, this means that distortion of a certain degree is introduced into the reproducing mechanism, making the loud speaker sound "raspy" although the fault is really in the use of a high plate current passing through the coils.

As I have stated, push-pull amplification is more effective to swell the volume of a signal that is already audible to a good degree; therefore it is used, for example, as the third stage of an audio-frequency amplifier. Many radio fans will place a duplex stage right after their detector tube and expect the loud speaker to pour forth a marvelous volume on a signal that is extremely weak. They are disappointed because a stage of ordinary amplification should be used on a weak signal before it is fed into the duplex stage. Good transformer-repeated cascade (ordinary AF) amplification is better suited to the amplification of a weak signal, but it falls down when it comes to amplifying a strong signal to a still greater extent. Some radio fans have found that they can secure more volume as well as distance by using this super amplifier after two stages of ordinary audio amplification. On a distant station excellent results can be so obtained, but when a good set is used and such a combination is employed for the reception of a loud or local station they are apt to seriously injure the loud speaker. I have seen and heard the diaphragm of one of the strongest power type of loud speakers permanently damaged in a test of this nature.

The diagram herewith clearly shows the actual wiring connections. It is plain to see that there is very little wiring to the job and the assembly is extremely easy; the



Plan view of a completed power amplifier. The wiring is plainly shown and the terminals are all marked for ease in hooking up.

wires almost fall into place after the apparatus has been properly located on a suitable baseboard.

After assembling this amplifier do not be afraid to apply heavy "B" battery voltage to the tubes in the duplex stage and for every 45 volts of "B" battery about 1.5 volts of "C" battery must be used. The "C" battery can be made up of small flashlight cells, or an Eveready "Three" battery can be used. Although this amplifier functions best when UV201A or C301A tubes are used, still very excellent results are obtainable with the UV199 or C299. I would not recommend this unit for use with the WD11 or the WD12 owing to the fact that this type of tube is a very poor audio-frequency amplifier for super or power amplification.

If you are building a new set the super amplifier can be mounted in the cabinet with the other parts of the set,

(*Concluded on next page*)

Radio Primer

MAKING YOUR RECEIVER MORE EFFICIENT: Lately there has been much to do about "efficient" receivers. One circuit will be bruited about as "the most wonderfully efficient" and the next one as the "most efficient circuit using steeny-umph tubes ever perfected." Needless to say such statements should all be taken with a good deal of salt. Because a circuit is as efficient as its wiring and the apparatus used in its construction. Efficiency means one thing—using the energy that is collected in the antenna circuit to the best advantage, with the least amount of loss in the circuits that eventually lead the currents to the audible circuits (phone or loud speaker circuit).

A simple crystal circuit can be made more efficient than the most complex heterodyne receiver, which is not properly or efficiently constructed, if you take the word efficiency correctly. It will not give louder signals, but will put the received energy to the best use. Efficiency does not mean the use of six or eight tubes, or complex filtering circuits or double, triple or quadruple tuners. It means getting the most good out of the current received. the loudest possible response in the phones with the least amount of loss in the circuit.

One of the points that leads to the efficient working of a receiver is the cutting down of losses in the circuit itself. Most receivers, both home constructed and factory made, use long leads, with pretty and fancy bends in the wires. This looks right, but is absolutely wrong. To convince yourself of this fact, do the following: Take two crystal receivers, identical as to apparatus, and wire one up with nice bends in the wire, long leads, and few soldered connections. The second, wire up with heavy copper wire (No. 12 if possible) and make the leads as short as possible. Where two leads go to one piece of apparatus, arrange the parts so that one lead will suffice. Then hook up first the nicely constructed one to the antenna and tune in on some medium strength signal. If possible, get an audibility meter and test the strength. Then test the other one, under the same conditions. The one that uses the short leads with the heavy wire will surprise you in its increase of audibility over the second or nicely wired one. This will give the "wire bending fans" something to think over, if they will only test the thing out.

Now, not getting away from the point, two receivers using identical apparatus and the same circuit, which by the way was the Superdyne, were tested out under the same conditions. Care was taken, of course, not to run the plate and grid leads too close, but the other wires were run every which way, short and direct. An increase in audibility of over 30 per cent. on the detector alone, and a lessening of the disturbing howling noises was immediately apparent in the direct wire receiver. To prove this to the average builder would be simple, as all he has to do is to rewire his set, making his leads short, direct and of heavy, low resistance wire.

The ideal receiver would be one that could use wire as heavy as No. 6 or No. 8, but this is a physical impossibility, as this wire is as thick as a thin lead pencil, and costs too much.

The next point to consider is the spacing of the parts. Do not use a 27" or 30" panel just because you happen to have that size cabinet at home. You can easily and cheaply buy a new cabinet, but you cannot chase resistance out of a circuit by laying a half dollar down in front of the set.

Then make sure that every connection (and that doesn't mean almost every one) is firmly soldered with a *resin flux solder*. A handy flux can be made by making a paste of powdered resin in alcohol and placing a tiny bit on each connection before applying the solder. Have the iron good and hot, and the point well tinned.

The next thing, when using tubes is to use good sockets. In most cases, the sockets of today depend upon the nibs of the tubes making contact with the springs by pressing down on them. They lose their springiness and consequently relax, causing a poor contact. There are sockets made which due to their peculiar construction always make a perfect contact, which is always wiped clean. These sockets are harder to obtain than most, as they are not as widely distributed as the cheap ones, but it is worth while to wait three weeks to get one and be sure of good contacts than it is to use a poor one and wonder where the trouble lies.

Finally, do not use coils that cover too great a wave length range, or that use a great number of taps to vary the wave length. A single coil correctly proportioned, the wave length of which is varied by a 23 plate condenser, should be the standard for the average amateur. Bank wound coils because of distributed capacity and dead end loss will sometimes cut the volume of the signals down 25 per cent. on local stations and even more on the distant signals. A single coil of from 30 to 40 turns shunted by a 23 plate condenser on a 4" tube will allow a receiver to respond to all the broadcast waves, with the probable exception of the very lowest around 200 meters. It is better to have a receiver which is very efficient over a wave length of from 250 to 500 meters than one that will respond with lessened efficiency from 150 to 1,000 meters.

Plan your receiver carefully, wire it with heavy wire, use straight connections, solder every one, and use inductances that cover just the band you wish to receive. Use the best of parts, pay especial attention to your sockets and condensers, and you will find that every receiver you hear about, read about or build will prove itself a success as far as received signals and distance go.

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but the wiring should be so arranged that the input to this duplex stage can be connected to the detector, first stage or second stage, in order to control the volume output. This is readily done by having a flexible phone cord with a plug on one end and the other end permanently connected to the input coil of the push-pull stage. This will allow the input of the duplex stage to be connected into the detector jack, the first stage jack, or the second stage jack.

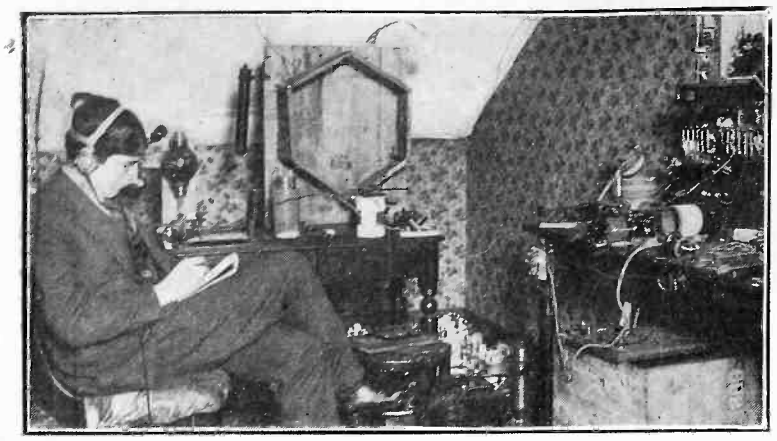
Another fact to bear in mind is that the "C" battery voltage is important. Failure to apply sufficient "C" voltage will mean a noisy amplifier, while with the correct amount of grid bias ("C") voltage the tone will be loud and pure. Then again, the "C" battery aids to conserve the "B" battery, since when the correct "C" voltage is applied to the grid, the minimum plate current is drawn from the plate potential supply.

All in all, there has been no more important addition to the audio-frequency field than the introduction of push-pull amplification. It has accomplished what had heretofore been considered as impossible; that is, more volume with less distortion by the use of an extra stage of audio-frequency.

In conclusion, I want to thank all those who have written me in care of RADIO WORLD, Como Apparatus Company, and personally for their kind appreciation of my humble efforts to serve them, and I regret the fact that personal physical limitations alone prevented me from giving all letters a personal answer, such as is my general rule. However, I am sure they will understand what it means to receive so many letters on one subject.

RADIOGRAMS

WORLD NEWS HAPPENINGS BRIEFLY PHRASED FOR OUR BUSY READERS



(C. P. & A. Photos)

Frederick L. Hogg, of Highgate, London, England, who kept up a two hours' back-and-forth talk with an amateur in Canada. Low waves around 150 meters were used, with comparatively low power. Hogg is shown copying messages from American and Canadian amateurs. He has a licensed station—a rarity in England.

Lives of great men all remind us we should broadcast as we go, and, departing, leave behind us echoes from the radio.—New York Tribune.

* * *

Cook: What are we having tonight, m'm?

Mistress: Why, I've just told you; clear soup; fillet of sole; cutlets; cabinet pudding.

Cook: I meant on the wireless, m'm.—Punch.

* * *

Students in the classes to be taught by radio planned by some of the Western universities will have no difficulty in walking out on the professor whenever his discourse bores them.—The New York Herald.

* * *

In a recent radio contest from Station WLW, Cincinnati, the broadcasting station of the Crosley Radio Corporation, a number of hams were given away. Several letters have been received asking when the eggs will be offered in a contest.

* * *

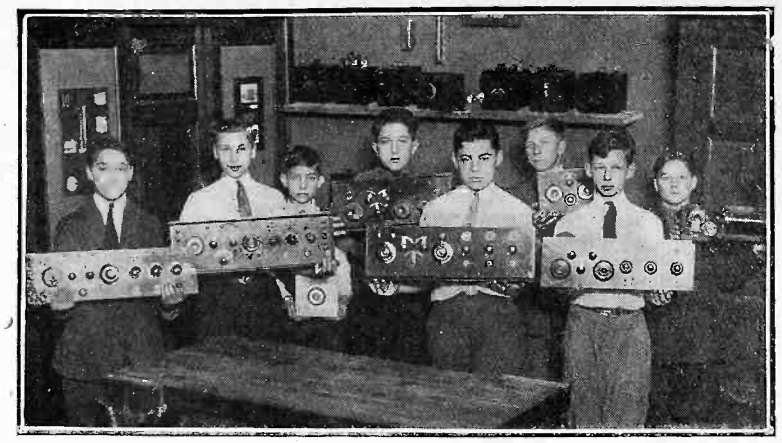
E. F. W. Alexanderson, consulting engineer of the General Electric Company, and chief consulting engineer of the Radio Corporation of America, has been awarded the Order of the Polonia Restituta by the Polish Government, in recognition of his meritorious service in connection with the building of Poland's new radio station near Warsaw.

* * *

The Postmaster General of Ireland is reported to have decided upon a method of broadcasting control and a group of Irish firms have agreed to work the scheme together. There is to be a main station at Dublin. Radio sets will be imported and manufactured locally. The license for an amateur will cost $5; hotels and restaurants will pay $25. News, music and advertising will be broadcast.

(C. P. & A. Photos)

Bartholomew Molinari, San Francisco amateur, who is one of the few American amateurs in communication with WNP, the MacMillan Expedition at the North Pole. A 250-watt tube set is used for transmitting, with a home constructed regenerative set for receiving. Direct two-way communication was established without the necessity of any relays or aid from other amateurs. The fading of WNP was bothersome, though.



(C. P. & A. Photos)

Making radio receivers in school shops now takes the place of making the old-time taboret and knife box or candle-stands. The illustration shows a group of New York school boys with the finished receivers they constructed during their manual training periods in school. While all the sets bear some resemblance to one another, no two are the same.

Remember, we never know how many receivers catch something of the influence we radio daily.—Forbes Magazine.

* * *

Jazz music and radio loud-speakers have rendered great service to the deaf. Deafness isn't the curse that it once was.—San Diego Union.

* * *

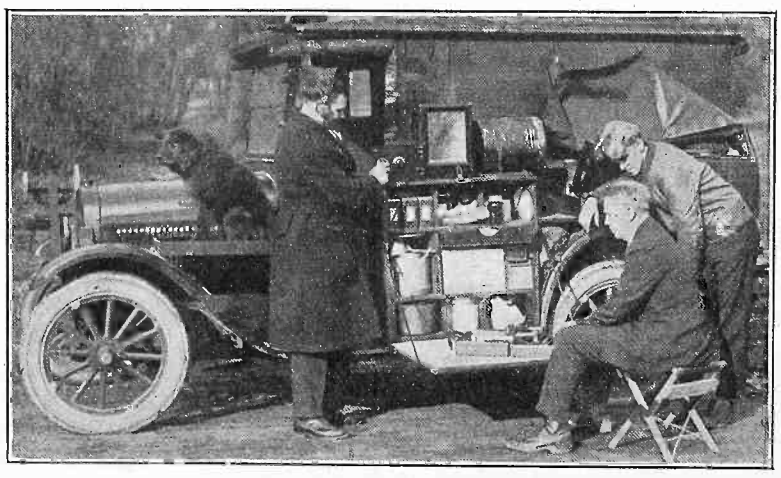
Almost everything but thinking may be artificially done, but knowledge and understanding must be actively sought and acquired. Man is the only animal who can do this.—Dr. W. R. Whitney.

* * *

Islands of the Southern Pacific Ocean have been brought within range of American radio broadcasting. KGO, the new 1,000-watt station of the General Electric Company at Oakland, California, was heard two evenings out of five at Apia, Samoa, a distance of 4,750 miles from Oakland.

* * *

At the Great Lakes Naval Training Station, where radio operators are trained, the new fangled psychological method of increasing speed in code reception, while the partly trained gobs sleep, is being used with as great success as met the initial sleep instruction tests at Pensacola. One night, after sending at high speed to seventeen sleeping embryo operators equipped with "ear-muffs," a petty officer ended his watch with the code message: "Hey, gobs! Get up, it's five-fifty-five!" Much to his surprise, the snoring ceased, three of the men awoke, and in a few minutes the other fourteen rolled out, asking what was the matter. The flabbergasted petty officer now admits night code practice may increase receiving speed, but he knows it will get the students up at four bells.



(C. Wide World Photos)

The unique automobile in which four New Yorkers are to cross the country. The car is equipped with every household necessity, and even boasts a loop receiver, with which they may while away their idle moments while traveling. The receiver is of the duo-control type, operating on the battery of the car, and uses a small loop located inside the body to keep it dry in case of damp or rainy weather.

Complete List of U. S. Broadcasters

Includes Stations in Canada, Cuba, Porto Rico and Mexico

Corrected to February 8, 1924

Call	Owner	Location	Meters	Kcys.
KDKA	West'ghouse Elec. & Mfg. Co.	E. Pittsburgh, Pa.	326	920
KDPM	West'ghouse Elec. & Mfg. Co.	Cleveland, Ohio	270	1110
KDPT	Southern Electrical Co.	San Diego, Cal.	244	1230
KDYL	Telegram Publishing Co.	Salt Lake City, Utah	360	830
KDYM	Savoy Theatre	San Diego, Cal.	280	1070
KDYQ	Oregon Inst. of Tech.	Portland, Oregon	360	620
KDYW	Smith, Hughes & Co.	Phoenix, Ariz.	360	830
KDYX	Star Bulletin	Honolulu, Hawaii	360	620
KDZB	Frank E. Siefert	Bakersfield, Cal.	240	1250
KDZE	The Rhodes Co.	Seattle, Wash.	270	1110
KDZF	Auto Club of So. California	Los Angeles, Cal.	278	1080
KDZI	Electric Supply Co.	Wenatchee, Wash.	360	830
KDZQ	Nichols Academy of Music	Denver, Colo.	360	830
KDZR	Bellingham Publishing Co.	Bellingham, Wash.	261	1150
KFAD	McArthur Bros. Merc. Co.	Phoenix, Ariz.	360	830
KFAE	State College of Washington	Pullman, Wash.	330	910
KFAF	Western Radio Corp.	Denver, Colo.	360	830
KFAJ	University of Colorado	Boulder, Colo.	360	830
KFAN	The Electric Shop	Moscow, Idaho	360	830
KFAR	Studio Lighting Service Co.	Hollywood, Cal.	280	1070
KFAU	Daily Sun	Boise, Idaho	270	1110
KFAW	The Radio Den	Santa, Ana, Cal.	280	1070
KFAY	W. T. Virgin Milling Co.	Medford, Ore.	283	1060
KFBB	F. A. Buttrey & Co.	Havre, Mont.	360	830
KFBC	W. K. Azbill	San Diego, Cal.	278	1080
KFBE	Reuben H. Horn	San Luis Obispo, Cal.	360	380
KFBG	First Presbyterian Church	Tacoma, Wash.	360	830
KFBK	Kimball-Upson Co.	Sacramento, Cal.	283	1060
KFBL	Leise Bros.	Everett, Wash.	224	1340
KFBS	Trinidad Gas & Elec Co.	Trinidad, Colo.	360	830
KFBU	The Cathedral	Laramie, Wyo.	283	1060
KFCB	Nielsen Radio Supply Co.	Phoenix, Ariz.	238	1260
KFCF	Frank A. Moore	Walla Walla, Wash.	360	830
KFCH	Electric Service Sta., Inc.	Billings, Mont.	360	830
KFCM	Richmond Radio Shop	Richmond, Cal.	244	1230
KFCP	Ralph W. Flygare	Ogden, Utah	360	830
KFCV	Fred Mahaffey, Jr.	Houston, Texas	360	830
KFCY	Western Union College	Le Mars, Iowa	360	830
KFCZ	Omaha Central High School	Omaha, Neb.	258	1160
KFDA	Adlers Music Store	Baker, Ore.	360	830
KFDD	St. Michael's Cathedral	Boise, Idaho	252	1190
KFDH	University of Arizona	Tucson, Ariz.	360	830
KFDJ	Oregon Agricultural College	Corvallis, Ore.	360	830
KFDO	H. Everett Cutting	Bozeman, Mont.	248	1210
KFDR	Bullock's Hdw. & Spt. Goods	York, Neb.	360	830
KFDV	Gilbrech & Stinson	Fayetteville, Ark.	360	830
KFDX	First Baptist Church	Shreveport, La.	360	830
KFDY	S. D. State Col. of Agric.	Brookings, S. D.	360	830
KFDZ	Harry O. Iverson	Minneapolis, Minn.	231	1300
KFEC	Meier & Frank Co.	Portland, Ore.	360	830
KFEL	Winner Radio Corp.	Denver, Colo.	360	830
KFEQ	J. L. Scroggin	Oak, Neb.	270	1110
KFER	Auto Electric Service Co.	Fort Dodge, Iowa	231	1300
KFEV	Radio Electric Shop	Douglas, Wyo.	263	1140
KFEX	Augsburg Seminary	Minneapolis, Minn.	261	1150
KFEY	Bunker Hill & Sull. Mng. Co.	Kellogg, Idaho	360	830
KFEZ	Am. Soc. of Mech. Engineers	St. Louis, Mo.	360	830
KFFB	Jenkins Furniture Co.	Boise, Idaho	273	1100
KFFE	Eastern Oregon Radio Co.	Pendleton, Ore.	360	830
KFFO	Dr. E. H. Smith	Hillsboro, Ore.	229	1310
KFFQ	Marksheffel Motor Co.	Colorado Springs, Colo.	360	830
KFFR	Jim Kirk	Sparks, Nev.	226	1330
KFFV	Graceland College	Lamoni, Iowa	360	830
KFFX	McGraw Company	Omaha, Neb.	278	1080
KFFY	Pincus & Murphey	Alexandria, La.	275	1090
KFFZ	Al. G. Barnes Amuse. Co.	Dallas, Texas	226	1330
KFGC	Louisiana State University	Baton Rouge, La.	254	1180
KFGD	Chickasha Radio & Elec. Co.	Chickasha, Okla.	248	1210
KFGH	Leland Stanford University	Stanford Univ., Cal.	226	1330
KFGJ	Mo. Nat. Guard, 138th Inf.	St. Louis, Mo.	226	1130
KFGL	Arlington Garage	Arlington, Ore.	234	1250
KFGQ	Crary Hardware Co.	Boone, Iowa	226	1330
KFGV	Heidbreder Radio Sup. Co.	Utica, Neb.	224	1340
KFGX	First Presbyterian Church	Orange, Texas	250	1200
KFGY	Gjelhaug's Radio Shop	Baudette, Minn.	224	1340
KFGZ	Emmanuel Missionary Col.	Berrien Springs, Mich.	268	1120
KFHA	Colo. State Normal School	Gunnison, Colo.	252	1190
KFHB	Rialto Theatre	Hood River, Ore.	280	1070
KFHD	Utz Elec. Shop Company	St. Joseph, Mo.	226	1330
KFHF	Central Christian Church	Shreveport, La.	266	1130
KFHH	Ambrose A. McCue	Neah Bay, Wash.	261	1150
KFHJ	Fallon & Company	Santa Barbara, Cal.	360	830
KFHR	Star Electric & Radio Co.	Seattle, Wash.	270	1110
KFHS	Clifford J. Dow	Linue, Hawaii	275	1090
KFHX	Robert W. Nelson	Hutchinson, Kan.	229	1310
KFI	Earle C. Anthony, Inc.	Los Angeles, Cal.	469	640
KFID	Ross Arbuckle's Garage	Iola, Kan.	246	1220
KFIF	Benson Poly. Institute	Portland, Ore.	360	830
KFIL	Windisch Elec. Farm Eqp. Co.	Louisburg, Kan.	234	1280
KFIO	North Central High School	Spokane, Wash.	252	1190
KFIQ	Yakima Valley Radio Broadcasting Association	Yakima, Wash.	224	1340
KFIU	Alaska Elec. Light & Pr. Co.	Juneau, Alaska	226	1330
KFIX	Church of Latter Day Saints	Independence, Mo.	240	1250
KFIZ	Daily Commonwealth	Fond du Lac, Wis.	273	1100
KFJB	Marshall Electrical Co.	Marshalltown, Iowa	248	1210
KFJC	Seattle Post-Intelligencer	Seattle, Wash.	233	1290
KFJF	National Radio Mfg. Co.	Oklahoma City, Okla.	252	1190
KFJI	Liberty Theatre	Astoria, Ore.	252	1190
KFJK	Delano Radio & Elec. Co.	Bristow, Okla.	233	1290
KFJL	Hardsack Mfg. Company	Ottumwa, Iowa	242	1240
KFJM	University of North Dakota	Grand Forks, N. D.	229	1310
KFJQ	Valley Radio Co.	Grand Forks, N. D.	280	1070
KFJR	Ashley C. Dixon & Son	Stevensville, Mont.	258	1160
KFJV	T. H. Warren	Dexter, Iowa	224	1340
KFJW	Le Grand Radio	Tonawanda, Kan.	226	1320
KFJX	Iowa State Teachers' Col.	Cedar Falls, Iowa	229	1310
KFKA	Tunwall Radio Co.	Fort Dodge, Iowa	246	1220
KFIV	Texas National Guard	Fort Worth, Texas	254	1180
KFJZ	Colo. State Teachers' College	Greeley, Colo.	248	1210
KFKB	Brinkley-Jones Hospital	Milford, Kan.	286	1050
KFKQ	Conway Radio Lab.	Conway, Ark.	224	1340
KFKV	F. Gray	Butte, Mont.	283	1060
KFKX	West'ghouse Elec. & Mfg. Co	Hastings, Neb.	286	1050
KFKZ	Nassour Bros.	Colorado Springs, Colo.	234	1280
KFLA	A. R. Willson	Butte, Mont.	248	1210
KFLB	Signal Mfg. Co.	Menominee, Mich.	248	1210
KFLD	P. E. Greenlaw	Franklinton, La.	234	1280
KFLE	Nat'l Educational Service	Denver, Colo.	268	1120
KFLH	Errickson Radio Co.	Salt Lake City, Utah	261	1150
KFLP	E. N. Foster	Cedar Rapids, Iowa	240	1250
KFLQ	Bizzell Radio Co.	Little Rock, Ark.	261	1150
KFLR	University of New Mexico	Albuquerque, N. M.	254	1180
KFLU	Rio Grande Radio Co.	San Benito, Texas	236	1270
KFLV	Rev. A. T. Frykman	Rockford, Ill.	229	1310
KFLW	Missoula Elec. Supply Co.	Missoula, Mont.	234	1280
KFLX	Geo. R. Clough	Galveston, Texas	240	1250
KFLY	Fargo Radio Co.	Fargo, N. D.	231	1300
KFLZ	Atlantic Auto Co.	Atlantic, Iowa	273	1100
KFMQ	University of Arkansas	Fayetteville, Ark.	263	1140
KFMR	Morningside College	Sioux City, Iowa	261	1150
KFMS	Freimuth Dept. Store	Duluth, Minn.	275	1090
KFMT	Dr. G. W. Young	Minneapolis, Minn.	231	1300
KFMU	Stevens Bros.	San Marcos, Tex.	240	1250
KFMW	M. G. Sateren	Houghton, Mich.	266	1130
KFMX	Carleton College	Northfield, Minn.	283	1060
KFMY	Boy Scouts of America	Long Beach, Cal.	229	1310
KFMZ	Roswell Bdcstg. Club	Roswell, N. M.	250	1200
KFNC	Echo Pk. Evang'tic As., Inc.	Los Angeles, Calif.	278	1080
KFNG	Wooten's Radio Shop	Coldwater, Miss.	254	1180
KFNH	State Teachers' College	Springfield, Mo.	236	1270
KFNJ	Warrensburg Elec. Shop	Warrensburg, Mo.	234	1280
KFZ	Doerr-Mitchell Elec. Co.	Spokane, Wash.	283	1060
KGB	Tacoma Daily Ledger	Tacoma, Wash.	252	1190
KGG	Hallock & Watson Radio Ser.	Portland, Ore.	360	830
KGN	Northwestern Radio Mfg. Co.	Portland, Ore.	360	830
KGO	General Electric Co.	Oakland, Cal.	312	960
KGU	Marion A. Mulrony	Honolulu, Hawaii	360	830
KGW	Portland Morning Oregonian	Portland, Ore.	492	610
KGY	St. Martin's College	Lacey, Wash.	258	1160
KHJ	Los Angeles Times	Los Angeles, Cal.	395	760
KHQ	Louis Wasmer	Seattle, Wash.	360	830
KJQ	C. O. Gould	Stockton, Cal.	360	830
KJR	Northwest Radio Service	Seattle, Wash.	283	1060
KJS	Bible Inst. of Los Angeles	Los Angeles, Cal.	360	830
KLS	Warner Bros. Radio Co.	Oakland, Cal.	360	830
KLX	Tribune Publishing Co.	Oakland, Cal.	509	590
KLZ	Reynolds Radio Company	Denver, Colo.	360	830
KMJ	San Joaquin Lt. & Pr. Corp.	Fresno, Cal.	273	1100
KMO	Tacoma Times	Tacoma, Wash.	360	830
KNT	Gray's Harbor Radio Co.	Aberdeen, Wash.	263	1140
KNV	Radio Supply Co.	Los Angeles, Cal.	256	1180
KNX	Elec. Lighting Supply Co.	Los Angeles, Cal.	360	830
KOB	N. M. Col. of Ag. & Mec. Arts	State College, N. M.	360	620
KOP	Detroit Police Department	Detroit, Mich.	286	1050
KPO	Hale Bros.	San Francisco, Cal.	423	710
KQP	Apple City Radio Club	Hood River, Ore.	360	830
KQV	Doubleday-Hill Elec. Co.	Pittsburgh, Pa.	360	830
KQW	Chas. D. Herrold	San Jose, Cal.	360	830
KRE	Berkeley Daily Gazette	Berkeley, Cal.	278	1080
KSD	Post Dispatch	St. Louis, Mo.	546	550
KSL	The Emporium	San Francisco, Cal.	360	830
KSS	Prest & Dean Radio Co.	Long Beach, Cal.	360	830
KTW	First Presbyterian Church	Seattle, Wash.	360	830
KUO	Examiner Printing Co.	San Francisco, Cal.	360	830
KUS	City Dye Wks. & Laun. Co.	San Francisco, Cal.	360	830
KUY	Coast Radio Company	El Monte, Cal.	256	1170
KWG	Portable Wireless Tel. Co.	Stockton, Cal.	360	830
KWH	Los Angeles Examiner	Los Angeles, Cal.	360	830
KXD	Herald Publishing Company	Modesto, Cal.	252	1190
KYW	West'ghouse Elec. & Mfg. Co.	Chicago, Ill.	536	560
KYQ	Electric Shop	Honolulu, Hawaii	360	830
KZM	Preston D. Allen	Oakland, Cal.	360	830
KZN	The Deseret News	Salt Lake City, Utah	360	830
KZV	Wenatchee Bat. & Motor Co.	Wenatchee, Wash.	360	620
WAAB	Valdemar Jensen	New Orleans, La.	268	1120
WAAC	Tulane University	New Orleans, La.	463	650
WAAD	Ohio Mechanics Inst.	Cincinnati, Ohio	360	830
WAAF	Daily Drovers Journal	Chicago, Ill.	384	1050
WAAK	Gimbel Bros.	Milwaukee, Wis.	280	1070
WAAM	I. R. Nelson Company	Newark, N. J.	263	1140
WAAN	University of Missouri	Columbia, Mo.	254	1180
WAAW	Omaha Grain Exchange	Omaha, Neb.	360	830
WABB	Dr. John B. Lawrence	Harrisburg, Pa.	266	1130
WABD	Parker High School	Dayton, Ohio	283	1060
WABE	Y. M. C. A.	Washington, D. C.	283	1060
WABG	Arnold Edwards Piano Co.	Jacksonville, Fla.	248	1210
WABH	Lake Shore Tire Co.	Sandusky, Ohio	240	1250
WABI	Bangor Railway & Elec. Co.	Bangor, Me.	248	1250
WABK	First Baptist Church	Worcester, Mass.	252	1190
WABL	Conn. Agricultural College	Storrs, Conn.	283	1060
WABM	F. E. Doherty Radio Sup. Co.	Saginaw, Mich.	254	1180
WABN	Waldo C. Grover	La Cross, Wis.	234	1280
WABO	Lave Ave. Baptist Church	Rochester, N. Y.	252	1190
WABQ	Haverford Col. Radio Club	Haverford, Pa.	261	1150
WABR	Scott High School	Toledo, Ohio	270	1100
WABS	Essex Mfg. Co.	Newark, N. J.	244	1230
WABT	Holliday Hall	Washington, Pa.	252	1190
WABU	Victor Talking Machine Co.	Camden, N. J.	226	1330
WABV	John H. De Witt	Nashville, Tenn.	263	1140
WABW	College of Wooster	Wooster, Ohio	234	1280
WABX	H. B. Coy	Mt. Clemens, Mich.	270	1110
WABY	John Magaldi	Philadelphia, Pa.	242	1240
WABZ	Coliseum Pl. Baptist Church	New Orleans, La.	263	1140
WBAA	Purdue University	W. Lafayette, Ind.	360	830
WBAH	The Dayton Company	Minneapolis, Minn.	360	830
WBAK	Pennsylvania State Police	Harrisburg, Pa.	400	750
WBAN	Wireless Phone Corp.	Paterson, N. J.	246	1220
WBAO	James Millikin University	Decatur, Ill.	360	830
WBAP	Star-Telegram	Fort Worth, Texas	476	630
WBAU	Republican Publishing Co.	Hamilton, Ohio	258	1160
WBAV	Erner & Hopkins Co.	Columbus, Ohio	390	770

Call	Owner	Location	Meters	Kcys.
WBAX	John H. Stenger, Jr.	Wilkes-Barre, Pa.	360	830
WBAY	American Tel. & Tel.	New York, N. Y.	492	610
WBBA	Newark Radio Laboratories	Newark, Ohio	240	1250
WBBD	Barbey Battery Service	Reading, Pa.	234	1280
WBBE	Alfred R. Marcy	Syracuse, N. Y.	246	1220
WBBF	Petoskey High School	Petoskey, Mich.	246	1220
WBBG	Irving Vermilya	Mattapoisett, Mass.	240	1250
WBBH	J. Irving Bell	Port Huron, Mich.	246	1220
WBBI	The Indianapolis Radio Club	Indianapolis, Ind.	234	1280
WBBJ	Neel Electric Co., P. E. Neal,	West Palm Beach, Fla.	258	1160
WBBK	Kaufmann & Baer Co.	Pittsburgh, Pa.	254	1180
WBBM	Frank Atlass Prod. Co.	Lincoln, Ill.	226	1330
WBBN	Blake, A. B.	Wilmington, N. C.	275	1090
WBBO	Mich. Limestone Co.	Rogers, Mich.	250	1200
WBBQ	Frank Crooke,	Pawtucket, R. I.	275	1090
WBBR	People's Pulpit Asso.	Rossville, N. Y.	244	1230
WBL	T. & H. Radio Company	Anthony, Kan.	261	1150
WBR	Penna. State Police	Butler, Pa.	286	1050
WBS	D. W. May, Inc.	Newark, N. J.	360	830
WBT	Southern Radio Corporation	Charlotte, N. C.	360	830
WBZ	Westinghouse Elec. & Mfg. Co.	Springfield, Mass.	337	890
WCAC	J. Finke Jewelry Mfg. Co.	Fort Smith, Ark.	360	830
WCAD	St. Lawrence University	Canton, N. Y.	360	830
WCAE	Kaufman & Baer Company	Pittsburgh, Pa.	462	650
WCAG	C. R. Randall	New Orleans, La.	268	1120
WCAH	Entrekin Electric Company	Columbus, Ohio	286	1050
WCAJ	Nebraska Wesleyan Univ'ity	University Place, Neb.	360	830
WCAK	Alfred P. Daniel	Houston, Texas	263	1140
WCAL	St. Olaf College	Northfield, Minn.	360	830
WCAM	Villanova College	Villanova, Pa.	360	830
WCAO	Sanders & Stayman Company	Baltimore, Md.	360	830
WCAP	Chesapeake & Potomac Tel. Co.	Washington, D. C.	469	640
WCAR	Alamo Radio Elec. Co.	San Antonio, Texas	360	830
WCAS	Wm. Hood Dunwoody Ind. Inst.	Minneapolis, Minn.	246	1220
WCAT	S. D. School of Mines	Rapid City, S. D.	240	1250
WCAU	Durham & Company	Philadelphia, Pa.	286	1050
WCAV	J. C. Dice Elec. Co.	Little Rock, Ark.	360	830
WCAY	Kesselman O'Driscoll Co.	Milwaukee, Wis.	261	1150
WCBA	Charles W. Heimbach	Allentown, Pa.	280	1070
WCBC	University of Michigan	Ann Arbor, Mich.	280	1070
WCBD	Wilbur G. Voliva	Zion, Ill.	345	870
WCK	Stix-Baer & Co. & Fuller Co.	St. Louis, Mo.	360	830
WCM	University of Texas	Austin, Texas	360	830
WCX	Detroit Free Press	Detroit, Mich.	517	580
WDAE	Tampa Daily Times	Tampa, Fla.	360	830
WDAF	Kansas City Star	Kansas City, Mo.	411	730
WDAG	J. Lawrence Martin	Amarillo, Texas	263	1140
WDAH	Trinity Meth. Church (So.)	El Paso, Texas	268	1120
WDAJ	Atlanta & West Point R.R. Co.	College Park, Ga.	360	830
WDAK	The Courant	Hartford, Conn.	261	1150
WDAO	Automotive Electric Co.	Dallas, Texas	360	830
WDAP	Board of Trade	Chicago, Ill.	360	830
WDAR	Lit Bros.	Philadelphia, Pa.	395	760
WDAS	Samuel A. Waite	Worcester, Mass.	360	830
WDAU	Slocum & Kilburn	New Bedford, Mass.	360	830
WDAY	Fargo Radio Electric Co.	Fargo, N. D.	244	1280
WDBC	Kirk, Johnson & Company	Lancaster, Pa.	258	1160
WDM	Church of the Covenant	Washington, D. C.	234	1280
WDZ	James L. Bush	Tuscola, Ill.	248	1210
WEAA	Fallain & Lathrop	Flint, Mich.	280	1070
WEAF	West. Elec. Co. (A. T. & T.)	New York, N. Y.	492	610
WEAH	Wichita Board of Trade	Wichita, Kan.	244	1230
WEAI	Cornell University	Ithaca, N. Y.	286	1050
WEAJ	University of South Dakota	Vermilion, S. D.	280	1070
WEAM	Borough of North Plainfield	North Plainfield, N. J.	252	1190
WEAN	Shepard Company	Providence, R. I.	273	1100
WEAO	Ohio State University	Columbus, Ohio	360	830
WEAP	Mobile Radio Company	Mobile, Ala.	360	620
WEAR	Balto. Am. & News Pub. Co.	Baltimore, Md.	360	830
WEAS	Hecht Company	Washington, D. C.	360	830
WEAU	Davidson Bros. Company	Sioux City, Iowa	360	830
WEAY	Will Horowitz, Jr.	Houston, Texas	360	830
WEB	Benwood Company	St. Louis, Mo.	360	830
WEV	Hurlburt-Still Electrical Co.	Houston, Texas	360	830
WEW	St. Louis University	St. Louis, Mo.	261	1150
WFAA	Dallas News & Dallas Journal	Dallas, Texas	476	620
WFAB	Carl F. Woese	Syracuse, N. Y.	234	1280
WFAF	H. C. Spratley Radio Co.	Poughkeepsie, N. Y.	360	830
WFAH	Electric Supply Company	Port Arthur, Texas	360	830
WFAJ	Hi-Grade Wireless Inst. Co.	Asheville, N. C.	360	830
WFAM	Times Publishing Company	St. Cloud, Minn.	485	620
WFAN	Hutchinson Elec. Ser. Co.	Hutchinson, Minn.	360	830
WFAQ	Wo. Wesleyan College	Cameron, Mo.	360	830
WFAV	U. of Neb. Dept of Elec Eng.	Lincoln, Neb.	275	1090
WFI	Strawbridge & Clothier	Philadelphia, Pa.	395	760
WGAL	Lancaster Elec. Supply Co.	Lancaster, Pa.	248	1210
WGAN	Cecil E. Lloyd	Pensacola, Fla.	360	830
WGAQ	Glenwood Radio Corp.	Shreveport, La.	360	830
WGAW	Ernest C. Albright	Altoona, Pa.	261	1150
WGAZ	South Bend Tribune	South Bend, Ind.	360	830
WGI	Amer. Radio Research Corp.	Medford Hillside, Mass.	485	620
WGR	Federal Tel. & Tel. Co.	Buffalo, N. Y.	360	830
WGV	Interstate Electric Co.	New Orleans, La.	242	1240
WGY	General Electric Co.	Schenectady, N. Y.	380	760
WHA	University of Wisconsin	Madison, Wis.	360	830
WHAA	State University of Iowa	Iowa City, Iowa	283	1060
WHAB	Clark W. Thompson	Galveston, Texas	360	830
WHAD	Marquette University	Milwaukee, Wis.	280	1070
WHAG	University of Cincinnati	Cincinnati, Ohio	222	1350
WHAH	Hafer Supply Co.	Joplin, Mo.	283	1060
WHAK	Roberts Hardware Co.	Clarksburg, W. Va.	360	830
WHAM	University of Rochester	Rochester, N. Y.	283	1060
WHAP	Otta & Kuhns	Decatur, Ill.	360	830
WHAR	Paramount Radio & Elec. Co.	Atlantic City, N. J.	231	1300
WHAS	Courier-Journal & Lo. Times	Louisville, Ky.	400	750
WHAV	Wilmington Elec. Spec. Co.	Wilmington, Del.	360	830
WHAZ	Rensselaer Poly. Inst.	Troy, N. Y.	380	760
WHB	Sweeney School Co.	Kansas City, Mo.	411	730
WHK	Radio Box Co.	Cleveland, Ohio	283	1060
WHN	Loew's State Theatre	New York, N. Y.	360	830
WHT	Mich. Limestone & Chem. Co.	Rogers, Mich.	300	1000
WIAB	Joslyn Automobile Co.	Rockford, Ill.	252	1190
WIAC	Galveston Tribune	Galveston, Texas	360	830
WIAD	H. R. Miller	Philadelphia, Pa.	254	1180
WIAF	Gustava DeCortin	New Orleans, La.	234	1250
WIAI	Heer Stores Company	Springfield, Mo.	252	1190
WIAJ	Fox Riv. Val. Radio Supply Co.	Neenah, Wis.	224	1340
WIAK	Journal-Stockman Co.	Omaha, Neb.	278	1080
WIAO	School of Eng. of Milwaukee	Milwaukee, Wis.	360	830
WIAQ	Chronicle Publishing Co.	Marion, Ind.	226	1330
WIAS	Home Electric Company	Burlington, Iowa	360	830
WIAU	Am. Trust & Savings Bank	Le Mars, Iowa	360	830
WIK	K. & L. Elec. Supply Co.	McKeesport, Pa.	360	830
WIP	Gimbel Bros.	Philadelphia, Pa.	509	590
WJAD	Jackson's Radio Eng. Lab.	Waco, Tex.	360	830
WJAF	Muncie Press	Providence, R. I.	360	830
WIL	Continental Elec. Supply Co.	Washington, D. C.	360	830
WJAG	Norfolk Daily News	Norfolk, Neb.	283	1060
WJAK	C. L. White	Norfolk, Nebr.	360	830
WJAM	D. M. Perham	Greentown, Ind.	254	1180
WJAN	Peoria Star	Cedar Rapids, Iowa	268	1120
WJAQ	Capper Publications	Peoria, Ill.	280	1070
WJAR	The Outlet Co.	Topeka, Kans.	360	830
WJAS	Pittsburgh Radio Sup. House	Pittsburgh, Pa.	250	1200
WJAT	Kelly-Vawter Jewelry Co.	Marshall, Mo.	360	830
WJAX	Union Trust Co.	Cleveland, Ohio	390	760
WJAZ	Chicago Radio Laboratory	Chicago, Ill.	448	670
WJD	Dennison University	Granville, Ohio	229	1310
WJH	Wm. P. Boyer Company	Washington, D. C.	273	1100
WJX	De Forest Radio T. & T. Co.	New York, N. Y.	360	830
WJY	Radio Corp. of America	New York, N. Y.	405	740
WJZ	Radio Corp. of America	New York, N. Y.	455	660
WKAA	H. F. Paar	Cedar Rapids, Iowa	360	830
WKAD	Charles Looff	E. Providence, R. I.	240	1250
WKAF	U. S. Radio Supply Co.	Wichita Falls, Texas	360	830
WKAN	United Battery Co.	Montgomery, Ala.	226	1330
WKAP	Dutee W. Flint	Cranston, R. I.	360	830
WKAQ	Radio Corp. of Porto Rico.	San Juan, P. R.	360	830
WKAR	Mich. Agricultural College	E. Lansing, Mich.	280	1070
WKAV	Laconia Radio Club	Laconia, N. H.	254	1180
WKAY	Brenau College	Gainesville, Ga.	280	1070
WKY	WKY Radio Shop	Oklahoma City, Okla.	360	620
WLAG	Cutting & Wash. Radio. Corp.	Minneapolis, Minn.	417	720
WLAH	Samuel Woodworth	Syracuse, N. Y.	234	1250
WLAJ	Waco Elec. Supply Co.	Waco, Texas	360	830
WLAK	Vt. Farm Machine Corp.	Bellows Falls, Vt.	360	830
WLAL	Naylor Elec. Co.	Tulsa, Okla.	360	830
WLAP	W. V. Jordan	Louisville, Ky.	360	830
WLAQ	A. E. Schilling	Kalamazoo, Mich.	283	1060
WLAV	Electric Shop	Pensacola, Fla.	254	1180
WLAW	Police Dept of N. Y. City	New York, N. Y.	360	830
WLAX	Putnam Electric Company	Greencastle, Ind.	231	1300
WLB	University of Minnesota	Minneapolis, Minn.	360	830
WLW	Crosley Mfg. Co.	Cincinnati, Ohio	309	970
WMAC	Clive B. Meredith	Cazenovia, N. Y.	261	1150
WMAF	Round Hills Radio Corp.	Dartmouth, Mass.	360	830
WMAH	General Supply Company	Lincoln, Nebr.	254	1180
WMAJ	Drovers Telegram Company	Kansas City, Mo.	275	1090
WMAK	Norton Laboratories	Lockport, N. Y.	360	830
WMAL	Trenton Hardware Company	Trenton, N. J.	256	1170
WMAN	Broad St. Baptist Church	Columbia, Ohio	286	1050
WMAP	Utility Battery Service	Easton, Pa.	246	1220
WMAQ	Chicago Daily News	Chicago, Ill.	448	672
WMAV	Alabama Poly. Inst.	Auburn, Ala.	250	1200
WMAW	Wahpeton Electric Co.	Wahpeton, N. D.	254	1180
WMAY	Kingshighway Pres. Church	St. Louis, Mo.	280	1070
WMAZ	Mercer University	Macon, Ga.	268	1120
WMC	Commercial Appeal	Memphis, Tenn.	500	600
WMU	Doubleday-Hill Elec. Co.	Washington, D. C.	261	1150
WNAC	Shepard Stores	Boston, Mass.	278	1080
WNAD	University of Oklahoma	Norman, Okla.	360	830
WNAL	R. J. Rockwell	Omaha, Nebr.	242	1240
WNAN	Syracuse Radio Telephone Co.	Syracuse, N. Y.	286	1050
WNAP	Wittenberg College	Springfield, Ohio	230	1300
WNAQ	Charleston Radio Elec. Co.	Charleston, S. C.	360	830
WNAR	C. C. Rhodes	Butler, Mo.	231	1300
WNAS	Austin Statesman	Austin, Tex.	360	830
WNAT	Lenning Bros. Co.	Philadelphia, Pa.	360	830
WNAV	Peoples Tel. & Tel. Co.	Knoxville, Tenn.	236	1270
WNAW	Peninsular Radio Club	Ft. Monroe, Va.	360	830
WNAX	Dakota Radio Apparatus Co.	Yankton, S. Dak.	244	1280
WNJ	Shotton Radio Mfg. Co.	Albany, N. Y.	360	830
WOAB	Valley Radio	Grand Forks, N. D.	280	1070
WOAC	Maus Radio Co.	Lima, Ohio	266	1130
WOAD	Friday Battery & Elec. Corp.	Sigourney, Iowa	360	830
WOAE	Midland College	Fremont, Nebr.	360	830
WOAF	Tyler Commercial College	Tyler, Tex.	360	830
WOAG	Apollo Theatre	Belvidere, Ill.	224	1340
WOAH	Palmetto Radio Corp.	Charleston, S. C.	360	830
WOAI	Evening News & Express	San Antonio, Tex.	385	780
WOAL	Em. E. Woods	Webster Groves, Mo.	286	1050
WOAN	Vaughn Conservat'y of Music	Lawrenceburg, Tenn.	360	830
WOAO	Lyradion Mfg. Co.	Mishawaka, Ind.	360	830
WOAP	Kalamazoo College	Kalamazoo, Mich.	240	1250
WOAR	Henry P Lundskow	Kenosha, Wis.	229	1310
WOAT	Boyd M. Hamp	Wilmington, Del.	360	830
WOAV	Penn. National Guard	Erie, Pa.	242	1240
WOAW	Woodmen of the World	Omaha, Nebr.	526	570
WOAX	Franklin J. Wolff	Trenton, N. J.	240	1250
WOC	Palmer Sch. of Chiropractic	Davenport, Iowa	484	620
WOI	Iowa State College	Ames, Iowa	360	830
WOO	John Wanamaker	Philadelphia, Pa.	509	590
WOQ	Western Radio Company	Kansas City, Mo.	360	830
WOR	L. Bamberger & Co.	Newark, N. J.	405	740
WOS	Mo. State Marketing Bureau	Jefferson City, Mo.	441	680
WPAB	Penn. State College	State College, Pa.	283	1060
WPAC	Donaldson Radio	Okmulgee, Okla.	360	830
WPAH	Wis. Dept. of Markets	Waupaca, Wis.	360	830
WPAJ	Doolittle Radio Corp.	New Haven, Conn.	268	1120
WPAK	N. Dak. Agricultural College	Agricultural Col., N. D.	360	620
WPAL	Superior Rad. Tel. & Eqp. Co.	Columbus, Ohio	286	1050
WPAM	Auerbach & Guettel	Topeka, Kans.	360	830
WPAP	Theodore D. Philips	Winchester, Ky.	360	830
WPAQ	Gen. Sales & Engineering Co.	Frostburg, Md.	360	830
WPAT	St. Patrick's Cathedral	El Paso, Tex.	360	830
WPAU	Concordia College	Moorhead, Minn.	360	620
WPAZ	Dr. John R. Koch	Charleston, W. Va.	273	1100
WPG	Nushagwa Poultry Farm	New Lebanon, Ohio	234	1280
WQAA	Horace A. Beale, Jr.	Parkesburg, Pa.	360	830
WQAC	E. B. Gish	Amarillo, Tex.	360	830
WQAD	Whithall Electric Co.	Waterbury, Conn.	242	1240
WQAE	Moore Radio News Sta.	Springfield, Vt.	275	1090
WQAF	Sandusky Register	Sandusky, Ohio	240	1250
WQAH	Brock-Anerson Elec. Eng. Co.	Lexington, Ky.	254	1180
WQAL	Coles Co. Tel. & Tel. Co.	Mattoon, Ill.	258	1160
WQAM	Electrical Equipment Co.	Miami, Fla.	283	1060
WQAN	Scranton Times	Scranton, Pa.	280	1070
WQAO	Calvary Baptist Church	New York, N. Y.	360	830
WQAQ	West Texas Radio Co.	Abilene, Tex.	285	1050
WQAS	Prince-Walter Company	Lowell, Mass.	266	1130
WQAV	Huntington & Guerry, Inc.	Greenville, S. C.	258	1160
WQAW	Catholic University	Washington, D. C.	236	1270
WQAX	Radio Equipment Co.	Peoria, Ill.	360	830
WRAA	Wm. M. Rice Inst.	Houston, Tex.	360	830
WRAB	Board of Public Education	Savannah, Ga.	360	830
WRAD	Taylor Radio Shop	Marion, Kans.	248	1210
WRAF	The Radio Club, Inc.	Laporte, Ind.	224	1340
WRAH	Stanley N. Read	Providence, R. I.	231	1300

Call	Owner	Location	Meters	Kcys.
WRAL	Northern States Power Co.	St. Croix Falls, Wis.	248	1210
WRAN	Black Hawk Electrical Co.	Waterloo, Iowa	236	1270
WRAO	Radio Service Co.	St. Louis, Mo.	360	830
WRAR	Jacob L. Thomas	David City, Nebr.	226	1330
WRAV	Antioch College	Yellow Springs, O.	242	1240
WRAW	Avenue Radio Shop	Reading, Pa.	360	830
WRAX	Flaxon's Garage	Gloucester City, N. J.	268	1120
WRAY	Radio Sales Corporation	Scranton, Pa.	280	1070
WRAZ	Radio Shop of Newark	Newark, N. J.	233	1290
WRC	Radio Corp. of America	Washington, D. C.	469	640
WRK	Doron Bros. Elec. Co.	Hamilton, Ohio	360	830
WRL	Union College	Schenectady, N. Y.	360	830
WRM	University of Illinois	Urbana, Ill.	360	830
WRR	City of Dallas	Dallas, Tex.	360	620
WRW	Tarrytown Radio Research	Tarrytown, N. Y.	273	1100
WSAB	S. E. Mo. State Teachers Col.	Cape Girardeau, Mo.	360	830
WSAC	Clemson Agricultural College	Clemson College, S. C.	360	830
WSAD	J. A. Foster Company	Providence, R. I.	261	1150
WSAG	City of St. Petersburg	St. Petersburg, Fla.	244	1230
WSAH	A. J. Leonard, Jr.	Chicago, Ill.	248	1210
WSAI	U. S. Playing Card Co.	Cincinnati, Ohio	309	970
WSAJ	Grove City College	Grove City, Pa.	360	830
WSAL	Franklin Electric Co.	Brookville, Ind.	246	1220
WSAN	Allentown Radio Club	Allentown, Pa.	229	1310
WSAR	Doughty & Welch Elec. Co.	Fall River, Mass.	254	1180
WSAT	Donohoe-Ware Co.	Plainview, Tex.	268	1120
WSAU	Camp Marienfield	Chesham, N. H.	229	1310
WSAW	J. J. Long	Canandaigua, N. Y.	275	1090
WSAX	Chicago Radio Laboratory	Chicago, Ill.	268	1120
WSAY	Irving Austin	Portchester, N. Y.	230	1300
WSAZ	Chase Radio Co.	Pomeroy, Ohio	258	1160
WSB	Atlanta Journal	Atlanta, Ga.	429	700
WSL	J. & M. Electric Co.	Utica, N. Y.	273	1100
WSY	Alabama Power Company	Birmingham, Ala.	360	830
WTAB	Fall River Daily Herald	Fall River, Mass.	248	1210
WTAC	Penn. Traffic Company	Johnstown, Pa.	360	830
WTAF	Lewis J. Gallo	New Orleans, La.	268	1120
WTAG	Kern Music Company	Providence, R. I.	258	1160
WTAH	Carmen Ferro	Belvidere, Ill.	236	1270
WTAJ	The Radio Shop	Portland, Me.	236	1270
WTAK	Swan-Bower Company	Steubenville, Ohio	266	1130
WTAL	Toledo Radio & Elec. Co.	Toledo, Ohio	252	1190
WTAM	Willard Storage Battery Co.	Cleveland, Ohio	390	770
WTAN	Orendorff Radio Co.	Mattoon, Ill.	240	1250
WTAP	Cambridge Radio Elec. Co.	Cambridge, Ill.	242	1240
WTAQ	S. Van Gorden	Oseo, Wis.	226	1330
WTAR	Reliance Radio & Elec. Co.	Norfolk, Va.	280	1070
WTAS	Geo. D. Carpenter	Elgin, Ill.	275	1090
WTAU	Ruegg Battery & Elec. Co.	Tecumseh, Nebr.	360	830
WTAW	Agricultural & Mech. College	College Stations, Tex.	254	1180
WTAX	Williams Hardware Mfg. Co.	Streator, Ill.	231	1300
WTAY	The Oak Leaves	Oak Park, Ill.	226	1330
WTAZ	T. J. McGuire	Lambertville, N. J.	280	1070
WTG	Kans. State Agr. College	Manhattan, Kans.	360	830
WWAC	Sanger Bros.	Waco, Tex.	360	830
WWAD	Wright & Wright, Inc.	Philadelphia, Pa.	360	830
WWAO	Mich. College of Mines	Houghton, Mich.	244	1230
WWI	Ford Motor Company	Dearborn, Mich.	273	1100
WWJ	Detroit News	Detroit, Mich.	517	580
WWL	Loyola University	New Orleans, La.	280	1070
WWT	McCarthy Bros. & Ford	Buffalo, N. Y.	360	830
	CANADA			
CFAC	The Calgary Herald	Calgary, Alta.	430	700
CFCA	Star Pub. & Printing Co.	Toronto, Ont.	400	750
CFCF	Marconi Wireless Tel. Co. of Canada	Montreal, Quebec	440	680
CFCH	Abitibi Pow. & Paper Co., Ltd.	Iroquois Falls, Ont.	400	750
CFCJ	La Cie de L'Evenement	Quebec, Que.	410	730
CFCK	Radio Supply Co., Ltd.	Edmonton, Alta.	410	730
CFCL	Centennial Methodist Church	Victoria, B. C.	400	750
CFCN	W. W. Grant Radio, Ltd.	Calgary, Alta.	440	680
CFCO	Semmelhaack-Dickson, Ltd.	Bellevue, Que.	450	670
CFCQ	Radio Specialties, Ltd.	Vancouver, B. C.	450	670
CFCR	Laurentide Air Service	Sudbury, Ont.	410	730
CFCW	The Radio Shop	London, Ont.	420	710
CFDC	Sparks Co.	Nanaimo, B. C.	430	700
CFQC	Electric Shop, Ltd.	Saskatoon, Sask.	400	750
CFRC	Queen's University	Kingston, Ont.	450	670
CFUC	University of Montreal	Montreal, Que.	400	730
CHAC	Radio Engineers, Ltd.	Halifax, N. S.	400	750
CHBC	The Albertan Pub. Co.	Calgary, Alta.	410	730
CHCB	Marconi Company	Toronto, Ont.	440	680
CHCC	Canadian Westinghouse Co.	Edmonton, Alta.	400	750
CHCD	Canadian Wireless & Elec Co.	Quebec, Que.	410	730
CHCE	W. Canada Radio Supply, Ltd.	Victoria, B. C.	400	750
CHCL	The Vancouver Merchants Exchange, Ltd.	Vancouver, B. C.	440	680
CHYC	North Electric Co., Ltd.	Montreal, Que.	410	730
CJCA	The Edmonton Journal, Ltd.	Edmonton, Alta	450	670
CJCC	London Free Press	London, Ont.	430	700
CJCD	T. Eaton Company	Toronto, Ont.	410	730
CJCE	Sprott-Shaw Radio Co.	Vancouver, B. C.	420	710
CJCI	Maritime Radio Corp., Ltd.	St. John, N. B.	400	750
CJCN	Simons, Agnew & Co., Ltd.	Toronto, Ont.	410	730
CJCX	Percival Wesley Shackleton	Olds, Alta.	400	750
CJSC	The Evening Telegram	Toronto, Ont.	430	700
CKAC	La Presse Pub. Co., Ltd.	Montreal, Que.	430	700
CKCD	Vancouver Daily Province	Vancouver, B. C.	410	730
CKCE	Canadian Independent Tel. Co.	Toronto, Ont.	450	670
CKCK	Leader Publishing Co., Ltd.	Regina, Sask.	420	710
CKOC	Wentworth Radio Supply Co.	Hamilton, Ont.	410	730
CKY	Manitoba Telephone System	Winnipeg, Man.	450	670
OA	C. P. Edwards	Ottawa, Que.	...	...
	CUBA			
Call	Owner	Location	Meters	Kcys.
PWX	Cuban Telephone Co.	Habana	400	750
2DW	Pedro Zayas	Habana	300	1000
2AB	Alberto S.de Bustamante	Habana	240	1250
2OK	Mario Garcia Velez	Habana	360	830
2BY	Frederick W. Borton	Habana	260	1150
2CX	Frederick W. Borton	Habana	320	940
2EV	Westinghouse Elec. Co.	Habana	220	1360
2TW	Roberto E. Ramires	Habana	230	1300
2HC	Heraldo de Cuba	Habana	275	1090
2LC	Luis Casas	Habana	250	1200
2KD	E. Sanchez de Fuentes	Habana	350	860
2MN	Fausto Simon	Habana	270	1110
2MG	Manuel G. Salas	Habana	280	1070
2JO	Raul Perez Falcon	Habana	150	1990
2KP	Alvara Daza	Habana	200	1500
2HS	Julio Power	Habana	180	1660
2OL	Oscar Collado	Habana	290	1030
2WW	Amadeo Saenz	Habana	210	1430
5EV	Leopoldo V. Figueroa	Colon	360	830
6KW	Frank H. Jones	Tuinucu	340	880
6KJ	Frank H. Jones	Tuinucu	275	1090
6CX	Antonio T. Figueroa	Cienfuegos	170	1760
6DW	Eduardo Terry	Cienfuegos	225	1330
6BY	Jose Ganduxe	Cienfuegos	300	1000
6AZ	Valentin Ullivarri	Cienfuegos	200	1500
6EV	Josefa Alvarex	Caibarien	225	1330
8BY	Alberto Ravelo	Stgo. de Cuba	240	1250
8AZ	Alfredo Brooks	Stgo. de Cuba	250	1200
8FU	Andres Vinnet	Stgo. de Cuba	225	1330
8DW	Pedro C. Anduz	Stgo. de Cuba	275	1090
8EV	Eduardo Mateos	Stgo. de Cuba	180	1660
	PORTO RICO			
Call	Owner	Location	Meters	Kcys.
WGAD	Sp. Am. Sch. of Radio Tel.	Ensenada	300	1800
WKAQ	Radio Corp. of Porto Rico	San Juan	360	830
	MEXICO			
Call	Owner	Location	Meters	Kcys.
CYL	La Casa del Radio	Mexico City, Mexico	500	600

Canary's Obbligato Keeps Sailors in Jail

By Washington R. Service

ONE would scarcely think the sweet song of a canary would in any way affect the prolongation of the incarceration of three of Uncle Sam's sailors in a Japanese prison, but so the tale of an ex-Navy radio operator goes. Three firemen from the good ship "Orion" got themselves in wrong with the Nagasaki authorities, and were detained ashore, although their ship was sailing. Upon the request of his captain, the "Orion" operator called the flag ship to ask that steps be taken to secure the firemen's release and return to the United States.

Sparks got his message off, despite the fact that a canary he was bringing home sang in harmony with the ship's radio wave note. As soon as the operator started to listen in for his O.K., the bird redoubled its efforts in a key which interfered so seriously with the reception of the flag ship's answer that it made impossible to get the message. Sparks couldn't leave his key to put the bird out of the shack, so he threw spare parts and tools in its general direction, without effect. Again he called the flag ship; again the dickey bird, now exceedingly unpopular with its temporary owner, began its lusty song. As the ship steamed out to sea, the operator gave up in despair; he couldn't get his answer through the canary's QRM. It developed later that "Orion's" message was not received correctly, and the unlucky firemen were held in the Japanese "brig" several months, all because of the canary's sweet obbligato. The bird finished the voyage in a stateroom, but when delivered to its ultimate owner ashore, it refused to sing again.

Every State Now Has a Broadcasting Station

WITH the recent licensing of KFNG, at Coldwater, Miss., every state in the Union had one or more broadcasters, it was learned at the Bureau of Navigation, Department of Commerce. This is not the first time, however, that each state has been listed; last year a broadcasting station opened up in Corinth, Mississippi, which completed the roster, but this station later dropped out, leaving one of the 48 states unrepresented.

The Radio University

A Question and Answer Department conducted by the Technical Staff of RADIO WORLD for the information and instruction of its subscribers. A "trouble shooter" is always ready here to help new radio fans.

I have constructed the Superdyne receiver, using the very best parts, such as Hammerlund condensers, Condensite sockets, and coils wound on latticed bakelite tubes, which I tooled out myself, so as to have the least amount of insulating material necessary to support the coils. I use Bradleystats to control the filament current, and the rest of the parts are all of really high quality. My trouble is this. I can tune in the local stations fine with wonderful clarity and clearness, and no distortion, but after fooling with it a week and a half cannot tune in anything more distant than KDKA, which I can bring in on a single tube set without any antenna. Is this a good distance receiver? Are there any models made up which will back up the claims made for them? What can the trouble be, seeing as the receiver works to perfection on all the nearby stations, even cutting the powerful WEAF out entirely and listening to WIP with absolutely no interference?—Kenneth Halper, 1600 Broadway, N. Y. C.

Your trouble can be easily diagnosed. You do not know how to tune the distant stations, or signals in. This receiver, while wonderfully clear and distinct, and sharp in tuning, must be operated in a certain manner. It is also of advantage in some receivers to include a grid leak (variable—of very high manufacture such as Bradleyleak, or Variohm or some similar make) from the grid side of the condenser to the filament of the tube. Tuning in weak signals in this receiver is much harder than on the other makes, and for this reason it is known as a "tricky set." Patience and lots of practice on tuning weak signals, will do wonders for the receiver. Vernier controls are absolutely necessary.

* * *

I have constructed the Superdyne as per the articles in RADIO WORLD *for Dec. 15, 22 and 29, using the following apparatus: One Murdock condenser; one unknown make; Workrite sockets; Franco B battery two UV199 tubes; Dubilier grid condenser. The tubes for the windings are cardboard. Have you any suggestions in regard to the apparatus used? How far above the top of the secondary should the center of the rotor be? Why does my detector rheostat have more to do with the tuning than the radio frequency tube? Which terminals of a UV199 is the filament minus? Should the primary be wound in the same direction as the secondary? What causes a steady click in the receiver which stops if I touch the grid circuit of the detector tube?—Robert Reynolds, Cumming, Ia.*

The condensers you mention would do for a purely experimental receiver, but for a receiver that is to give constant use would suggest that you use better ones. Condensers were specified in the article; if possible obtain them and use them. Use either radion or formica tubing instead of cardboard. Cardboard is hygroscopic and is poor material to use when constructing a super sensitive set of the type described. We note you have constructed a two-tube receiver, so if you intend to incorporate audio frequency in it, suggest that you use the best of everything when you rebuild it. The bottom of the rotor should be so located that the last turn is about 1" above the top of the secondary winding. The detector tube will have most to do with the reception in any receiver, but in this receiver if it is properly constructed it should not be critical. This depends upon how you wire it up—it makes no difference which side of the filament itself is connected to the minus or plus side as long as the wiring in the circuit is correct. No. The click is caused by too small a grid condenser; use one size larger and incorporate a small grid leak from the grid side of the condenser to the filament-grid return.

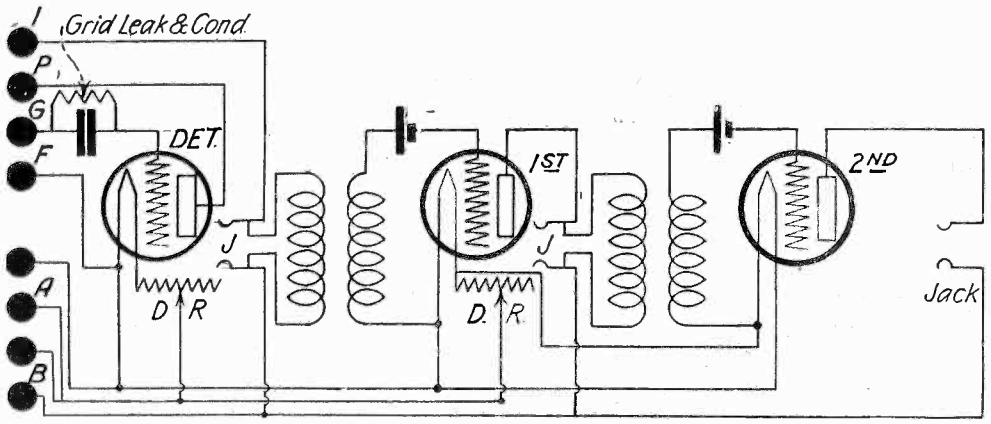
Where can the flat spiderweb variometers used in the "autoplex," as described by B. C. Caldwell, be obtained?—C. H. Karuts, 1104 Broadway, N. Y. C.

They may be obtained from the Biltmore Radio Co., 238 Lamartine Street, Boston 30, Mass. The complete set may be purchased from these people.

* * *

Please publish a diagram of a dectector and two stage amplifier, using "C" batteries in the grid leads of the audio frequency tubes. Can selective, stable and satisfactory results be secured with a set using transformer coupled radio frequency and regeneration?—Kenneth H. Jones, London Mills, Ill..

The diagram you desire is herewith published. The minus side of the "C" battery goes to the grid of the tubes, the plus going to the transformer grid secondary. For your information, if you use over 60 volts it is desirable to use 3 volts minus bias on the tube. If not over 60, a single 1½-volt cell in each tube will suffice, although a little experimentation on this value especially in the second tube should prove the best value in a short space of time. Tune in a strong signal, and vary the value of "C" battery with a slightly higher filament current than you normally use, and the best value will show itself in a distortionless signal. The results you desire may be had if a variable transformer of the Ballantine type is used. However, at its best, it will prove unstable, and tricky to handle, so suggest that you use the radio frequency without the regeneration. Two stages of good tuned radio frequency amplification if constructed carefully should prove far more satisfactory than any regenerative set made. Use the best apparatus, however, if good results are wanted.



Detector and two stages of audio-frequency amplification with "C" batteries asked for by Kenneth H. Jones.

* * *

In regard to the superdyne, would it be possible to get the American stations on one properly constructed and following directions? What distance has been covered on it consistently? Does it regenerate or is it non-regenerative? Can the Ediswan Dull emitter type A. R. 06 valve be used in this circuit?—C. Bell, Hull, England.

While this is a good receiver and capable of extremely good work as far as distance is concerned it is a matter of conjecture if the circuit will consistently work under the conditions you name. Under practical test conditions the circuit has showed a consistent range of 2,000 miles, with much better range, conditions of course favoring such work. However as reception over water is much better than over land, you should have no trouble in getting the American coastal stations such as WJZ, WEAF, KDKA and others, under good conditions. This valve is identical to the UV199, which is a high emission thoriated filament tube. You may use his valve.

* * *

In Kenneth Harkness' book "Radio Frequency Amplification" the writer mentions a D coil, made by himself, in which he was able to obtain neutralization of tube capacity without the necessary neutrodons. The illustration shows a regulation air-core coupler such as the neutrodyne receivers use. How does he make a D coil out of a round tube? What is the size of the tube used? What is the size of the wire? How is the primary arranged, so that it may also be a D coil? Will these coils work equal to a regulation neutralized radio frequency coil set? Is it possible to neutralize tube capacity by means such as he outlines—Otto Bank, 908 Ottwards Building, Cincinnati, Ohio.

The D coils may be wound on a regulation tube by doing the following: Obtain a 3½" tube (radion, bakelite, formica) and cut two ¼" slots, one on either side of the coil. Cut these down to within 1" of the end of the tube. You will then be enabled to wind the D form coil on this. You may use either No. 22 or 24 DSC wire—do not use shellac or binder. Wind the primary at the beginning of the slot (1 near the 1" solid end and then leave a space of about ¼" and begin the winding of the secondary. These coils will work in the set mentioned, using the hookup given in the book you mention. Set them at the same angle as those of the Neutrodyne, namely 60° off vertical. It is perfectly possible and highly plausible to do this, providing the correct wiring is used, and the leads do not interfere in any manner. Be careful when using a coil of this sort that the insulation of the coils is not "stripped" when bringing it around the sharp corner of the D form. For this purpose it is best to file the corners round, and to wind the wire just tight enough to hold, but not so tight that the form will cut through the insulation and bare the wire. More care is necessary in constructing a set of this type than of the neutrodyne type, as you are dealing with very fine balances which is one of the reasons that the neutrodyne is so nearly fool proof—it is not so severely critical.

* * *

I have just purchased a receiver which I know from other's experience is a good set. My trouble is that I cannot seem to get the third tube to work properly. I get good results on two tubes, but when I plug it in the third, the sound is reduced and sandy. When I place my hand on the tube and push it to the left side, facing the slot in the socket it works fine, but the moment I remove my hand, the amplification fails and it gets sandy again.—Myron Cohen, 1640 Park Ave., New York City.

You evidently have a socket which is making imperfect contact with the tube. Remove the tube from the socket, and see if there is something interfering with the contact of the tube prongs. It may be that the prongs are loose. Pry them up so that they have a slight spring to them when the tube is inserted in the socket.

* * *

I have constructed the Superdyne receiver and it works fine, giving all the volume that my five tube neutrodyne did on distance, and even more when tuned to exact resonance. How can I eliminate the shrill whistle that lasts for about two seconds when the set is tuned? The receiver is very quiet otherwise, but this short whistle makes it impossible to use the loud speaker late at night. —K. M. Kalbe, New York City.

This whistle as you term it should present itself as a rather high hiss. Suggest that you use a slightly larger size of grid condenser in the detector tube circuit. It is not possible to do away with this hiss, if the receiver is working properly, but as it does not last long it should not prove annoying.

* * *

Please advise me of some minor details of the Superdyne. What length of tubing (4" OD) should be necessary for the construction of the coupler and coil? What does "OD" mean?—A. Miller, Rosedale, L. I., N. Y.

As each winding takes up 1¼", you will need a 2" piece for the tuned impedance coil, and a 2½ or 3" piece for the coupler. OD is a mechanical term, meaning outside diameter, or outside dimension. This means that the tube should be 4" in diameter measured from the outside.

* * *

Does the proximity of the radio frequency coil to L1 and LF1 and tickler coils have any effect on the efficiency of the superdyne?—C. C. Seymour, P. O. Box 591, Barrington, N. J.

This coil is to be wound in the opposite direction to the ones mentioned, and should be set at an angle of 90 degrees to them. This will stand it upright, with its windings vertical. It should be located at least 2" distant from the coil.

* * *

What is the wave length of PWX? I have tried to get him every time I see his call letters in the papers, but have had no success. Is he powerful enough to be heard by amateurs in this section?—M. Fleischer, Bradford, Pa.

This station operates on a wave length of 400 meters. It is a rather hard station to tune in on anything less than a very selective and sensitive receiver, seeing as it is so distant and is also operating on a wave band that is rather crowded. He has been received in the vicinity you mention, but not as a regular performance.

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Boston Representative: Chas. H. M. White, 1367 Commonwealth Avenue, Allston, Mass.
Chicago Representative: Mat H. Friedman, 519 East 60th St., Chicago, Ill.
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Editor
Roland Burke Hennessy

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

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FEBRUARY 16, 1924

Woodrow Wilson

WOODROW WILSON, twenty-eighth President of the United States, passed on peacefully and painlessly, after four years of ill health, at his home in Washington on February third. His death brought to his family literally thousands of messages of condolence from all over the civilized globe. They came from those who admired him and from those who were opposed to his policies. History will accord him a place among the idealists who gave their all, including life itself, to the causes which they unselfishly championed. A great American is dead.

Radio played its part in the solemn event. The naval radio station at Arlington, Va., flashed the news around the world. As it was received, American vessels upon the seven seas dipped the flag in salute and then half-masted it in official mourning. Stations WJZ and WEAF, in New York City, also broadcast the sad news. Many other stations stayed off the air or revised their programs to include tributes to Mr. Wilson.

Alleged Radio Monopoly

A CAREFUL study of the complaint filed by the Federal Trade Commission against the Radio Corporation of America and its component companies, alleging that certain acts and practices charged are to the prejudice of the public and of the corporation's competitors and constitute unfair methods of competition in commerce, leaves one confused and bewildered. The basis of the charges seems to be that the respondents have acquired a large number of patents, some 2,000, and that through these and others which they may acquire by purchase or by grant, they intend to perpetuate their control of the patent situation beyond the life of the patents they now own. A patent is a monopoly. The government says so when it grants it. The patentee is entitled for seventeen years to all the benefits he may be able to derive from it. The argument of the Federal Trade Commission in this instance would seem to be that when a group of companies acquires a group of patents the monopolies inherent to each of the patents become a menace to the public when operated as a group. And that naturally might bring up the question "When is a patent not a patent?"

The radio industry is to a greater extent than almost any other built upon patents. And the Radio Corporation of America does not own them all by any means. Could the commission's reasoning be applied to a manufacturing company owning a little group of ten or twelve patents which gave it an absolute monopoly in its particlar line of goods?

The Radio Corporation of America was formed in 1919 practically at the request of the government. A Navy Department report recording the organization of the corporation says: "Probably the most important single act affecting the communications of the United States, was directly originated and fostered by representatives of the Navy Department." The new corporation acquired the interests of all foreign owners in the then existing radio stations of any importance. Thus was established what Naval Communication officers believed to be "a 100 per cent. American company for the operation of the high powered radio stations of this country."

If the allegations of the Federal Trade Commission that the respondents have conspired to create a monopoly in the manufacture, purchase and sale of radio devices and apparatus can be sustained, then the restraint exercised by the Radio Corporation of America in the enforcement of what it now believes are its rights will be a matter for wonder. Few, if any, of the millions of receiving sets built by amateurs all over the country fail to infringe one or more of the patents controlled by the corporation. Instead of pursuing these infringers in the courts, the corporation has, at least indirectly, encouraged the widest possible use of radio by the people.

The Federal Trade Commission is not always right, either in its premises or in its conclusions, as its record clearly shows. According to statistics quoted by the New York "Times" it has issued 1,062 complaints with the result of final action in only 563. The courts have reviewed 35 cases and found in 23 that the orders of the commission were wholly void. Only in seven were they valid. On the balance of presumptions the respondents would stand a three to one chance of being right and the commission wrong. The commission made a report to Congress on the respondents' activities in the radio industry and expressed no adverse opinion. The respondents maintain that their intentions were made known to the government, that for a time a representative of the government sat on their board of directors, that their contractual relations are in the public interest rather than against it and that they are advised that these contracts are legal.

Only when the evidence is heard and the courts pass upon the law can it be asserted that the respondents are in restraint of trade. Now, while the radio industry is comparatively young, is an excellent time to have this important matter resolved. While RADIO WORLD holds no brief for any of the respondents, especially if it can be demonstrated that they are acting in restraint of trade and thereby retarding the progress of what promises to be one of the greatest of all industries, we are of the opinion that the Federal Trade Commission will be unable to maintain its allegations in this instance.

- — - — -

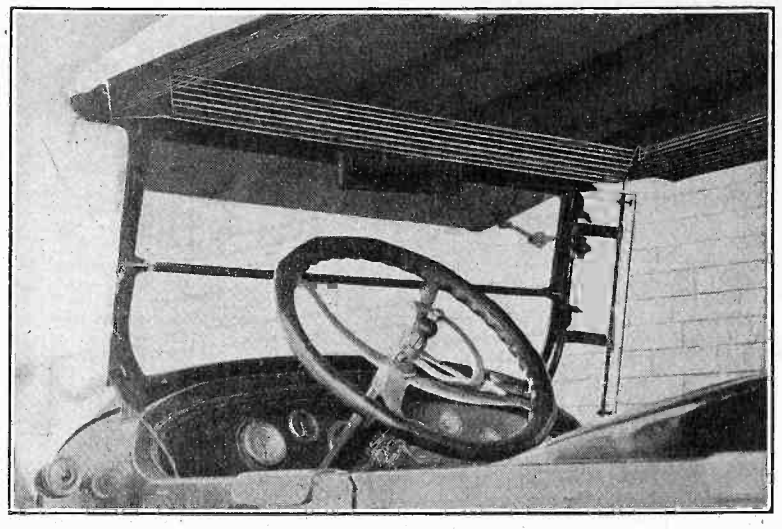
AGAIN we call attention to the fact that instructions for the construction of circuits as published from time to time in our columns must be followed to the letter. If this is not done it is useless to complain that the circuit won't work and to bombard RADIO WORLD with questions as to why it doesn't. Often legitimate questions arise even when instructions are followed and these we are glad to answer.

- — - — -

THE most satisfactory definition of man is that credited to Benjamin Franklin: "Man is a tool-using animal." Although possessing remarkable vision this patron saint of the electrical arts little dreamed that his definition not only included all the males of the species but that it would apply with especial aptitude, 150 years after his death, to the amateur radio constructor.

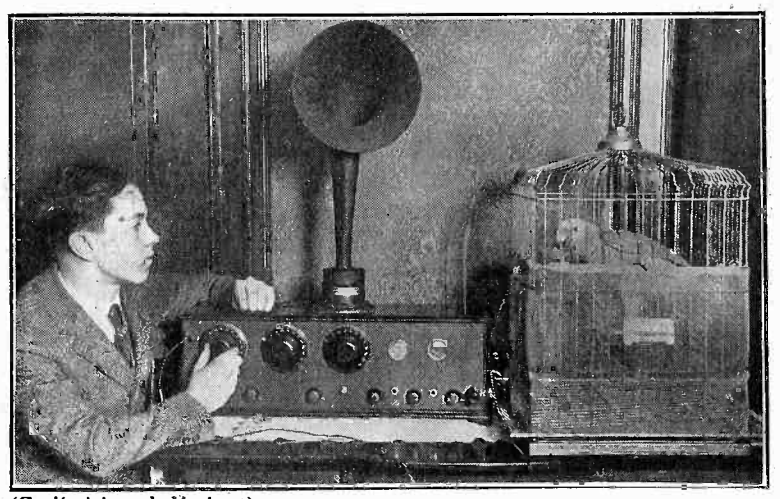
All Kinds of Radio News Pictured Here

(C. Underwood and Underwood)
Bevy of English chorus girls rehearsing one of their intricate dance steps at the Selwyn Theatre, N. Y., to the tune of a jazz band broadcasting from WJAZ, Chicago.

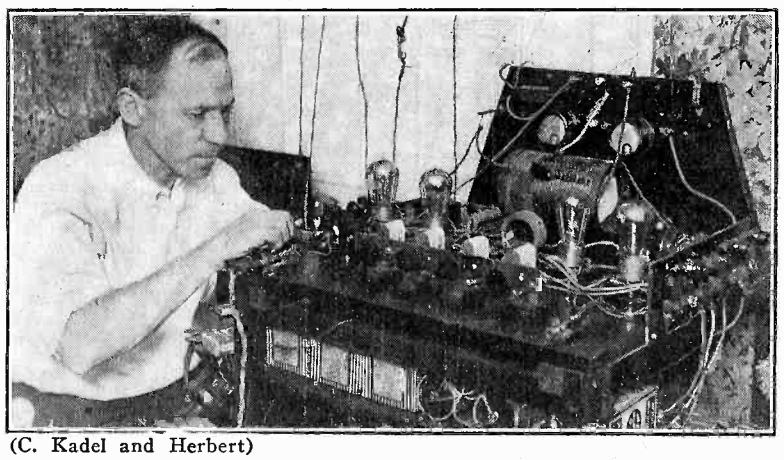


The way a radio enthusiast fixed his antenna. It is arranged so that it can form a closed loop or a straight antenna, using the frame of the car as the counterpoise.

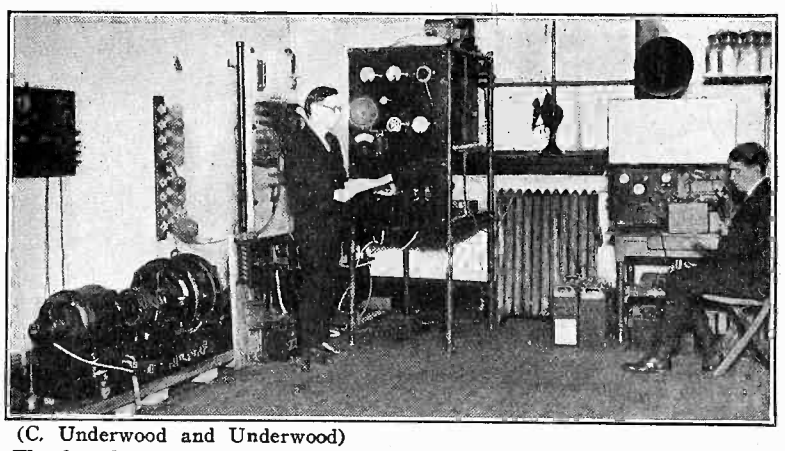
(C. Foto Topics)
Paul Specht, who broadcasts from the Alamac Hotel, New York City, through WJZ, looking over a day's receipts of manuscripts, sent in at his request. In one week he received over 6,000 pieces.



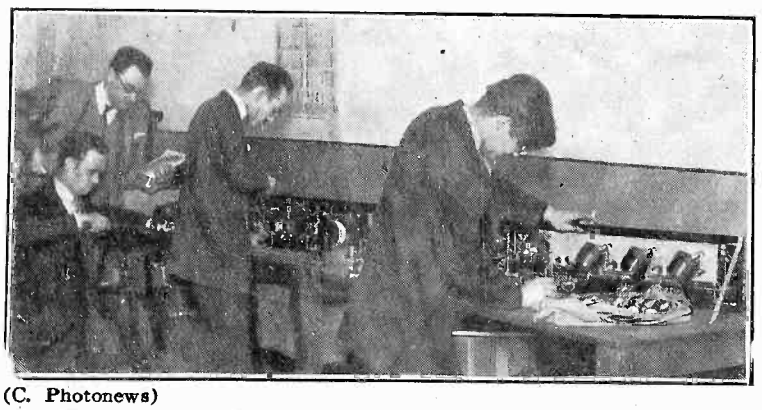
(C. Kadel and Herbert)
Robert McAffee, New York radio enthusiast, and his pet parrot "Jake," who imitates all the announcers perfectly, and mimics them when they start to broadcast.



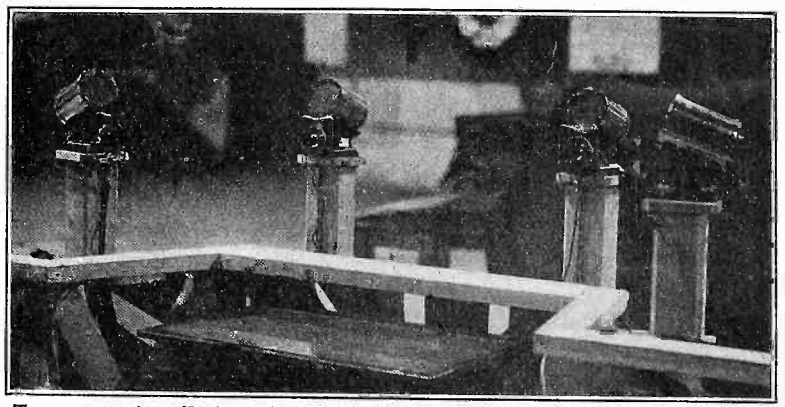
(C. Kadel and Herbert)
Leo Johnson and his station 2CTQ, which has established some wonderful records. When he gets the best system of modulation he will put it in a cabinet—maybe!



(C. Underwood and Underwood)
The broadcasting station of the University of Illinois, showing the transmitter and controls. Here the students study advanced radio and broadcasting methods.



(C. Photonews)
The Radio Association of Greater New York maintains a shop and laboratory where members make and test receivers. A few members snapped on a Saturday afternoon, finishing their work.



Temporary installation of microphones in Montreal through which prominent parliamentary members spoke recently. The talks were broadcast through CKAC, the broadcasting station of "La Presse," Montreal.

Here Are Good Broadcast Programs

Station KDKA, East Pittsburgh, Pa.

326 Meters (920 Kcys). E. S. T. Feb. 15—9:45 A. M.—Union live stock market reports. 11:55 A. M.—Arlington time signals. 12 M—Weather forecast. United States Bureau of Market Reports. 12:10 P. M.—Concert by Broudy's Orchestra, from the dining room of Kanfmann's, Pittsburg, Pa. 6:15 P. M.—Organ Recital by Lucile Hale, from the Cameo Motion Picture Theater, Pittsburgh, Pa. 7:15 P. M.—Radio Boy Scout meeting conducted by Richard Victor. 7:45 P. M.—The Children's Period. 8 P. M.—Market reports. 8:15 P. M.—"Joshua and the Conquest of Canaan," the Sunday School lesson for February 17, presented by Dr. R. L. Lanning. 8:30 P. M.—Address by S. M. Kintner, Westinghouse Electric & Mfg. Co. 8:45 P. M.—Concert by artists from the LeSueur Studios, assisted by Leo Kruczek, violin. 9:55 P. M.—Arlington time signals; weather forecast.

Feb. 16—9:45 A. M.—Union live stock market reports. 11:55 A. M.—Arlington time signals. 12 M.—Weather forecast. United States Bureau of Market Reports. 1:30 P. M.—Concert by Daugherty's Orchestra from the dining room of McCreery Company. 6:15 P. M.—Dinner concert by the Westinghouse Band, T. J. Vastine, conductor. 7:30 P. M.—"Bringing the World to America," prepared by "Our World." 7:45 P. M.—The Children's Period. 8 P. M.—Feature. 8:15 P. M.—"Personal Income Tax Returns for Small Incomes," Robert D. Ayers, Assistant Professor of Accounting, University of Pittsburgh. 8:30 P. M.—Concert by the Westinghouse Band, T. J. Vastine, conductor, assisted by "An Unknown Tenor." 9:55 P. M.—Arlington time signals. Weather forecast.

Station WGI, Medford, Mass.

360 Meters (830 Kcys). E. S. T. Feb. 15.—12:00 Noon—Selection on the Ampico in the Chickering; Amrad Round Table; Selections on the Brunswick Console. 12:40 P. M.—New England weather forecast. 12:45 P. M.—Closing report on farmers' produce market. 3:00 P. M.—Amrad Women's Club program: Talk by Miss Dorothy H. Goodwin; Musicale by the Brunswick Console. 3:30 P. M.—Talk by Miss Dorothy Dean, Girl Scouts. 5:30 P. M.—Closing stock market reports; Live stock markets report. 6:15 P. M.—Code practice, lesson No. 234. 6:30 P. M.—Meeting of the Big Brother Amrad Club. 7:00 P. M.—Boston police reports. 7:30 P. M.—Selected verses by Mr. Charles L. H. Wagner, radio poet; Red Cross health talk by Henry Copley Green, "Your Milk Supply"; Musicale. 8:15 P. M.—Reading of Boy Scout Oath.

Feb. 16.—6:30 P. M.—Meeting of the Big Brother Amrad Club. 6:45 P. M.—Code practice, lesson No. 235. 7:05 P. M.—New England weather forecast; New England crop notes. 7:30 P. M.—Third of a series of talks on New England Business Industry by Arthur R. Curnick; Arthur Murray's course in Ball Room Dancing; Musicale.

Feb. 17.—4:00 P. M.—"Adventure Hour" by the Youth's Companion; Musicale. 8:30 P. M.—Talk on "World Unity" under the auspices of the Greater Boston Federation of Churches; Musicale.

Station WFAA, Dallas, Texas

476 Meters (630 Kcys). C. S. T. Feb. 15—12:30-1 P. M.—Address, Dr. Robert Stewart Hyer, Southern Methodist University, on the Sunday School lesson, "Joshua and the Conquest of Canaan." 8:30-9:30 P. M.—Musical variety program presenting the orchestra and assisting performers from Kerens, Texas.

Feb. 16—12:30-1 P. M.—Address, Dr. Edward H. Jones, Southern Methodist University, on "The Science of Numbers." 8:30-9:30—Faculty recital by music department of Southern Methodist University. 11-12 P. M.—Dance music, Adolphus Hotel Orchestra, broadcast from the junior ballroom of the hotel.

Feb. 17—6-7 P. M.—Radio Bible Class, Dr. William M. Anderson, Jr., pastor First Presbyterian Church, teacher; half hour of Bible study and half hour of gospel song. 9:30-10 P. M.—Address by the Rt. Rev. Harry T. Moore, bishop of Dallas, American Protestant Episcopal Church, on "Worship and Christianity." 10-11 P. M.—Popular music recital by Jimmy Allen's Serenaders, S. A. E., Fraternity, Southern Methodist University.

Station WRC, Washington, D. C.

469 Meters (640 Kcys.) E. S. T. Feb. 15.—5:15 P. M.—Instruction in international code. 6:00 P. M.—Stories for children by Peggy Albion. 6:20 P. M.—"The Question Box." 7:45 P. M.—Bible talk by Homer J. Councilor, chairman of Men's Organized Bible Class Association. 8:00 P. M.—Song recital to be announced. 8:15 P. M.—A talk on the Coast Guard by Oliver M. Maxam, chief of the Division of Operations of the United States Coast Guard. 8:30 P. M.—Piano recital to be announced. 8:45 P. M.—A talk on the Navy by Admiral E. W. Eberle, chief of naval operations. 9:00 P. M.—Concert by the United States Navy Band under the direction of Charles Benter.

Feb. 16.—3:00 P. M.—Fashion developments of the moment. 3:10 P. M.—Song recital to be announced. 3:25 P. M.—Current events by the editor of the "Review of Reviews." 3:35 P. M.—Piano recital by Edwina Greene. 4:00 P. M.—The Magazine of Wall Street. 5:15 P. M.—Instruction in international code. 6:00 P. M.—Stories for children by Peggy Albion.

Station WJZ, New York City

455 Meters (660 Kcys.) E. S. T. Feb. 15.—12:15 P. M.—Music from the Brick Presbyterian Church. 3:00 P. M.—Organ recital by Leo Riggs on Hotel Astor organ. 5:00 P. M.—"The Larger Aspect of World Affairs" by the International Interpreter. 5:30 P. M.—Closing reports of the New York State Department of Farms and Markets; Farm and Home reports; closing quotations of the New York Stock Exchange; foreign exchange quotations; "The Condition of the Leading Businesses" by the "Magazine of Wall Street"; "Evening Post" news. 7:00 P. M.—MacDowell program, under the auspices of the Music Study Club of Newark. 7:30 P. M.—Burr McIntosh, the Cheerful Philosopher. 7:50 P. M.—MacDowell program, under the auspices of the Music Study Club of Newark. 8:15 P. M.—"Looseleaf" current lege Musical Clubs direct from the Grand Ballroom topics. 8:30 P. M.—Concert by the Amherst Col- of the Ritz-Carlton Hotel. 10:30 P. M.—Dance program by Paul Specht and his Alamac Hotel Orchestra, direct from the Congo Room of the Alamac Hotel.

Feb. 16.—3:00-3:30 P. M.—Charles Phillips, pianist. 4:00 P. M.—Tea concert by the Hotel Belmont Stringed Ensemble, Harry Lerner, leader; direct from the Balcony of the Tea Room of the Hotel Belmont. 5:00 P. M.—Famous Fain Orchestra. 5:30 P. M.—Closing reports of the New York State Department of Farms and Markets; Farm and Home reports; closing quotations of the New York Stock Exchange; foreign exchange quotations; "Bradstreet's" financial report; "Evening Post" news. 7:00 P. M.—"Uncle Wiggily Stories" by Howard Garis. 8:00 P. M.—"The Asset Value of the Ocean Liner to a Port" by Emerson E. Parvin, secretary of the International Mercantile Marine. 8:40 P. M.—Dr. Alfred N. Goldsmith, director of research of the Radio Corporation of America; "Applying the Golden Rule in Radio"; one of the "Highlights of Modern Radio Broadcasting" series of talks. 9:15 P. M.—"In a Persian Garden" (Quartet), accompanied by Creighton Allen. 9:45 P. M.—Harold Lieberman, violinist, accompanied by C. Allen. 9:55 P. M.—Time signals and weather forecast from Station NAA at Arlington. 10:00 P. M.—Harold Lieberman, violinist, accompanied by C. Allen. 10:20 P. M.—"English Folk Songs," Kenneth K. Wheeler. 10:45 P. M.—Recital by Alphonse Bohrer, pianist, directly from Aeolian Hall.

Feb. 17.—11:00 A. M.-1:00 P. M.; 7:00-10:30 P. M.

Station KYW, Chicago, Ill.

536 Meters (560 Kcys). C. S. T. Feb. 15—9:30 A. M.—Late news and comment of the financial and commercial markets. (This service is broadcast from KYW every half hour during the twenty-four). 11:35 A. M.—Table talk by Mrs. Anna J. Peterson. 12:30 P. M.—"The Progress of the World," by Review of Reviews. 6:30 P. M.—News, financial and final market and sport summary. 6:50 P. M.—Children's bedtime story. 7-7:10 P. M.—Joska DeBabary and his orchestra playing in the Louis XVI room, Congress Hotel. 7:10-7:20 P. M.—Clyde Doerr and his orchestra playing in the Pompeiian room. 7:20-7:30 P. M.—Jocka Debabary and his orchestra playing in the Louis XVI room. 10-2 P. M.—Midnight revue, artists and program to be announced.

Feb. 16—9:30 A. M.—Late news and comment of the financial and commercial markets. (This service is broadcast every half hour during the twenty-four). 10:30 A. M.—Farm and home service. 11:35 A. M.—Table talk by Mrs. Anna J. Peterson. 6:30 P. M.—News, financial and final market and sport summary. 6:50 P. M.—Children's bedtime story. 7-7:10 P. M.—Joska DeBabary and his orchestra from the Louis XVI room, Congress Hotel. 7:10-7:20 P. M.—Clyde Doerr and his orchestra from the Pompeiian room. 7:20-7:30 P. M.—Joska DeBabary and his orchestra from the Louis XVI room. 8-8:58 P. M.—Musical program. 9:05 P. M.—"Under the Evening Lamp." 10-12 P. M.—Midnight revue to be broadcast from the KYW studio in the Congress Hotel.

Feb. 17—11 A. M.—Central Church Service, Orchestra Hall, Chicago, Dr. F. F. Shannon, pastor. 6:30 P. M.—Excerpts from the New Testament—An American Translation by Prof. Edgar J. Goodspeed, read by William Ziegler Nourse. 7 P. M.—Chicago Sunday Evening Club service from Orchestra Hall, Chicago. Speaker, Hon. Frank O. Lowden.

Station WBZ, Springfield, Mass.

337 Meters (890 Kcys). E. S. T. Feb. 15—11:55 A. M.—Arlington time signals; weather reports; Boston and Springfield market reports. 6 P. M.—Dinner concert by the WBZ Quintet. 7 P. M.—"A Tale of the Poplar," a dramatized story by the Youth's Companion. Talk by Herbert Myrick, **Editor of Farm and Home**, a Mrs. Mary R. Reynolds, Household Editor of Farm and Home. 7:30 P. M.—Bedtime story for the kiddies. Current book review by H. A. MacDonald. Story for grown-ups by Orison S. Marden. 9:55 P. M.—Arlington time signals.

Feb. 16—11:55 A. M.—Arlington time signals; weather reports; Boston market report. 7 P. M.—Dinner concert by the Hotel Kimball Trio transmitted from the Hotel Kimball Dining Room Jan Geerts, director. 7:30 P. M.—Bedtime story for the kiddies. "Bringing the World to America," prepared by "Our World" Magazine. 8 P. M.—Concert by Harry Knight, saxophone and clarinet. 9 P. M.—Bedtime story for grown-ups by Orison S. Marden. 9:55 P. M.—Arlington time signals.

Station WEAF, New York City

492 Meters (610 Kcys.) E. S. T. Feb. 15.—11:00 A. M.—Lecture by Dr. Walter Damrosch, conductor of the New York Symphony Orchestra, under the auspices of the League for Political Education, direct from Town Hall, New York City. 11:50 A. M.—Consolidated market and weather reports by the U. S. and N. Y. State Departments of Agriculture. 4:00-5:30 P. M.—Marguerite Eckenroth, soprano, accompanied by Katherine Eckenroth. Recital by "The Banjo Trio." Children's Hour Stories and Songs. 7:15-10:00 P. M.—Beatrice Lilly and Jack Buchanan, singing comedians. Daily sport talk by Thornton Fisher; Ted Schmidt and Harry Regan, popular singers; Battery instruction talk by George Furness, radio head of the National Carbon Company. "The Happiness Boys" Billy Jones and Ernest Hare; Music by the World Mutual Instrumental Trio, and a talk on the "Care and Safe Operation of Automobiles" by Major A. A. Stewart. B. Fischer & Company's "Astor Coffee" Dance Orchestra.

Feb. 16.—1:45-3:30 P. M.—Foreign Policy Association luncheon direct from Hotel Astor, New York City. 4:00-5:30 P. M.—Dance program by the Carolinians Orchestra, Charles M. Koch, director; Helen Albus, dramatic soprano. 7:30-12:00 P. M.—W. C. Fields, comedian monologist; David Franklin, pianist, and Tom Butler, baritone; "The Chiclet Trio" assisted by the "Chiclet Quartette"; Myra Purtis Bindenberger, contralto, accompanied by George Vause. Recital by George Vause, pianist; Bernard Ahrens, baritone. Gimbel Brothers' program. Vincent Lopez and his orchestra direct from the Grill of the Hotel Pennsylvania.

Station KFI, Los Angeles, Cal.

469 Meters (640 Kcys.) P. T. Feb. 17.—10:00-10:45 A. M.—L. A. Church Federation Service. 4:00-5:00 P. M.—Federated Church Musicians Vesper Service. 6:45-7:30 P. M.—Bedtime story and concert. 8:00-9:00 P. M.—Ambassador Hotel concert. 9:00-10:00 P. M.—Examiner concert. 10:00-11:00 P. M.—Theron Bennett's Packard Six.

Feb. 18.—4:45-5:15 P. M.—Evening Herald news bulletin. 5:15-5:45 P. M.—Examiner news bulletins. 8:00-9:00 P. M.—Evening Herald concert. 9:00-10:00 P. M.—Examiner concert. 10:00-11:00 P. M.—Ambassador-Lyman's Cocoanut Grove Orchestra.

Feb. 19.—4:45-5:15 P. M.—Evening Herald news bulletins. 5:15-5:45 P. M.—Examiner news bulletins. 6:45-7:30 P. M.—Geo. J. Birkel concert. 8:00-9:00 P. M.—Ambassador-Lyman's Cocoanut Grove Orchestra. 9:00-10:00 P. M.—Examiner concert. 10:00-11:00 P. M.—Sol Cohen and associates.

Feb. 20.—4:45-5:15 P. M.—Evening Herald news bulletins. 5:15-5:45 P. M.—Examiner news bulletins. 6:45-7:30 P. M.—Nick Harris detective stories and concert. 8:00-9:00 P. M.—Evening Herald concert. 9:00-10:00 P. M.—Examiner concert. 10:00-11:00 P. M.—Hollywood Community Orchestra. 11:00-12:00 P. M.—Ambassador-Lyman's Cocoanut Grove Orchestra.

Feb. 21.—4:45-5:15 P. M.—Evening Herald news bulletins. 5:15-5:45 P. M.—Examiner news bulletins. 6:45-7:30 P. M.—Y. M. C. A. concert and bedtime story. 8:00-9:00 P. M.—Ambassador Hotel concert. 9:00-10:00 P. M. Examiner concert. 10:00-11:00 P. M.—Mrs. William Barber concert.

Station WOR, Newark, N. J.

405 Meters (740 Kcys). E. S. T. Feb. 15—2:30 P. M.—Musical program by the combined musical clubs of Lafayette College of Easton, Pa. 6:15 P. M.—"Music While You Dine," Ben Friedman Entertainers, augmented by George Perry's Singing Orchestra. 6:30 P. M.—"Man in the Moon Stories for the Children." 7-7:30 P. M.—"Music While You Dine," by Ben Friedman Entertainers, augmented by George Perry's Singing Orchestra.

Feb. 16—Betwen 2:30 and 4:00 P. M.—Broadcasting from Radio Exposition, 6th floor, L. Bamberger & Co. 2:30 P. M.—Frank Dailey's Meadowbrook Dance Orchestra. 3:10 P. M.—Baroness Leja de Torinoff, on "The Russian Revolution from a Woman's Viewpoint." Followed by Russian Folk Songs. 3:30 P. M.—Frank Dailey's Meadowbrook Dance Orchestra. 6:15-7:15 P. M.—"Music While You Dine," Paul Van Loan and his Cinderella Dance Orchestra of New York. 7:15 P. M.—Fred J. Bendel, on "Sporting News-Uu-to-the-Minute." 8:00-9:00 P. M.—Gene Ingraham and his Bell Record Orchestra. 9:00 P. M.—"The Law and Income Tax," by John Armstrong, C. P. A. 9:15 P. M.—J. Bernard Walker, Editor Scientific American, on "What America Owes Europe." 9:45 P. M.—Joint program by Mary Dell Dowman, Lorraine Boardman and Intenrational Trio.

Station WOS, Jefferson City, Mo.

441 Meters (680 Kcys.) C. S. T. Feb. 15.—8:00 P. M.—Program by the students of the Missouri Military Academy, Mexico, Missouri.

Feb. 17.—7:30 P. M.—Services of the First Christian Church, Jefferson City, Robert M. Talbert, pastor. Professor Siebert Price, organist. Robed choir of twenty-four voices. Mrs. Fred Reagle, violinist.

Feb. 18.—8:00 P. M.—Dance program by the Missouri State Prison Dance Orchestra, Hugh C. French, director. Piano numbers by Harry M. Snodgrass.

Feb. 20.—8:00 P. M.—Address on agricultural topic by a faculty member of the Missouri College of Agriculture. 8:20 P. M.—Dance program by S. C. Stancil's Novelty Six Dance Orchestra.

Station WHAS, Louisville, Ky.

400 Meters (750 Kcys.).—C. S. T. Feb. 15.—4:00 to 5:00 P. M.—Selections by the Walnut Theatre Orchestra; Walter Davison, conductor; police bulletins; weather forecast; "Just Among Home Folks," a daily humorous column appearing in the "Courier-Journal"; selections by the Strand Theatre Orchestra; Harry S. Currie, conductor; late important news bulletins. 4:50 P. M.—Local live stock, produce and grain market reports. 5:00 P. M.—Official Central Standard time announced. 7:30 to 9:00 P. M.—Concert, visiting students of Louisville Conservatory of Music, who will sing especially to their own home towns, under the directin of Miss Laura Butler, Marion, Ky.; late important news bulletins; official Central Standard time announced.

Feb. 16.—4:00 to 5:00 P. M.—Selections by the Strand Theatre Orchestra; Harry S. Currie, conductor; police bulletins; weather forecast; old-fashioned fiddler, Charles Elder, accompanied by Miss Sue Elder; "Just Among Home Folks," a daily humorous column appearing in the "Courier-Journal"; selections by the Walnut Theatre Orchestra; Walter Davison, conductor; late important news bulletins. 4:50 P. M.—Local live stock, produce and grain market reports. 5:00 P. M.—Official Central Standard time announced. 7:30 to 9:00 P. M.—Concert by the Delta Omicron Sorority of the Louisville Conservatory of Music, under the direction of Miss Elizabeth Shelton, president; late important news bulletins; official Central Standard time announced at 9 o'clock.

Station WOC, Davenport, Iowa

484 Meters (620 Kcys). C. S. T. Feb. 15—10 A. M.—Opening market quotations and household hints. 10:55 A. M.—Time signals. 11 A. M.—Weather and river forecast. 11:05 A. M.—Market quotations. 12 M.—Chimes concert. 2 P. M.—Closing stocks and markets. 3:30 P. M.—Lecture by R. G. Maybach, P. S. C. Dept. of Anatomy, "The Teeth, Their Function and Care." 5:45 P. M.—Chimes concert.. 6:30 P. M.—Sandman's Visit. 6:50 P. M.—Sport news and weather forecast. 7:20 P. M.—International lesson for next Sunday discussed by Dr. Frank Willard Court, pastor St. John's Methodist Episcopal Church, Davenport, Iowa. 8 P. M.—Musical program, Erwin Swindell, musical director. Program under the auspices of the Scott County Farm Bureau.

Feb. 16—10 A. M.—Opening market quotations and household hints. 10:55 A. M.—Time signals. 11 A. M.—Weather and river forecast. 11:05 A. M.—Market quotations. 12 M.—Chimes concert. 12:30 P. M.—Closing stocks and markets. 3:30 P. M.—Lecture by C. C. Hall, P. S. C. Dept. of Chemistry, "Preparation and Uses of Rubber." 5:45 P. M.—Chimes concert. 6:30 P. M.—Sandman's visit. 6:50 P. M.—Sport news and weather forecast. 7 P. M.—"Our National Guard," by Lieut. Ralph A. Lancaster, Iowa National Guard. 9 P. M.—P. S. C. Orchestra, Gerald M. Barrow, director. (Popular selections released through the National Association of Broadcasters, of which WOC is a member.) V. B. Rochte, baritone soloist.

Station WDAR, Philadelphia

395 Meters (760 Kcys.). E. S. T. Feb. 15.—11:45 A. M.—Daily almanac. 12:02 P. M.—Organ recital from the Stanley Theatre features from the studio; Arcadia Concert Orchestra, Fery Sarkozi, director. 2:00 to 3:00 P. M.—Arcadia Concert Orchestra; Artist recital. 4:30 P. M.—Program of dance music by the Scranton Sirens. 7:30 P. M.—Dream Daddy with the Boys and Girls. 7:50 P. M.—An Evening with Betsy Logan. 10:10 P. M.—Howard Lanin's Dance Orchestra; Artie Bittong's Elk Frolic; Harry Glynn and others.

Feb. 16.—11:45 A. M.—Daily almanac. 12:02 P. M.—Organ recital from the Stanley Theatre. features from the studio; Arcadia Concert Orchestra. 2:00 to 3:00 P. M.—Arcadia Concert Orchestra; Artist recital; 4:30 P. M.—Bobbie Lee and his Cotton Pickers. 7:30 P. M.—Dream Daddy with Boys and Girls.

Station KGO, Oakland, Cal.

312 Meters (960 Kcys). P. T. Feb. 14—8 P. M.—Musical program.

Feb. 16—8 P. M.—Musical program.

Station KHJ, Los Angeles, Calif.

395 Meters (760 Kcys.). P. T. Feb. 15.—12:30 to 1:15 P. M.—Music; news items. 2:30 to 3:30 P. M.—Matinee musicale. 6:40 P. M.—Live stock and vegetable reports. 6:45 to 7:00 P. M.—Children's program presenting Richard Headrick, screen juvenile. Bedtime story by "Uncle John." 8:00 to 10:00 P. M.—Program arranged by Floryane Thompson, soprano. "An Evening of Old Fashioned Songs." 10:00 to 12:00 P. M.—Broadcasting Art Hickman's Orchestra by line telephony from the Los Angeles Biltmore Hotel.

Feb. 16.—12:30 to 1:15 P. M.—Program presented by the Rainbow Melody Makers. 2:30 to 3:30 P. M.—Matinee musicale. 6:40 P. M.—Live stock and vegetable reports. 6:45 to 7:30 P. M.—Children's program presenting Helene Pirie, screen juvenile, and John M. Trimbur, flutist. Bedtime story by "Uncle John." 8:00 to 10:00 P. M.—Program presented by the Los Angeles Federation of P. T. A. N. E. Brown, Electrical Engineer, will speak. 10:00 to 12:00 P. M.—Broadcasting Art Hickman's Orchestra by line telephony from the Los Angeles Hotel.

Station WGY, Schenectady, N. Y.

380 Meters (790 Kcys). E. S. T. Feb. 15—11:55 A. M.—Time signals. 12:30 P. M.—Stock market report. 12:40 P. M.—Produce market report. 12:45 P. M.—Weather forecast. 2 P. M.—Music and fashion talk. "Dress Accessories," Ralph L. Smith. 6 P. M.—Produce and stock market quotations; news bulletins. 6:30 P. M.—Children's program. 7:35 P. M.—Health talk, N. Y. State Department of Health. 7:45 P. M.—Radio drama, comedy, "Anne," by WGY players. Instrumental selection, WGY Orchestra. 10:30 P. M.—Musical program.

Feb. 16—11:55 A. M.—U. S. Naval Observatory time signals. 12:30 P. M.—Stock market report. 12:40 P. M.—Produce market report. 9:30 P. M.—Dance music by Jack Symonds' Orchestra, Hampton Hotel, Albany, N. Y.

Station WLW, Cincinnati, Ohio

309 Meters (970 Kcys.) C. S. T. Feb. 15.—10:30 A. M.—Weather forecast and business reports. 1:30 P. M.—Market reports. 3:00 P. M.—Stock quotations. 4:00 P. M.—Half hour lecture recital.

Feb. 16.—10:30 A. M.—Weather forecast and business reports. 1:30 P. M.—Business reports.

Feb. 17.—9:30 A. M.—Sunday school conducted by the Editorial Staff of Sunday School Publication of the Methodist Book Concern. 11A. M.—Services of the Church of the Covenant, Dr. Frank Stevenson, minister. 7:45 P. M.—Services of the First Presbyterian Church, Walnut Hills, Cincinnati.

Station KPO, San Francisco, Cal.

423 Meters (770 Kcys.) P. T. Feb. 14.—6:00-7:00 P. M.—Dinner concert by George Lipschults and Music Masters from the Loew's Warfield Theatre. 8:00-9:00 P. M.—Theodore J. Irwin at the console of the Robert Norton organ. 9:00-10:00 P. M.—Program by the San Lorenzo Improvement Association. 10:00-11:00 P. M.—Palace Hotel Dance Orchestra.

Feb. 15.—Silent.

Feb. 16.—Art Weidner and the Fairmont Hotel Dance Orchestra. 8:00-12:00 P. M.—During intermissions the KPO Trio will sing popular songs.

Station WJY, New York City

405 Meters (740 Kcys.) E. S. T. Feb. 15.—7:30 P. M.—Frank Shevitt, "Income Taxes." 7:45 P. M.—Program by the Brooklyn Edison Orchestra. 8:15 P. M.—The Honorable Julius Berg, "The Work of the New York Assembly." 8:30 P. M.—Program by the Brooklyn Edison Orchestra. 9:00 P. M.—"Father & Son." 9:30 P. M.—General Chas. H. Sherrill. 10:00 P. M.—Popular program by Breau and Tobias.

Feb. 17.—2:30-5:00 P. M.; 8:00-10:30 P. M.

Station KSD, St. Louis, Mo.

546 Meters (550 Kcys). C. S. T. Feb. 14—8 P. M.—Program by Glee Club of Shurtleff College, Mrs. D. Jones, director.

Feb. 15—8 P. M.—Concert by the Civic Orchestra, Ellis Levy, conductor, at Central High School.

Feb. 16—Silent.

Who Is America's Most Popular Radio Entertainer?

Everybody is interested in this query: Who is America's most popular radio entertainer? You have your favorite. Who is she or he? Let us know your choice, whether a comedian, an opera singer, a jazz band, or a story-teller.

RADIO WORLD wants to be able to tell the world the name of the entertainer who stands highest in the regard of listeners-in.

Use the accompanying blank and mail to Broadcasting Manager, RADIO WORLD. Cut off. Fill out. Mail today.

BROADCASTING MANAGER, RADIO WORLD,
1493 Broadway, New York City.

Dear Sir:

My favorite entertainer is.....Station.....

My second choice is.....

Name.....

Street Address.....

City and State.....

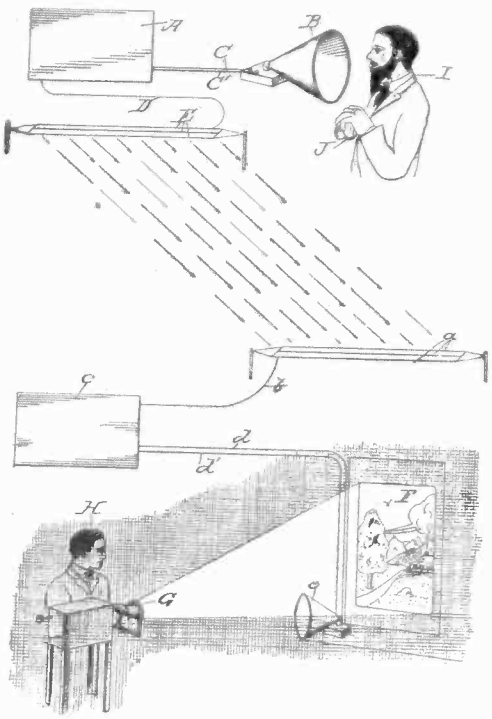
Latest Radio Patents

Method of Delivering Illustrated Lectures or Songs

No. 1,478,806: Patented December 25, 1923. Patentee: A. F. Victor, New York City.

My invention relates to the method of delivering illustrated lectures or songs by means of wireless telephony.

The object of my invention is to project radiogram lectures or songs or anything else, to audiences or persons having wireless receiving stations, and to illustrate the same by pictures projected upon a screen



Method of utilizing radio telephony so a speaker may give illustrated lectures at a distance from the place they are being shown. It is also applicable to give the same lecture at two or more places.

at the place where the lecture is presented. This I accomplish by the means hereinafter fully described and as particularly pointed out in the claims.

The drawing illustrates a diagrammatical layout of the invention.

In the drawings A represents a transmitting apparatus that has a receiving horn B, of the usual construction, that is attached thereto by wires C, C' and this transmitting apparatus A is connected by wires D to a wireless transmitting set of wires E.

At the receiving end of the invention, there is a receiving set of wires *a*, that is connected by a wire *b* to the receiving apparatus *c*, and this receiving apparatus, *c*, is connected by wires *d* and *d'* to the horn or amplifier *e*.

At the receiving end of the method, preferably in the same room as the amplifier *e*, there is a stereopticon screen F, upon which pictures are projected from a stereopticon G by the operator H, during the lecture, that is being delivered by a lecturer, I, into horn B.

The lecturer, I, has a castanet J in his hand, and when he desires the picture changed he simply claps the castanets together, and thus signals the operator for a change. Of course the lecturer could snap his fingers, or could speak his desire for a change. Any means that made a sound that would convey a signal could be satisfactorily employed.

The sound transmitted is preferably of a different timbre from vocal sounds so that the same will not be noticed by the audience, or if heard, will be taken to be interference that is common particularly from signals in code or the like.

It will be understood that, before the lecture, the slides to be displayed by the stereopticon, could be collected and arranged in the order in which they are to be used at a school, or a church, or at home, or other auditorium, where the lecture is to be presented to an audience.

The foregoing method can be used by any number of receiving stations at the same time, and, could be received by radio stations that were not supplied with the picture apparatus. Such lectures, however, would be enjoyed by audiences to a much less extent, than when illustrated by pictures.

It will be understood that where I refer to lectures I intend to include therein songs, or anything else that can be used by my invention.

Electric Oscillator

No. 1,478,638: Patented December 25, 1923. Patentee: H. G. Cordes, Bremerton, Wash.

My invention relates to improvements in arrangements for starting, sustaining, utilizing and studying a particular class of oscillations of a direct current arc oscillator. As to common subject-matter this application is a continuation in part of application 43,436.

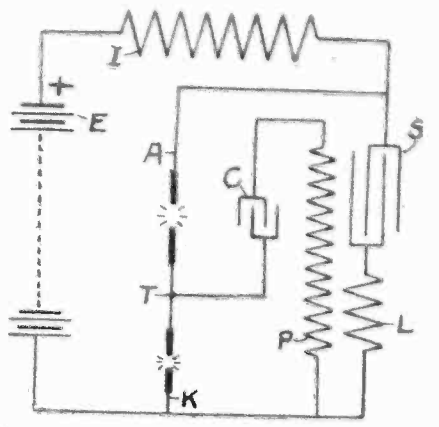
The object of my invention is to attain greater efficiency in converting direct current into oscillating current energy, to permit the efficient use of a lower potential direct current in a radio transmitter, to secure greater stability of the apparatus, to adapt an arc oscillator to the production of variable frequency oscillations for radio telephony and to efficiently transform the potential of direct current energy by means of oscillating current.

These improvements are attained by applying a principle well known in the production of oscillations in mechanical devices to the production of electrical oscillations.

My invention can be best explained by considering the direct current arc oscillator as the basis of my improvements. My improvements pertain to class 2 oscillations which are defined by the committee on standardization for 1915 of the Institute of Radio Engineers as those oscillations in which the amplitude of the oscillation circuit current is at least equal to the direct current, but in which the direction of the current through the arc is never reversed. In other words, in this class of oscillations the arc acts as an electric check valve.

A class 2 oscillation involves three circuits and two time intervals. The circuits will be referred to as the direct current charging circuit, the direct current arc circuit and the discharge circuit. The time intervals will be referred to as the primed and unprimed intervals. During the primed interval current flows through the arc and during the unprimed interval no current flows through the arc. The direct current arc and discharge circuits are only closed during the primed interval. With the usual large inductance in series with the direct current source the direct current amplitude varies a little and consists of an oscillating current of comparatively small amplitude superposed upon a direct current. The discharge circuit consists of a capacitance discharging through an inductance; the inductance may be either in series with the arc or in series with the capacitance across the direct current line.

The potential of the capacitance varies practically as a linear function of the time during the unprimed interval or period while the potential varies as a sinusoidal function of the time during the primed period of each cycle. Similarly, the graph of the current is also a straight line and a damped sine wave. Oscillations having the characteristics above described will be referred to by the general term "linear-sinusoidal oscillations."



Means and apparatus used to produce sustained oscillations in a circuit.

During the primed period electromagnetic energy is stored in the direct current arc-circuit inductance while during the unprimed period the discharge circuit capacitance is charged simultaneously with the discharge of this energy and the energy due to the flow of direct current during the unprimed period.

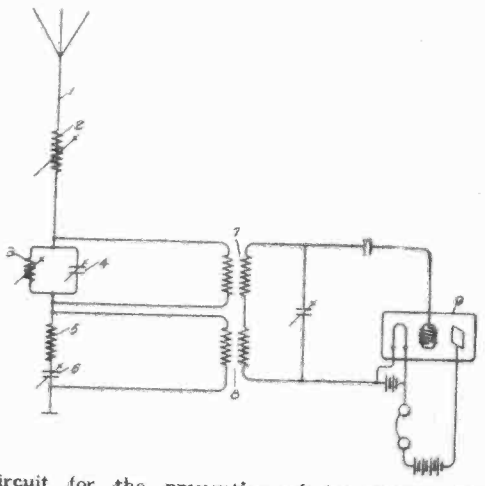
Radio Receiving Sets

No. 1,477,413: Patented December 11, 1923. Patentee: E. F. W. Alexanderson, Schenectady, N. Y.

My present invention relates to radio receiving systems, and more particularly to means for preventing interference in such systems with the reception of desired signals.

The object of my invention is to provide in a radio receiving system a means for preventing interference with the reception of desired signals from a near-by transmitting station having a different wave length.

In carrying my invention into effect I provide in connection with a receiving antenna means for impressing upon the receiving circuit two equal and opposing potentials produced in the antenna by



Circuit for the prevention of interference by means of double tuned inductances.

the interfering wave. This means is so arranged that it will also impress upon the receiving circuit two potentials produced by the desired signaling waves, but these two potentials will be of different magnitude and of the same phase or will have such phase relation to each other that they will add in the receiving circuit and will not neutralize one another

Hovey First with News of Wilson's Death

EDITOR, RADIO WORLD: I am wondering how many radiophans made the most of their opportunities today. At 10:32 this morning I received a radiogram saying "Former President Wilson passed away at 10:27." At 10:35 (although in working clothes) I was at the pulpit of the nearest church, and the announcement was made. Three minutes later I was in the pulpit of another church wih the announcement, and I followed at the same speed until every church in the city was visited. Although in each case services were in progress, I felt justified in intruding, and in each case was heartily thanked by the pastor.

The sad news was thus given to our people just 19 hours ahead of the daily papers which will reach here tomorrow morning.

They are talking radio in this town today all right. I might add, too, that for the past 48 hours I have worked and slept within six feet of a set all tuned in and lit up, ready to hear the first announcement of the death of this great and good man.

If you know of a radiophan in this entire country who goes to it stronger than I do I want to see what he looks like. I am still going on 70 years young and then some.

O. H. Hovey.

Perry, Oklahoma, Feb. 3, 1924.

If you see it in RADIO WORLD you know it's so. If you hear about it somewhere else, you can find it in last month's issues of RADIO WORLD. Start keeping that file now

BUSINESS NEWS OF THE INDUSTRY

My Bristol Single Control Receiver

By David Grimes

CONTRARY to general belief, most things in this world do not "just happen." There is usually a series of prior events which predetermine the final result. The person on the outside is not familiar with the earlier moves and he assumes the completed article is just "dumb luck." The Bristol Grimes combination is one of those things which doesn't just happen.

Some time ago when my Inverse Duplex was still in its infancy, I bought a power amplifier, which strange as it may seem required no "C" battery. Upon combining it with my circuit, I was surprised at the volume and the quality. It was the missing link in my development. No other set could produce that volume without sacrificing that quality. That power amplifier was made by the Bristol Company. Negotiations were immediately started with them which led to their purchase of the remaining ten licenses under the Grimes Inverse Duplex System, an ideal combination which permitted the high efficiency of the Grimes circuit to be fully realized through the quality reproduction of the Bristol power amplifier.

The next efforts were devoted toward simplicity. It was realized that a radio set was merely a means to an end and therefore should not require a correspondence school diploma for successful operation. The final result was a single control set which even a five-year-old child can operate and which has stood the extreme test of perfect performance in the hands of the blind. Several invalids confined to their beds are also satisfied owners of this single control set.

Many years of radio experience taught us that satisfactory reception depended a great deal on local surroundings. No one given set will operate equally well under all conditions. The Bristol set was therefore designed to be readily adaptable to these many conditions by flexibility in the methods of reception. By merely throwing a switch the set may be operated by loop or by antenna. A single connection in the rear adapts it most effectively to a long or short aerial. In many localities, it may operate with a ground connection only. No other set has the many possibilities for correct installation in particular receiving locations and with these determined, one knob does all the tuning.

Other refinements have been added, such as a protecting cover over the entire set, capable of being locked! A special jack has been installed for phone operation and

The Bristol single control receiver.

when tuning in, automatically reduces the volume on the loud speaker. A meter is used to permit most efficient operation of the amplifier tubes—greatly increasing their length of life as well as the life of the batteries. In every way possible this set has been made the latest word in radio and is one of the best adaptations of my Inverse Duplex principle. This set is now being manufactured and placed on the market by the Bristol Company, of Waterbury, Conn.

Rumors of a New Radio Corporation

RUMORS were current in New York City last week that a new radio patent holding company was about to be formed, with several million dollars capital, to be known as the Hazeltine Corporation. Its revenue was to be derived from royalties paid by manufacturers of radio products under patents controlled by the new company.

Prof. L. A. Hazeltine, inventor of the neutrodyne circuit, was named in the rumors as a director of the company to be formed. W. H. Taylor, Jr., of Pennie, Davis, Marvin & Edwards, patent attorneys of New York City, was said to be slated for the presidency.

When interviewed by RADIO WORLD Mr. Taylor declined to comment on the rumors and insisted that the matter was not in shape to be discussed, that he had authorized no statement in regard to it and that, so far as he knew, no announcement was forthcoming in the near future.

In the record of incorporations for which charters were granted at Dover, Delaware, last week, appears the following: "Hazeltine Corporation, New York, research and experimental work; $20,000,000."

R. C. A. vs. DeForest

SEVERAL months ago the Radio Corporation of America, of New York, City, secured an injunction against the De Forest Telephone & Telegraph Co., of Jersey City, N. J., restraining the latter from manufacturing certain radio tubes, the patents on which were claimed to be owned by the Radio Corporation of America. It is alleged that the De Forest Company has continued to manufacture the tubes in violation of the injunction.

Vice-Chancellor Lewis, at Paterson, N. J., on February 5, called a hearing to compel the De Forest Company to show why it should not be held in contempt of court for alleged violation of the injunction. The hearing was adjourned to February 25, when the De Forest Company will put forward evidence in support of its continued production of the tubes in question.

John W. Griggs, former U. S. Attorney-General, is counsel for the Radio Corporation. Thomas Haight, former U. S. District Judge, represents the De Forest Company.

Horace E. Genge, 125 Marquette Ave., South Bend, Ind., has gone into the radio business.

Radio Literature Wanted

Manufacturers or 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:

Dr. C. L. Harmer, Danville, Ohio.
John A. Sokol, 2117 So. Ridgeland Ave., Berwyn, Ill.
Horace E. Genge, 125 Marquette Ave., South Bend, Ind.
Albert H. Savage, 307 Hudson Ave., Albany, N. Y.
Burman C. Diddle, Chapin, Ill.
Harry A. Thomas, 1202 French street, Wilmington, Del.

Ajax Sued For Infringement

THE Ajax Radio Corporation, 367 Verona avenue, Newark, N. J., defendant in a suit brought by five other radio corporations, charging infringement on radio patent rights, was ordered on February 5 by Federal Judge John Rellstab in the United States Court in Newark to show cause, on February 18, why an injunction sought against it by the five companies should not be issued. Suit is brought by the Radio Corporation of America, De Forest Radio Telephone & Telegraph Co., General Electric Co., Westinghouse Electric & Manufacturing Co. and the American Telephone & Telegraph Co.

Broadcasting a Radio Show

F. P. GUTHRIE, district manager of the Radio Corporation of America, has pledged the cooperation of Station WRC in broadcasting to the country information regarding the First Annual Radio Show to be held at Washington, D. C., March 19-26. In line with this, Fred S. Lincoln, general chairman of the show committee, will deliver a series of addresses to the radio audience from WRC, the first of which will be broadcast in the near future.

Error in Telephone Number

THE telephone number of the Bel-Canto Manufacturing Co., Inc., 417 East 34th Street, New York City, is Vanderbilt 8959. As this company is advertising to sell a $25.00 loud speaker for $10.00 direct from manufacturer to consumer, and receives a large number of telephone orders, it is to be regretted that an error in the telephone number appeared in their advertisement in last week's RADIO WORLD.

Coming Events

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

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

FIRST ANNUAL RADIO SHOW, Convention Hall, Washington, D. C., March 19-26, 1924.

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

USE

EVEREADY
Radio Batteries
–they last longer

YOU DON'T NEED TUBES to hear programs from stations 400 to 1000 Miles Away. I can show you how to get them on YOUR CRYSTAL SET. Changes often cost Less Than One Dollar. Send self-addressed envelope for picture of my set.

LEON LAMBERT
561 So. Volutsia, Wichita, Kansas

NOW is the TIME to USE
"Where I Go by Radio"
This New Unique RADIO RECORD BOOK Enables You to Keep for Reference What You Hear and How You "Tune In." Increases Radio Pleasure at Small Cost.
POPULAR EDITION, 2 Copies, $1.00
Each Book Space for 300 Complete Records
HOLIDAY EDITION, 1 Copy, $1.00
Space for 700 Complete Records
Each Book also contains Accurate List of U. S. Broadcasting Stations to Nov. 15, 1923, alone worth the price of book.
Size of Book 8x11 inches. Record Pages good paper, suitable either pen or pencil. Cover, heavy, flexible cover stock.
"Ra-Owls" Everywhere Like It, However.
Your Money Back if Not Satisfied.
But Don't Expect the World for $1.00.
PROGRESS PRESS, Radio Dept.
Union, South Carolina, U. S. A.

1500 MILE RANGE
VACUUM TUBE RADIO SET READY BUILT

1,500-mile range attained in favorable weather with **Atlas Wizard** Single Tube Radio Set. Wonderful selectivity—clear tone reproduction—brings you melodies, music and market reports. Dials log with accuracy of a Neutrodyne.

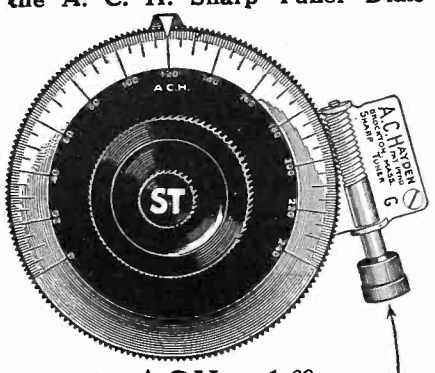
One ATLAS WIZARD Radio Set completely built, **nothing else to buy,** to one person in each community, only **$19.95.** Don't fail to take advantage of this amazing offer. Name and address brings set complete by express C. O. D. You take no risk so order this Radio wonder today.

ATLAS CUT RATE RADIO STORES
Div. 23, 345 S. Clark St., Chicago
Send 35c in stamps for Atlas Wizard Blueprint. Big Radio Catalog FREE.

$19.95 REG. VALUE $57.50

WHAT YOU GET
Atlas Wizard Receiver, mahogany finish; Head Phones; Vacuum Tube; A & B Batteries; Aerial; Ground Wire; Instructions.
READY BUILT

A Pleasant Surprise Awaits the User of
the A. C. H. Sharp Tuner Dials



Why the A.C.H. is different
3 in. DIAL 156-to-1
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Will improve any receiving set, making difficult tuning easy

Money Back Guarantee
Price 3-inch size..$2.50 Price 4-inch size..$5.00
Regular fitting 5/16 shaft ¼ and 3/16, 5c each extra

Extra Advantage of the A C H
1. Can be attached or removed from any instrument.
2. Rough tuning same as any dial.
3. Movement so fine that the eye cannot detect but the ear can.
4. Automatically locks instrument so no jar can disturb it.
5. Dial grounded reducing the body capacity to a minimum.
6. Special dial 2 graduations where ordinarily one.

MAIL ORDERS SENT PREPAID IN U. S. A.
A. C. Hayden Radio & Research Co.
BROCKTON, MASS., U. S. A.

LONDON ● **TURN-IT** ADJUSTABLE **GRID LEAK** ● PHIL.

"–did YOU get London?"

We have authentic reports proving that two of the three Philadelphia stations that tuned in London were equipped with "Turn-It" Adjustable Grid Leak—the perfect grid control.

Varies ½ to 5 Megohms! No Carbon or Graphite!
No Sliding Contacts! Eliminates Microphone Noises on DX Stations!

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$1.00 At your dealer or direct on receipt of price.

2,000 MILES
ON TRIPLE CIRCUIT with ONE TUBE
READ THE EXPERIENCE OF OTHERS

Gentlemen:—I completed making the SX-DX radio set which I bought from you while in New York on the 10th, and wish to state to you that after hearing quite a number of other one-tube sets this one is far superior to any one I have heard. Not only does this set enable me to tune in distant stations, but same does not fade, but holds the stations for any length of time and all the time very clear and with great volume.

I am unable to express my appreciation in this letter of how highly I am pleased with your set, but only wish I could be in personal conversation with you to tell you all the great things I have been able to do with my set.

Below are a few of the stations I have tuned in and have received very clear and distinct and with two sets of phones attached:

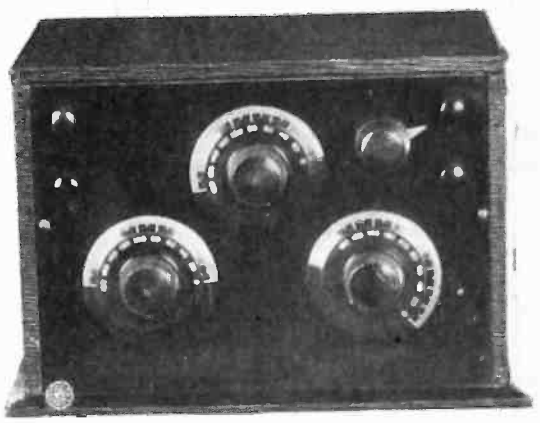
KDKA, WOR, WEAF, WCBD, KFKX, WHAS, WJAS, WCAP, WHAI, WJAZ, WTAM, and last night I was very much surprised to tune in PWX, Havana, Cuba.

I am thinking of adding a two-step amplifier to my set so that I will be able to use a loud speaker, and will you kindly quote me your prices on parts for same, including tubes and batteries?

Two of my friends are considering the purchase of one of your sets, and I will do all I can to secure the order for you.

If this letter will be of any value to you, you have my consent to use same.

Yours very truly,
B. H. M. CLARK,
375 Main Street,
Danbury, Conn.



ESSEX RADIO
AS SET LOOKS WHEN COMPLETED
$15.00

THIS SET COMES TO YOU WITH COMPLETE BOOK OF INSTRUCTIONS COVERING ASSEMBLING, REQUIRING NOT OVER ONE HOUR OF YOUR TIME EVEN IF YOU NEVER PUT A SET TOGETHER BEFORE.

COMPLETE SET INCLUDES—

Vario-Coupler, Special Winding, 23 Plate Essex Condenser, 17 Plate Essex Condenser, Leatherette Cabinet, Standard Essex Socket, Rheostat, 6 ohms, will work with any tube, 4 Binding Posts. Hard Rubber, 7x10 Hard Rubber Panel, 3-3" Dials, 4 Pieces Bus Wire, 1 Length Spaghetti.

This Set with Tube and Batteries Will Cost $20.00.
(PLUS POSTAGE)
These Prices Will Save You from $15.00 to $125.00.

MAIL ORDERS ONLY
MONEY ORDER—PREFERRED

ESSEX RADIO SERVICE
615 West 125th Street, NEW YORK CITY, N. Y.
Telephone: Morningside 0282

OUT OF THE ETHER

Chats About Broadcasting Stations

By Hirsch M. Kaplan

Proceeding up the scale we encountered station WPAB which was entertaining its listeners with a program of popular selections by the Nittany Nine, a musical group attending Penn State College. No doubt many of you remember the famous basketball team which this school once supported. Well, this musical team is making itself just as famous with its splendid efforts offered through this station.

Moving up the scale a few notches we next heard a splendid array of music as played by a very distinguished group known as the Shrine Band. Between numbers the individual members offered their own personal entertainment in the way of wise cracks. All in all their splendid offerings were greatly appreciated and let's hope that we will have the pleasure of hearing them again.

Station WGR, located in "The City of Opportunity" was next heard as they were offering a program of dance music by the well known Vincent Lopez Orchestra. No, they are not the original Vincent Lopez combination which plays through station WEAF every Wednesday and Saturday evening, but they are every bit as good. That says a great deal for, in our estimation, of all the dance orchestras we have

(*Concluded on next page*)

Out of the Ether

(Concluded from preceding page)

heard via radio, Vincent Lopez and his Hotel Pennsylvania Orchestra rank third to Paul Specht and his Hotel Alamac jazz boys whom we consider as the leaders of their class.

We next jumped to 429 meters on which wave WSB sprung a surprise by offering the fistic combat between Young Stribling and Billy Shade. The combat itself, from what we heard, was great, but the announcing of the clash was not up to the standard set by those who perform this feature through station KDKA and WJZ. So ended one evening of experimenting.

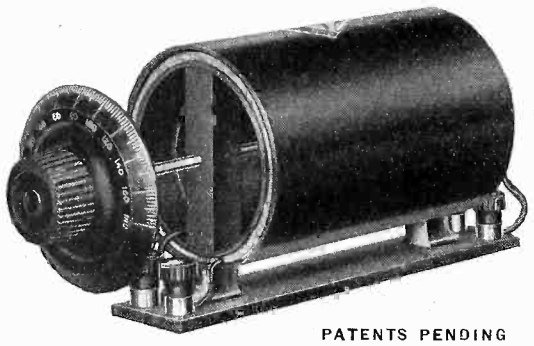
The male folks may have the reputation of being the whistlers, but you should have heard Miss Mary McKee whistle. Boy, oh boy! The canaries have nothing on her. She whistled a couple of classical selections and it was great stuff. Miss McKee was part of the Capitol's program rendered through station WEAF and we hope that Roxy will give us the pleasure of hearing her a few more times.

Are You Building A Radio Set?

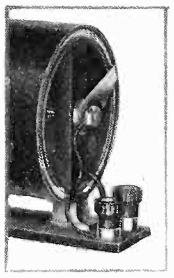
Then Use A

STAR SINGLE SLIDE COUPLER

TYPE 1C1



END VIEW



PATENTS PENDING

NO BODY CAPACITY
EXTRA KNOBS

NO SOLDERING
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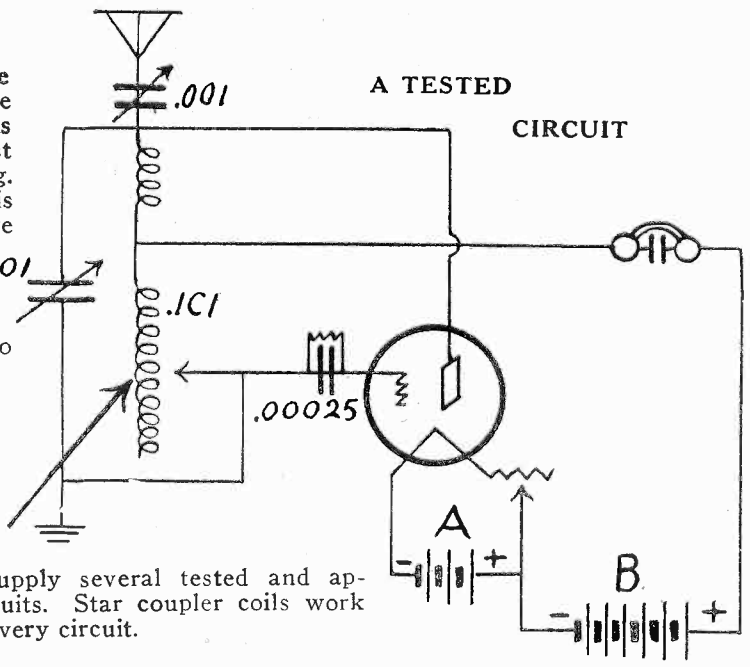
PERFECT CONTROL AND TUNING

Note:—

We have tested type 1C1 on this circuit, get coast to coast receiving. Type 1C1 on this circuit will give surprising results to you. Let us tell you about Better Radio Receiving.

OUR STAR COUPLE TYPE 1C1



A TESTED CIRCUIT

We can supply several tested and approved circuits. Star coupler coils work on nearly every circuit.

MAILED COMPLETE WITH PRINTS FOR TWO TESTED CIRCUITS FOR.. $8.50

—— WE PAY POSTAGE AND INSURANCE ——

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All Star Radio products are guaranteed to give perfect satisfaction. Guaranteed to be of the best material and workmanship obtainable. Guaranteed to be easily attached without soldering.

DEALERS—WRITE OR WIRE FOR EXCLUSIVE TERRITORY.
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Federal Standard Radio Products

Standard of the Radio World, 130 separate units, each fully Guaranteed.
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$3.50	Workrite 180° Silk Wound	$2.95
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VARIOMETERS

$3.50	Workrite	$2.95
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CONDENSERS

$2.00	R. C. 11 plate	$1.05
2.35	R. C. 23 plate	1.35
2.75	R. C. 43 plate	1.65

VERNIER CONDENSERS

$4.00	R. C. 23 plate	$2.25
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PHONES

$18.00	DR. SEIBT IMPORTED "SUPER HEADSET"	$5.90
$12.00	N. & K., Imported	$5.90

We specialize in the FAMOUS AMBASSADOR LONG DISTANCE CIRCUIT. Write for list of parts for this set. Either single or three tube set.
Price of parts for single tube set.....$15.60
Price of parts for THREE TUBE SET.... 28.90
Mail orders promptly attended to. All orders amounting to $5.00 or more will be shipped prepaid. Will ship C. O. D. unless remittance accompanies order.
The above items are just a few of our numerous attractive priced articles, which are contained in our BULLETIN OF RADIO PARTS. Gladly sent to you upon request.

First Annual

RADIO SHOW

under the auspices of

The Radio Merchants Association of Washington, D. C.

CONVENTION HALL
(60,000 Sq. Ft. Floor Space)
March 19th to 26th Inclusive

Featuring

Startling Government Exhibits. The First Public Display of Radio Photography by C. Francis Jenkins, Inventor. Many Other Late Developments.

See the Nation's Capital in the Grip of a Tremendous Epidemic of "Radioitis."

(Address all inquiries to Alfred L. Stern, Director, Washington Radio Show, Suite 333, Star Building, Washington, D. C.)

Kill the Squealers—RADIO WORLD has pledged itself to clear the air. Watch us do it!

Additional Programs

Station WOO, Philadelphia, Pa.

509 Meters (590 Kcys.) E. S. T. Feb. 15.—11:00 A. M.—Grand organ. 11:30 A. M.—Weather forecast. 11:55 P. M.—Naval Observatory time signal. 12:00 Noon—Luncheon music by the Tea Room Orchestra. 4:45 P. M.—Grand organ and trumpets. 5:00 P. M.—Sports results and police reports. 7:30 P. M.—Dinner music from Hotel Adelphia Concert Orchestra, A. Candelori, director. 8:00 P. M.—Dr. R. Tait McKenzie. "Keeping Physically Fit." 8:15 P. M.—Lewis James Howell, musical setting of Longfellow's "King Robert of Sicily"; Harriette G. Ridley, accompanist. 8:30 P. M.—Special musical progra from Fox Theatre Studio. 9:15 P. M.—Grand organ recital, Miss Mary E. Vogt at the Console. 9:55 P. M.—Naval Observatory time signal. 10:02 P. M.—Weather forecast. 10:03 P. M.—The Kentucky Kernels Dance Orchestra from Hotel Adelphia.

Feb. 16.—11:00 A. M.—Grand organ. 11:30 A. M.—Weather forecast. 11:55 A. M.—Naval Observatory time signal. 12:00 Noon—Luncheon music by the Tea Room Orchestra. 4:45 P. M.—Grand organ and trumpets. 5:00 P. M.—Sports results and police reports. 9:55 P. M.—Naval Observatory time signal. 10:02 P. M.—Weather forecast.

Station WBAP, Fort Worth, Texas

476 Meters (620 Kcys). C. S. T. Feb. 17—11 A. M.-12:15 P. M.—Complete services of the First Methodist Church; Rev. J. W. Bergin, pastor. 4-5 P. M.—Organ concert. 5-6 P. M.—Vesper concert. 11-12 P. M.—Concert by Fred Cahoon's WBAP Southern Serenaders Orchestra.

Feb. 18—7:30-8:30 P. M.—Concert by the John Tarleton Agricultural College, under the direction of Charles W. Froh. 9:30-10:45 P. M.—Concert by the band of Grandview, Texas, James E. King, director.

Feb. 19—7:30-8:30 P. M.—Concert by the D. G. Griffin Quartet. 9:30-10:45 P. M.—Concert by E. Clyde Whitlock's violin ensemble.

Feb. 20—7:30-8:30 P. M.—Monthly student recital arranged by Sam S. Losh, baritone and pianist. 9:30-10:45 P. M.—Concert by George Freeman's Sooner Serenaders, the Texas Hotel Orchestra.

Feb. 21—7:30-8:30 P. M.—Concert by the jubilee singers of the Dickson Colored Orphanage, Gilmer, Texas. 9:30-10:45 P. M.—Organ concert by Will Foster, organist of the First Methodist Church.

Feb. 22—7:30-8:30 P. M.—Concert by the Yeoman Orchestra, Owen Crockett, director. (E. L. O. announcing). 9:30-10:45 P. M.—Concert by the Palo Pinto, Texas, Square Dance Orchestra. (The Hired Hand announcing.)

Feb. 23.—7-7:30 P. M.—Review of the interdenominational Sunday School lesson and Radio Bible Class presented by Mrs. W. F. Barnum.

Come on, Fellows! Let's all build that Superdyne that appeared in RADIO WORLD for Dec. 15, 22 and 29. It's the best thing that the past year brought out. Start it now!

RADIO WORLD, the only radio paper that keeps right up to the minute on all radio news—it's NEWS when you see it in RADIO WORLD.

Government Wants Radio Engineers

THE United States Civil Service Commission announces the following open competitive examination: Radio engineer, $4,000 to $5,000 a year; associate radio engineer, $3,000 to $4,000 a year; assistant radio engineer, $2,000 to $3,000 a year.

Receipt of applications will close March 11. The examinations are to fill vacancies in the Signal Service, McCook Field, Dayton, Ohio, and Camp Alfred Vail, N. J., at an entrance salary of $2,000 a year, plus the increase of $20 a month, and vacancies in the federal classified service throughout the United States at the salaries indicated above.

The duties of appointees are to conduct or superintend the development, design, construction, installation, standardization, and the writings of specifications for practical and special apparatus and methods of radio communication, such apparatus to include sets for land use for more or less permanent stations, also for portable land stations, and for airplane and ship sets; to carry out advanced technical work in radio research; to analyze the data accruing from observations of the operation of various radio apparatus and installations; to make recommendations as to policy, apparatus, or installation in accordance with inspections; to plan and execute experimental investigations; and to perform other related work.

Competitors will not be required to report for examination at any place, but will be rated on their education, experience, and fitness, and publications, reports, or thesis to be filed with the application. 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 customhouse in any city.

Steamship in Pacific Gets Detroit

EDITOR, RADIO WORLD: The oil tank steamer "Eurana," chartered by the Tidewater Oil Company, was in touch with Detroit (WWJ) and Los Angeles (KHJ) all the way from Baltimore to San Pedro, Cal., via Panama Canal. A DeForest honeycomb coil set with two stages of audio-frequency amplification was used but signals were perfectly clear on detector alone.

Truly yours,
R. W. WOODS,
Radio Operator.
1365 So. 2nd St., Plainfield, N. J.

Additional Programs

Station WDAF, Kansas City, Mo.

411 Meters (730 Kcys.). C. S. T. Feb. 15.—3:30 to 4:30 P. M.—R. Davis "Radio" Orchestra. 6:00 to 7:00 P. M.—Piano tuning in number on the Duo-Art; marketgram, weather forecast, time signal and road report; address, speaker from the Kansas City Children's Bureau; the children's story and information period; music, Fritz Hanlein's Trianon Ensemble, Hotel Muehlebach. 8:00 to 9:15 P. M.—Classical program featuring prominent negro artists of the country. 11:45 P. M. to 1:00 A. M.—The "Merry Old Chief" and the Conn-Sanders Novelty Singing Orchestra, Plantation Grill, Hotel Muehlebach.

Feb. 16.—3:30 to 4:30 P. M.—The Riley-Ehrhart Orchestra. 6:00 to 7:00 P. M.—Piano tuning-in number on the Duo-Art; marketgram, weather forecast, time signal and road report; address, Edgar A. Linton, writer-lecturer; the children's story and information period; music, Fritz Hanlein's Trianon Ensemble, Hotel Muehlebach. 11:45 P. M. to 1:00 A. M.—(Nighthawk Frolic.) The "Merry Old Chief" and the Coon-Sanders Novelty Singing Orchestra, Plantation Grill, Hotel Muehlebach.

Station KSD, St. Louis, Mo.

546 Meters (550 Kcys.). C. S. T. Feb. 18.—8:30 P. M.—Vocal and instrumental specialties, orchestra and organ recital direct from Grand Central Theatre.

Feb. 19.—8:00 P. M.—Studio recital by Mrs. William H. Hopkins, soprano; Miss Mildred Freeze, accompanist. Address "Weeds Used in Medicine," by O. S. Ledman.

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WEAF Increases Its Power

WEAF'S development work in connection with the use of higher power has aroused the interest of radio listeners not only in the metropolitan area but throughout the eastern half of the United States, according to a statement issued by the American Telephone & Telegraph Co. It has long been realized by radio engineers who have studied the situation here that there can be no further improvement in broadcasting conditions, particularly as regards spark telegraph interference, unless it is possible to increase the power of New York broadcasting stations. Increased power results in greater volume; it reduces the ratio of telegraph and static interference as compared with the broadcast program. This improvement applies not only to expensive receiving sets but to the most modest equipment in operation. The owner of a crystal receiving set receives WEAF's program with much greater volume and is consequently much better able to enjoy the program. Those possessing vacuum tube sets with many stages of amplification are able to operate successfully with reduced amplification avoiding overloading of tubes and securing in consequence a much higher quality of reproduction. Sensitive receiving sets must, of course, be adapted by correct adjustments to receive properly under the new conditions. Audio-frequency amplifiers, if overloaded by signals of too great volume, do not reproduce as faithfully as they do when amplifying a current of normal volume.

Receiving sets located within a short distance of WEAF's transmitter or those not adapted to selective tuning may at first interfere with satisfactory reception of other local broadcasting stations. However, this is a condition which can certainly be corrected by simple adjustments of the receiving sets. It may be recalled that when two-channel broadcasting operation was first inaugurated last year on 360 and 400 meters, listeners were troubled by interference but by improvement of their sets now separate these two wave lengths without any difficulty. Similar difficulty was experienced when four-channel operation was undertaken in the metropolitan area.

An indication of the selectivity obtainable with suitable receiving apparatus is given by the fact that 600 meter watch is maintained

(Concluded on next page)

Before you forget it, send that check or money order for $6.00 in to RADIO WORLD, 1493 Broadway, New York City, for your year's sub!

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

SHIELDED FORMICA PANELS six cents per square inch. Stops body capacity and howls. Write for prices on shielded cabinets. KELLY RADIO NOISE ILLIMINATOR, 5434 S Sawyer Ave., Chicago, Ill.

AN ORIGINAL TRANSCONTINENTAL HOOK-UP. A wonder for simplicity, cheapness and efficiency. One tube, one dry cell, one B battery. Send one dollar for blue print and detailed building instructions. Stillwater Radio Laboratory, Lock Box 13, Stillwater, N. Y.

"20TH CENTURY MIRACLE" 320-page Radio Instructor. Fully illustrated. $1.25. Laine, 2428 Wilcox Street, Chicago, Ill.

EDISON ELEMENTS $0.03 pair. New 6-volt batteries $6.50. Magnet wire No. 20 $0.35 pound. Radio Generator $20.00. 824 North Fifth, Philadelphia, Pennsylvania.

USED BOOKS bought, sold and exchanged. List free. Ray McConnell, Ravenna, Nebraska.

IVORY RADIO PANEL: White pyralin ivory makes the most beautiful set of all. Guaranteed satisfactory. Any size 3/16 inch thick. Three cents per square inch. Sample sent. E. P. Haltom, 614 Main, Dept. W., Fort Worth, Texas.

INCREASE YOUR RANGE AND VOLUME by adding a Westinghouse 3-stage Radio Frequency Amplifier unit to your set. These units originally sold for $80.00, but my special price is only $43.00 while the supply lasts. All instruments are new and in original cartons. Can you afford to pass this up? N. E. Ristey, 251 West 95th Street, New York City.

LOWER PRICES on new tubes
Box 342, New Haven, Indiana.

EDISON ELEMENTS for building storage B batteries $2.00 per hundred pairs. First grade elements only. Edison 300 ampere hour storage battery $6.75. Cost $40.00 new. All material F. O. B. Philadelphia. Mail orders filled. J. Zied, 530 Callowhill Street, Philadelphia, Pa.

RADIO FANS—Have some applause cards on your Radio Table, fill in the blank spaces as program comes in, and they are ready to mail. 12 for 25c, 28 for 50c, 60 for $1.00. Sent prepaid, stamped, ready to mail. Satisfaction or money refunded. Address The Powell Radio Applause Card, Prescott, Ariz. Retail and wholesale.

VARIOCOUPLER AND VARIOMETERS silk wound including dial $1.35; 3000 ohm headsets $2.85; 3 plate condensers $0.55; phone condensers $0.10; contact points $0.13 doz. Order from ad. Include postage. Everything guaranteed. Huth Radio Supply Co., 1280 Elm Street, Green Bay, Wisconsin.

SPECIAL—Two stage R C A audio amplifier $20.00, original price $45.00. This is an ideal instrument incorporating unusual features of design and workmanship. Includes special stabilizer control, eliminating distortion of speech and music. Supply is limited. N. E. Ristey, 251 West 95th Street, New York City.

DETECTIVES NEEDED EVERYWHERE. Excellent positions, cities, towns. Particulars free. Captain Wagner, 188 East 79th St., New York.

WANTED—Mail us your discarded jewelry, Gold Crowns and Bridges, Watches, Diamonds, Silver, Platinum, and Old magneto points. Money promptly mailed. Goods returned if offer refused. United States Smelting Works (The Old Reliable), Dept. 55, Chicago.

HOW TO RENEW DRY CELLS, 10 cents. Circulars mailed, 25 cents per 100; $2.00 per 1,000. UNIVERSAL MAILERS, 650 Center, Waukegan, Ill.

BODY CAPACITY BOTHER YOU? The Stabilo circuit uses no shield. Gets distance, volume, tone. Result two years experimenting. Simple to make. Booklet, 50 cents cash. Charles R. Ladd, Bellows Falls, Vermont.

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.

PATENTS—SEND DRAWING OR MODEL FOR EXAMINATION AND OPINION. Booklet free. Watson E. Coleman, Patent Lawyer, 644 G St., Washington. D. C.

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PATENTS—Write for free Guide Books and Record of Invention Blank before disclosing inventions. Send model or sketch of your invention for our prompt Examination and Instructions. No charge for the above information. Radio, Electrical, Chemical, Mechanical and Trademark experts. Victor J. Evans & Co., 924 Ninth, Washington, D. C.

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WEAF Increases Power

(Concluded from preceding page)

within a few feet of WEAF's antenna. A short receiving antenna is employed which successfully eliminates WEAF so that reception of ship wave lengths is possible. If this can be done within 50′ of the broadcasting station, the feat can be duplicated at greater distances.

One of the causes of difficulty which has frequently been noted is the use of antenna of too great lengths for local reception. A 100′ outdoor antenna may be suitable for long distance reception while the local stations are not operating but it may be unsuitable for interference-free local reception.

For Better Radio Reception

FRESHMAN PRODUCTS

GUARANTEED:—to be mechanically perfect, scientifically accurate and built for unusual durability. Used by discriminating manufacturers and amateurs all over the world, who realize that a radio set is only as good as each individual part.

The Standard Unit for Every Tube Set

FRESHMAN
Variable Grid Leak and Condenser Combined

Permits you to adjust your circuit to any resistance you wish from zero to 10 megohms, in an unbroken range of 180 degrees. It takes the place of a grid condenser, grid leak mounting and grid leak, and, in addition permits an adjustment to the correct amount of resistance.
It is the most compact, the most efficient, the most adaptable to all grid circuits, and the only one which is entirely sealed and always remains unaffected by any climatic conditions.

Base on Panel Type complete with .00025 or .0005 Freshman Condenser. $1
Either type without condenser, $.75

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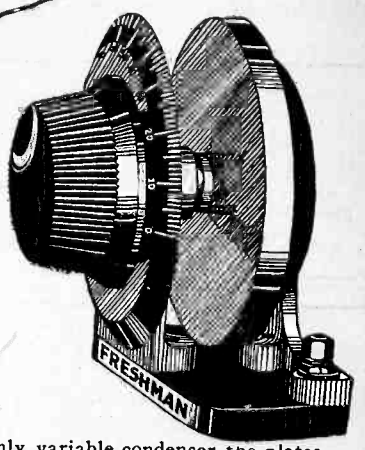
Mercury Variable
Condenser
for
Transmission
or
Reception



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

The "Freshman Selective" is attractively compact, quiet in operation and will withstand 5,000 volts without leakage or danger of short circuiting.

.0003 MF (Equiv. to 17 plate)
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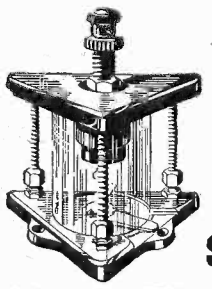
All molded parts and dial of finest Bakelite.



Price $1.50

Double Adjustable Freshman Crystal Detector

for base or panel mounting. When mounted on panel only the knob shows on the front. No more searching for the sensitive spot. Merely turn the knob as you would a dial thus adjusting the crystal instead of the cats-whisker. Best for both Reflex and Crystal sets.

Guaranteed Capacities

The Condenser Sensation of Modern Radio

FRESHMAN Noiseless Tested Mica Condensers

Style 100

Style 101

Every Condenser is individually tested on high voltage for capacity, breakdown and leakage. Every piece of Mica embodied in the Condenser is individually tested and examined.
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Capacity	Each	Capacity	Each	Capacity	Each	Capacity	Each	Capacity	Each
.00005	$0.35	.0003	$0.35	.001	$0.40	.0035	$0.70	.008	$1.00
.0001	.35	.00035	.35	.0015	.40	.004	.75	.009	1.00
.00015	.35	.0005	.35	.002	.40	.005	.75	.01	1.00
.0002	.35	.0006	.40	.0025	.50	.006	.75	.015	1.50
.00025	.35	.0008	.40	.003	.60	.007	1.00		

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ANTENELLA
attached to any lighting socket eliminates the inconveniences in radio, such as unsightly outdoor aerials, insulators, lightning arresters, lead-ins, etc.

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It is not only a real distance getter, but also overcomes static annoyances. The complete and efficient aerial, **ANTENELLA. Price only.....$1.25**

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A Bakelite dial with Vernier adjustment. A small rubber tired wheel through the slot in the dial permits you to set the dial to the exact point and obtain the same dial setting every time. Just the thing for Neutrodyne and Heterodyne.

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At your dealers, otherwise send purchase price and you will be supplied prepaid.

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A Fixed Grid Leak Combination 4 in 1

Freshman Condenser .00025
Leak Mounting
Freshman Grid Leak
Safe-T Handle
Price Complete 65c

Furnished in any value of resistance from 1/20 to 10 megohms.

Ask your dealer or write for our free diagrams of Neutrodyne, Tri-Flex, Kaufman and other circuits

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