RADIO AGE

The Magazine of the Hour

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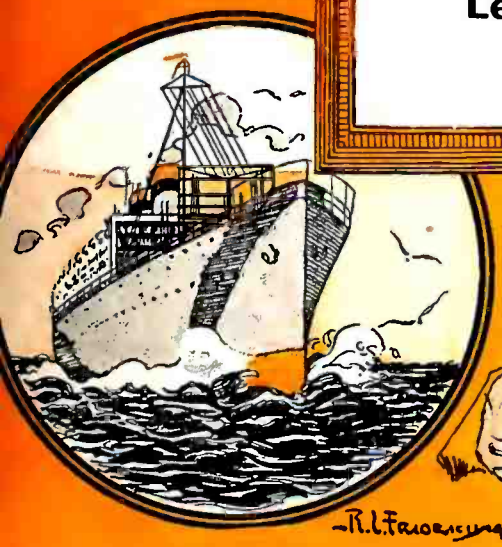
OCTOBER, 1923

IN THIS NUMBER



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RADIO AGE

The Magazine of the Hour

Volume 2 *OCTOBER, 1923* *Number 9*

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Solid Radio

ONE of our subscribers writes a letter telling us that he has constructed and successfully operated the latest four circuits which were featured in this magazine. The larger our circle of readers grows the more impressed we become with the eagerness of fans to experiment with new hook-ups.

If a receiver is constructed the fan immediately looks about for additional amplification or for a different antenna arrangement. It is the spirit that kept the amateurs at work long before there were broadcasting stations and it is the spirit which keeps Americans in the front rank in radio development.

All this justifies our original belief that there was a place for a radio periodical which would devote itself to practical radio construction and operation and let the other fellow discuss the wireless possibilities on the planet Mars.

We might publish articles of a general scientific nature, attractively illustrated, but we would then be getting away from radio. We might print pages of pretty actresses with ear-phones (often without connection with a receiver) but we believe the movie and drama journals do that acceptably. Anyhow, what does the fan care about pretty faces when he is hunting hook-ups?

We are printing thirty-two pages of solid radio information, with radio illustrations that have attracted favorable notice from fans as far away as Berlin and Tokio. Yes, we have subscribers in both places.

Let our hook-ups be your guide. You will have plenty of company.

—The Editor.

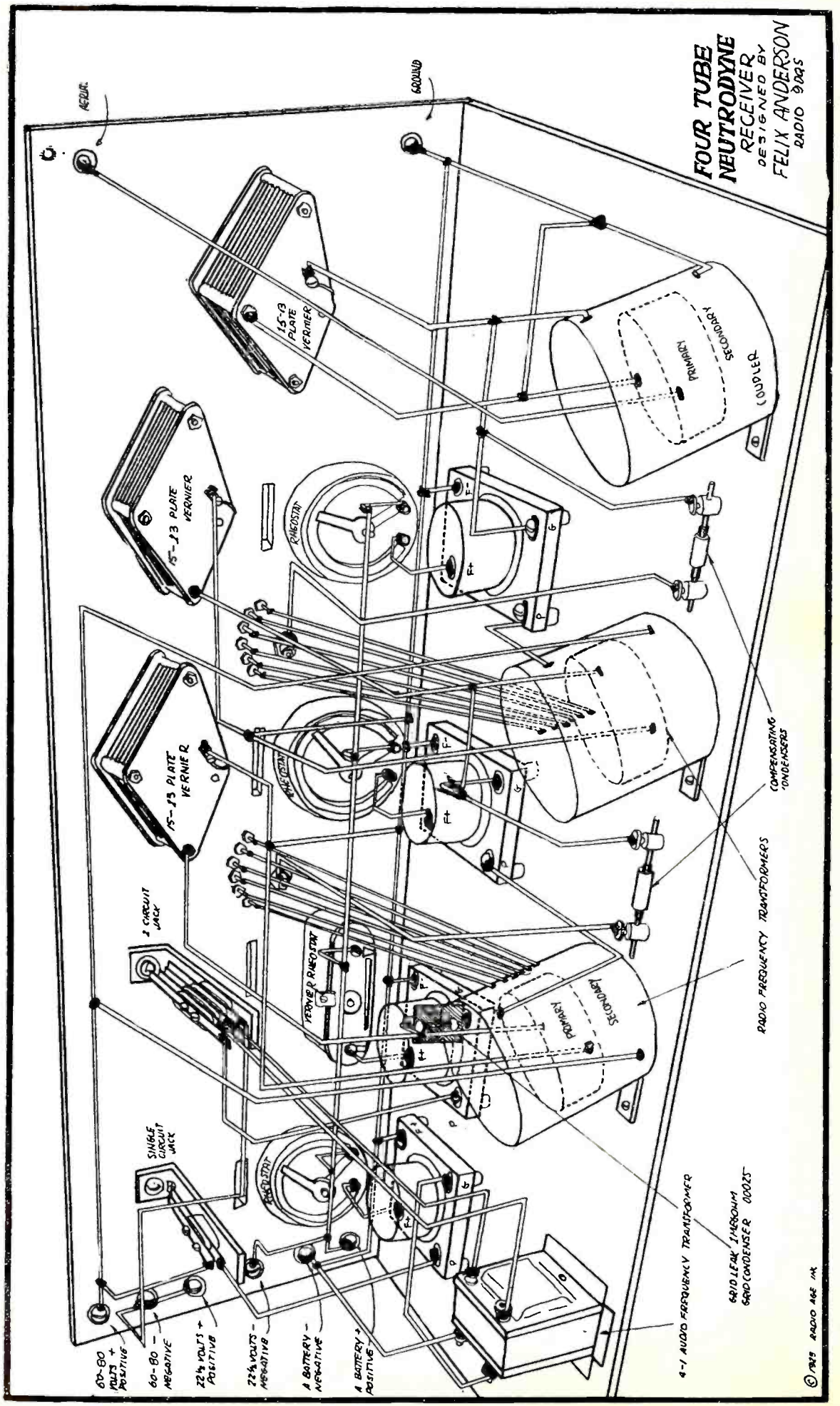


Figure 1. Isometric drawing showing the layout, wiring and construction of the Hazeltine Four Tube Neutrodyne Circuit.

RADIO AGE
"The Magazine of the Hour"
M. B. SMITH, PUBLISHER
PUBLISHED MONTHLY
FREDERICK SMITH, EDITOR

Construction of the Four Tube Neutrodyne-

By Frank D. Pearne

ONE of the most popular sets today is the Neutrodyne, first introduced by Professor L. A. Hazeltine, of the Stevens Institute of Technology, Hoboken, N. J. Since his disclosure of the idea before a meeting of the Radio Club of America, last March, many circuits have sprung up, which employ the original idea explained by Professor Hazeltine.

Briefly, this arrangement consists of methods of overcoming by neutralization, the various capacities between the component parts of the receiver and amplifier circuits and for distance, reception and clarity it ranks with the best. The great simplicity of control, combined with the fact that much may be done with very few tubes, compared to other circuits, makes it an extremely interesting circuit.

In the early days of the Neutrodyne, the circuit was made practical only by the use of a potentiometer, by means of which a slight positive potential was impressed upon the grids. Regeneration through coupling between the grid and plate, is the factor which causes the tubes to oscillate. If the capacity of the tubes is neutralized, the oscillations are stopped and the circuit is stabilized over a wide range of frequencies (depending upon the design of the transformers) without using a potentiometer.

In the design of the set explained in this article, the receiving range has been set at from 200 to 600 meters, and the transformers described will give splendid results over this wave band. Three transformers are to be made, one being merely a tuning coupler, while the other two are used as radio frequency transformers. For their construction it will first be necessary to procure three bakelite, or pasteboard tubes three inches long and three and one-half inches in diameter; also three tubes of the same material, three inches long and three and one-fourth inches in diameter. The two three and one-fourth used in the radio frequency transformers are wound with six turns of No. 28 D. C. C. copper wire, beginning at a point one-half inch from one end and spacing the turns so that the winding will cover a space of one-half inch. On the third three and one-fourth inch tube, wind a coil of ten turns of the same size of wire and spacing them the same distance apart as those in the six turn coils.

This completes the primary windings of the two radio frequency transformers and the primary of the tuning coupler. The secondaries are next wound, the three and one-half inch tubes being used for this purpose. Wind each of these tubes with sixty-five turns of No. 24 D. C. C. wire, beginning one-half inch from the end of the tube. On the two which are to be used as radio frequency transformers, tap the coils at the 12th, 13th, 14th, 15th, 16th, and 17th, turns. All six of these windings on the tubes must be wound in the same direction.

The two six-turn coils, which are to be used as the primaries of the radio frequency transformers, are placed inside of the two coils with the tapped windings. These are so placed that the inside and outside windings are in the same direction and start from the same end. The other two coils, one with ten turns and the other with sixty-five turns are also assembled in the same way and form the tuning coupler which is shown at the right, in Figure 1.

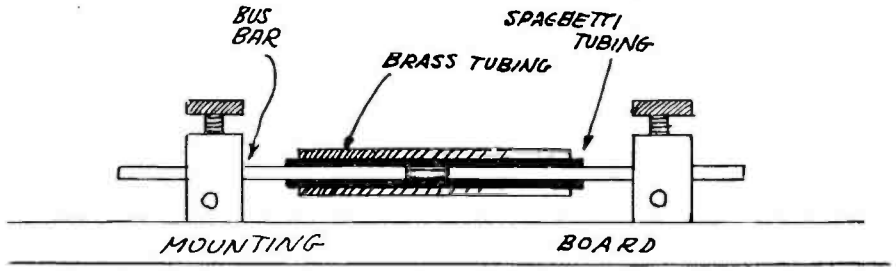


Figure 2. The two wires, in conjunction with the brass tubing and spaghetti covering insulation form the neutrodyne or compensating condensers. By varying the distance between the wires and changing the position of the brass covering, very delicate changes in capacity can be realized.

In order to prevent inductive coupling between them, they must be mounted on an angle of sixty degrees, as shown in Figure 1. This is accomplished by cutting out three brass strips one and one-half inches long, one-half inch wide and one-sixteenth of an inch thick, and bent one-half of an inch from one end, to an angle of sixty degrees, also shown in Figure 1. A hole is drilled in each of these brackets, so formed, to allow for fastening to the baseboard and to the transformers. By drilling holes through the blank space left at the bottom of the tubes and inserting a small brass machine screw through the bracket and tubes, a very substantial mounting is made. When the panel is laid out, one condenser must be placed as close to the left hand end of the panel

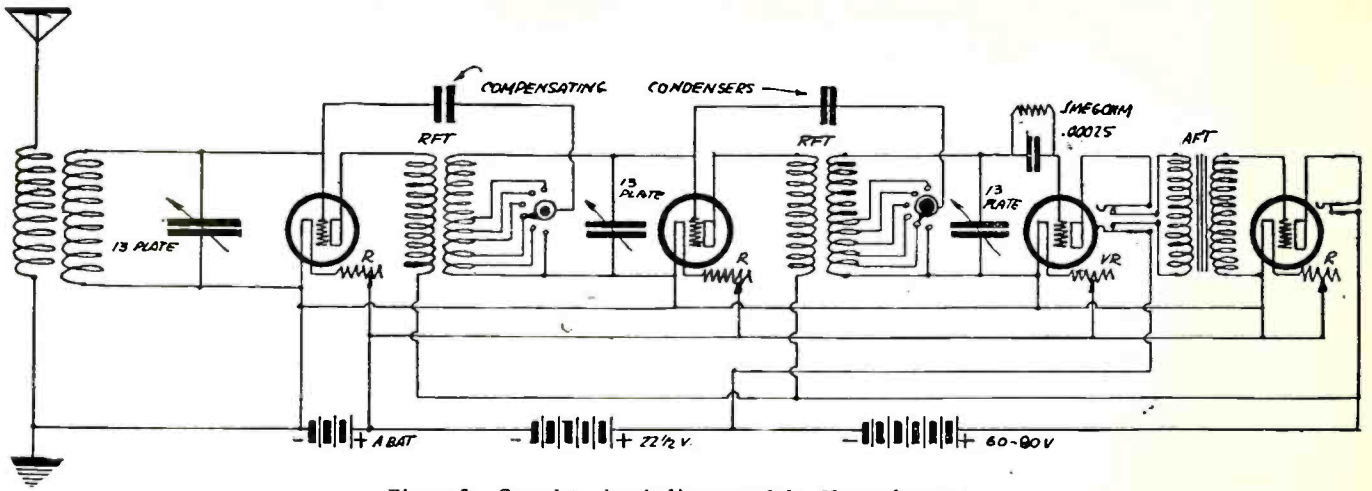


Figure 3. Complete circuit diagram of the Neutrodyne set.

as possible (looking at panel from front) and in the center as shown.

The next condenser is placed six and one-half inches from this one, and the third is mounted the same distance from the second. While the rheostats are shown as mounted below the condensers, they may be placed above them if desired; however, it will be better to follow the general idea of the layout shown in Figure 1, if possible. This shows quite clearly the method of mounting the different parts. In wiring the set, great care should be used to avoid running wires in parallel, unless they are some distance apart. The small neutralizing condensers are made as shown in Figure 2.

While these are shown as mounted directly upon the base board, it is a much better idea to mount them separately on bases made of sheet bakelite, which are in turn mounted on the main base board. Two binding posts are used as the supports for the No. 14 copper wires which are placed inside the brass tube.

These two wires are insulated from the brass tube by a piece of spaghetti tubing. The length of the brass tube is one and one-half inches, and the outside diameter is one-fourth inch. When the adjusting begins, this tube may be slipped back and forth, thus changing the capacity until the proper point is found, where neutralizing is as near as possible. The two wires do not touch each other; they should be so arranged that the distance between them can be altered.

After the set is all wired up and all connections soldered, plug in the phones and light the tubes. Turn the first dial to about twenty-five, and rotate the other two dials together. When a wave has been tuned in to the loudest degree, on all three dials and rheostats, the first radio frequency tube (the one nearest the coupler) is taken out of its socket and a piece of paper is placed over one of the filament contacts, so that when the tube is replaced, the filament circuit will be open at this point.

While doing this, be careful not to change any of the dial or rheostat adjustments. Now if the station can still be heard, change the capacity of the first neutralizing, or compensating condenser, by moving the brass tube, until the signal disappears. If it can still be heard regardless of the position of the brass tube, turn the switch which controls the taps on the first radio frequency transformer to another point and move the brass tube again. Continue this operation until the signal disappears. Next remove the paper, replace the tube and do the same thing with the second radio frequency tube until no signal is heard.

The neutralizing condensers are then in adjustment for the particular tube used and may be sealed permanently until the tube burns out, or is replaced for other reasons. The paper is then removed and the set is ready for operation. Looking at the front of the panel, the two tubes on the left hand side are the radio frequency tubes, the next is a detector tube and the fourth is the audio frequency amplifier tube. By adjusting the neutralizing condensers as explained above, the capacity of the plate, grid elements of the tubes will be neutralized.

The switches shown on the panel in Figure 1 are the ordinary switches and contact points usually used for the taps on a variocoupler and can be obtained with the other apparatus at any radio supply store. The audio frequency transformer may be any of the standard makes, but must have a four to one ratio. One very good point in favor of this set is the fact that when a certain wave is adjusted in, the dials may be marked at this point and the same wave length can always be found at any time by simply moving them back to these points. Thus the matter of adjustment becomes very simple, after it has once been located. This makes it possible for anyone to find a station without having any knowledge of how to adjust a set. Figure 3 is the complete circuit diagram of the Neutrodyne set.

Fight News via Air

News of the result of the Dempsey-Firpo fight in New York was transmitted across the country by radio in a manner that again demonstrated the value of wireless as a means of communication to the millions.

Broadcasting stations all over the country got the word of the finish within a few minutes of the last blow delivered by Dempsey. Entertainment programs were interrupted to permit the broadcasting of a fight bulletin. Details were added later and from most of the stations a detailed account of the brief combat was put on the air.

WGY, the General Electric Company's broadcasting station at Schenectady had a direct wire to the scene of the fight and got its report from a newspaper boxing authority.

In Grand Canyon

The geological survey party carrying a radio set on a trip through the Grand Canyon of the Colorado, has arrived safely at Bright Angel trail. Notwithstanding the predictions of experts that it would be impossible to receive radio messages while in the bottom of Grand Canyon, Colonel Birdseye reports that he is in daily receipt of messages broadcasted from Los Angeles, Salt Lake and Chicago. He received the news of President Harding's death within forty-five minutes after it occurred. Reports of his progress will be sent out for broadcasting when he reaches Diamond Creek, October 15.

How to Make Your First Tube Set

By FELIX ANDERSON
Technical Assistant Radio Age

WHEN the radio game took its first big leap toward becoming a popular diversion, one of the first ideas the newly inoculated novice had in mind was to get a simple set, get one quickly, and at the same time inexpensively.

The scarcity of tubes and sets, together with the lack of knowledge concerning their operation and the subsequent high prices, due to the scarcity of apparatus, is responsible probably, for the many crystal sets.

We know the impression the term "tube" set conveys, and the average fan knows that feeling of reckless extravagance with $$$ fluttering around in the air when tube sets and their accessories are mentioned. Now that the dry cell tubes and accessories have been placed within the reach of the average novice, there is no reason why an enthusiast should continue using a crystal set with its restricted range and its limited tuning facilities.

We so not want to commence a long-winded article on the comparative merits of tube versus crystal—the answer favoring tubes is self evident; but what we do want to make plain is the fact that the superiority of the tubes, including the ease of tuning, selectivity and their greater range which they furnish, makes it well worth while for the novice to own a vacuum tube outfit.

MANY crystal set users have set up a cry that they are being neglected—that nearly all radio magazines devote too much space to sets using vacuum tubes. We agree with them in certain particulars, explaining the seeming neglect by saying that crystal sets, while efficient, provide little room for development, inasmuch as they have been improved to a point where further experiments give about the same results. Like electrolytic and magnetic rectifiers, its scope of usefulness has crystalized, and considering the comparative merits of crystal and tube detection, we would advise our readers to look over the following article and profit by it.

THE EDITOR.

Many crystal set owners are under the impression that the construction of a valve set requires much skill and a comprehensive knowledge of electricity—both of which are desirable qualities to possess—but on the contrary, the making of a simple efficient set using a bulb is happily not difficult, and fortunately requires only a little patience and care.

We know that many people do not even own sets, and to the uninitiated we wish to say that a great store of pleasure and enjoyment is at their disposal, once the prospective fan decides to build a set.

Of course, he will want to make the first attempt end in a success, and we are partial to the circuit shown in Figure 2, feeling that this is probably the best circuit for the beginner to commence his radio career. Wading into detail, the first thing we will need is the parts which go to make up the set. We will need: 1 variometer; 1 43-plate variable vernier condenser; 1 tube socket; 1 vernier rheostat; 1 panel, 7x9 inches, of bakelite; 8 binding posts; 1 WD 12 vacuum tube; 1 tapped 22 1-2 volt B battery; 1 dry cell battery; 1 pair telephones; connecting wire, aerial, ground and cabinet.

The cost of the above apparatus is entirely dependent upon the character

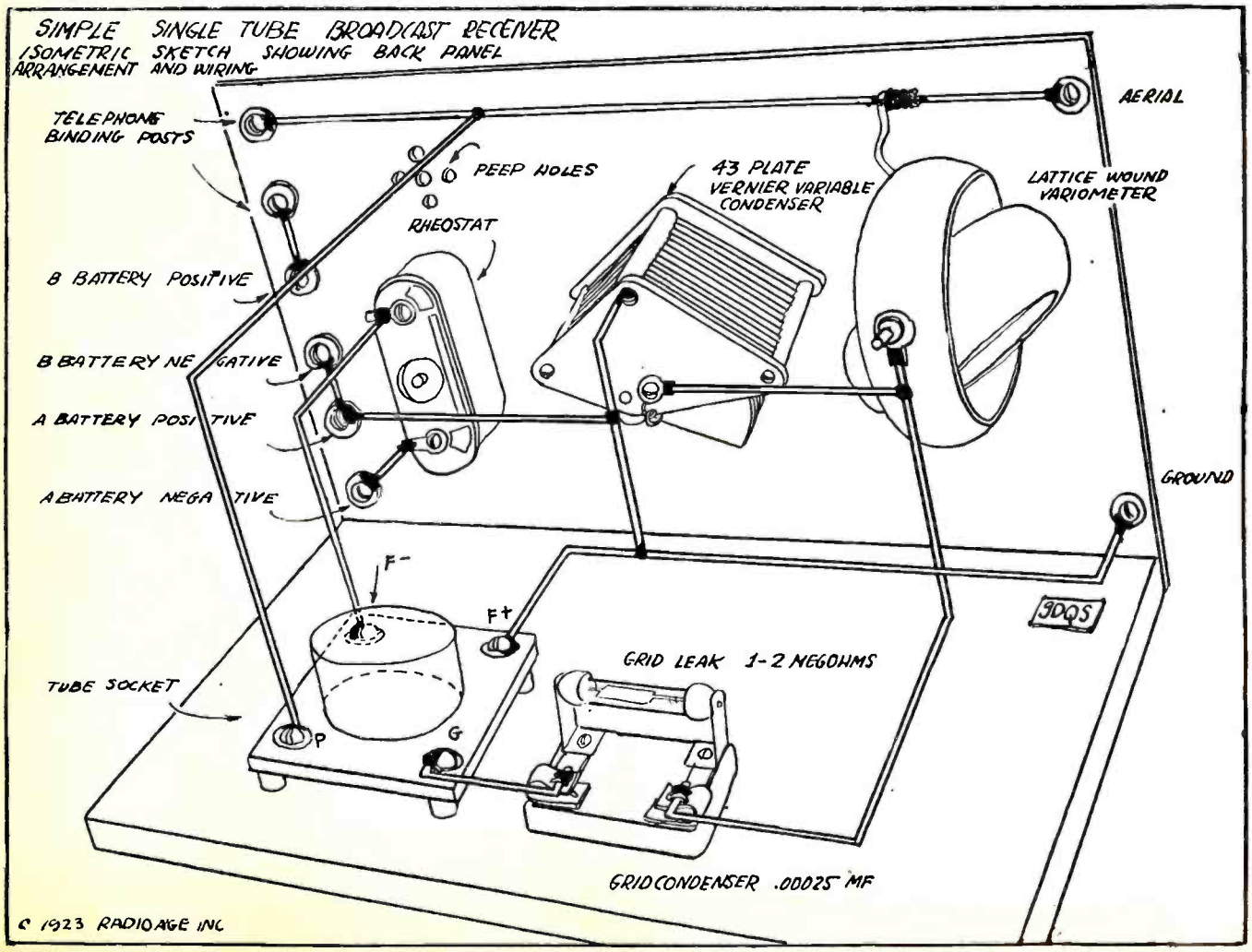


Figure 1.

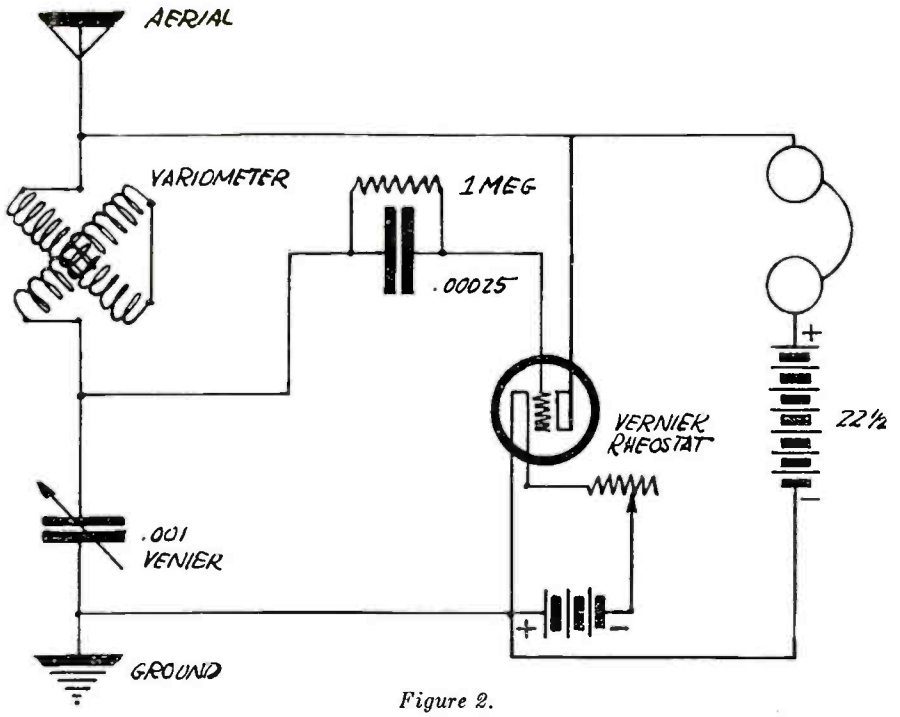


Figure 2.

of the apparatus chosen; but in any event, the set should not cost more than a few hour's time, and about twenty-five dollars in cash. The above list includes everything necessary to the set.

The beginner probably will wonder as to how he is going to put this collection of apparatus together in a radio circuit, and knowing that perhaps few understand the mysteries of the so-called circuit diagram, an isometeric sketch is shown in Figure 1 which eliminates any doubt as to the connection of parts.

The most simple way to assemble the set is to arrange the apparatus as shown in the illustration, and mount the parts on the panel with the respective parts provided for that purpose.

Wire up the set as shown, taking especial pains to make the connections tight and rigid, using solder wherever possible. Soldering should be done with flux—not acids, and should after completion be wiped with alcohol.

The variometer shown is of the lattice-wound type but any other standard variometer may be utilized so long as the connections are made correctly.

It is a good plan to start wiring up the A battery or filament circuit, (the circuit which lights the tube) first, and test the rheostat and tube socket connections to see if they are correct before proceeding further. After this has been done, the remaining wires may be added.

When this has been completed, the set is connected to the antenna.* Next connect the ground and batteries, setting the rheostat at the off position, and last the head phones. Put the B battery positive, or plus wire, on the positive (plus) 22 1-2 volt tap on the plate battery and then turn on the filament about a little less than half. Listening in on the headset, turn the condenser and vary the variometer until a station carrier wave announces itself by a sharp squeal or whistle, and proceed to clear up the signal by closer tuning and finally the vernier on the rheostat. If a Bradleystat is used as shown, fine tuning may be accomplished, due to the delicate adjustments possible.

When adjusting the set for long distance reception, try tuning the set with the B positive wire on various taps until the proper adjustment is obtained. Usually if the set is hard to tune and difficulty is experienced in bringing in the distant station, a decrease in the plate voltage will clear this up. We find that about the best results are obtained when 16 to 18 volts are used on the plate. The set when properly adjusted should give a soft thump or hiss when the condenser or variometer are varied.

The set tunes moderately close, the writer having tuned in stations right through local stations going full blast. The range of the set is necessarily limited by the location in which it is operated. Relative to the above it might be in order to mention that a set of this type operated at Chicago at a point seven miles from the powerful stations WMAQ and KYW, in one evening tuned in stations WSB, WSAH, WSAI (very loudly) and WOC, In less than an hour's time. These stations were heard distinctly, with little fading right through the local transmitting. This set is truly a BCL (Broadcast Listening) set.

Now for the fellows who already have crystals. We know that many readers would like to convert their present crystal sets into sets using tubes. In order that they may really get a kick out of the game, and do some real listening, we are printing a series of circuits showing how the conventional crystal sets may be rebuilt with the addition of a few pieces of inexpensive apparatus, to make an efficient tube unit capable of receivng over much greater distances and effecting greater selectivity.

If you possess a single side tuning coil crystal set, remove the crystal detector, substitute a tube and 43-plate condenser in the circuit as in Figure 3. The principle of this circuit is much the same as that of the circuit preceding with the exception that the variometer is substituted by a tuning coil.

The tube arrangement for a two slide is a little different. One of the sliders is connected to the antenna while the other connects to the grid leak and condenser as demonstrated in Figure 4. One of our St. Louis readers is using this circuit with great success.

The long distance crystal set which seems about the most efficient crystal set does not escape being a subject for a tube set. The bulb and a 23-plate vernier, in connection with a 25-turn

(*Continued on page 32.*)

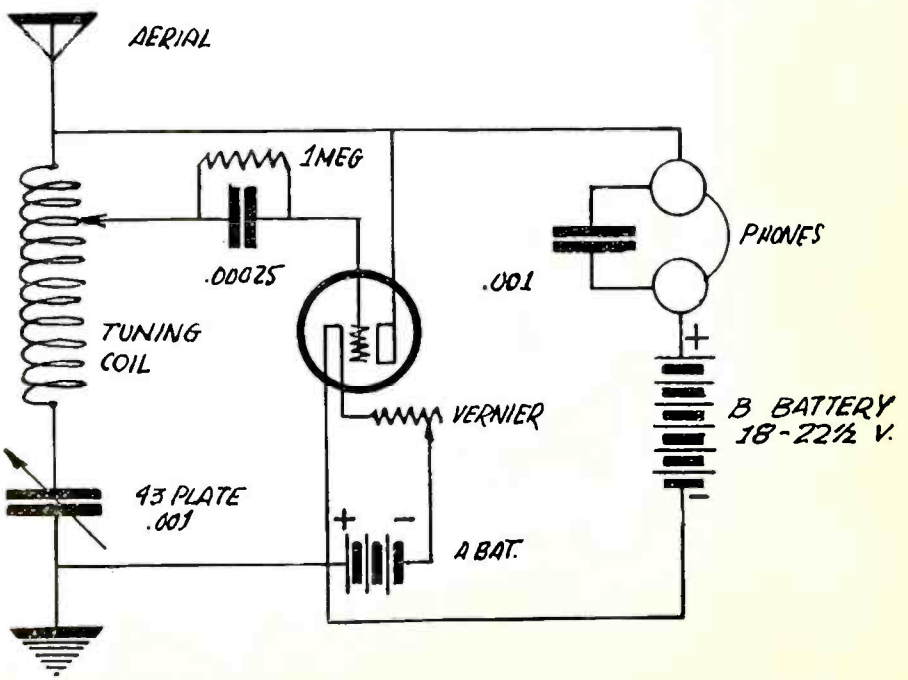


Figure 3—Circuit diagram showing how the apparatus used in a single-slide crystal receiver may be used in a tube set.

What Will Your Set Look Like Five Years From Now?

WE WONDER if there are any old-timers among our readers who remember way back when the set shown in Figure 1 was in vogue? Do you remember when tube sets were a thing of the future and Neutrodyne and Cockaday circuits were a thing unheard of?

The photograph shown in Figure 1 is a picture of the first transmitter at 9DQS, taken several years ago. The single slide tuning coil and crystal detector will probably raise a laugh from some of our interested readers who are the proud owners of six-tube sets which can apprehend signals from almost any part of the country, but the writer remembers the times when he heard signals from a very distant amateur some thirty miles away, and was as elated and as proud as a radio bug could be. The transmitter, consisting of a one-half inch spark coil, was the subject of much awe when interested friends were told that a communication had been carried on over the tremendous distance of ten miles! We remember the time when people hearing their first radio signals assumed the look of dummies and said: "Is it possible that you can really hear those things from the air with this apparatus?" and evinced their meager knowledge of radio by saying, "I wouldn't be able to understand a single thing about it."

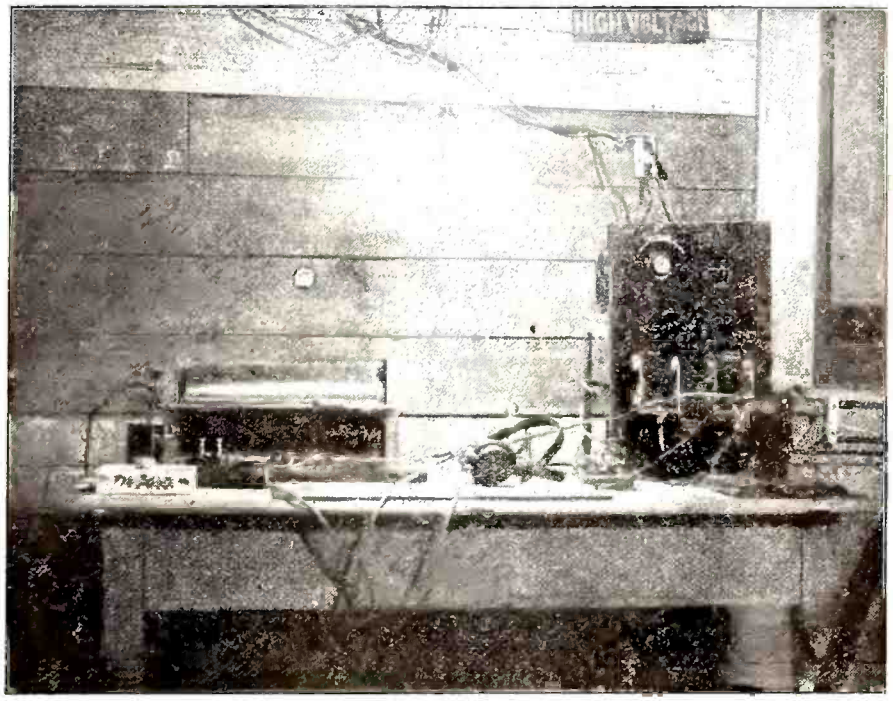


Figure 1. This is the first receiver and transmitter used at Radio Station 9DQS, showing the typical receiver and transmitter used by radio nuts several years ago.

Nevertheless, the photo shown is only a typical station of the many that were in use right after the war.

As a result of the big fight, radio got its first real start, and resulted in the popular use of tubes. We remember the time when the fellow with a tube set could look with scorn upon the crystal user (he probably still does) and pass the remark, "Why don't you get yourself a real set?" Tubes in those days were worth their weight in gold and it provokes our humor when we recollect how honored we felt when we were allowed to hold in our hands a real radio tube.

Of course, as soon as these valves were placed on the market at a price which did not necessitate your mortgaging the house, radio 9DQS became the owner of one of them. The first tube set used at the above station at that time was a whizz. It would oscillate to beat the band on about 3,000 meters, and the writer was much satisfied when he heard NAA at Arlington for the first time so loud that you could hear it almost six inches from the headset. As a short-wave tuner it was a complete failure—we never stopped to reason out why, but it refused to percolate. The three-slide tuner was discarded for a more efficient circuit called the honeycomb coil circuit, and the range of the set and satisfaction of the operator went up simultaneously.

(*Continued on page 27.*)

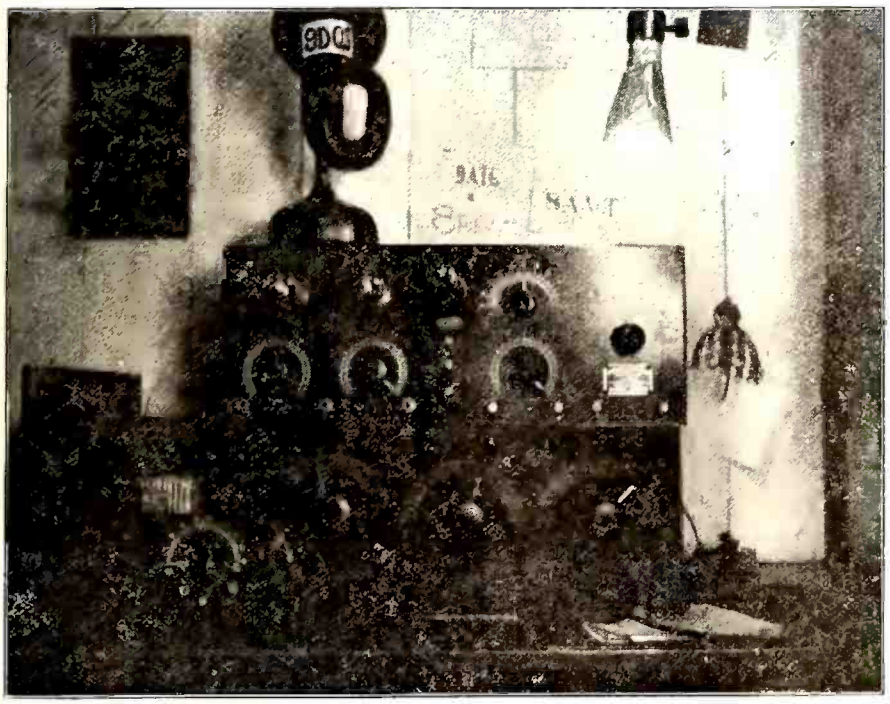
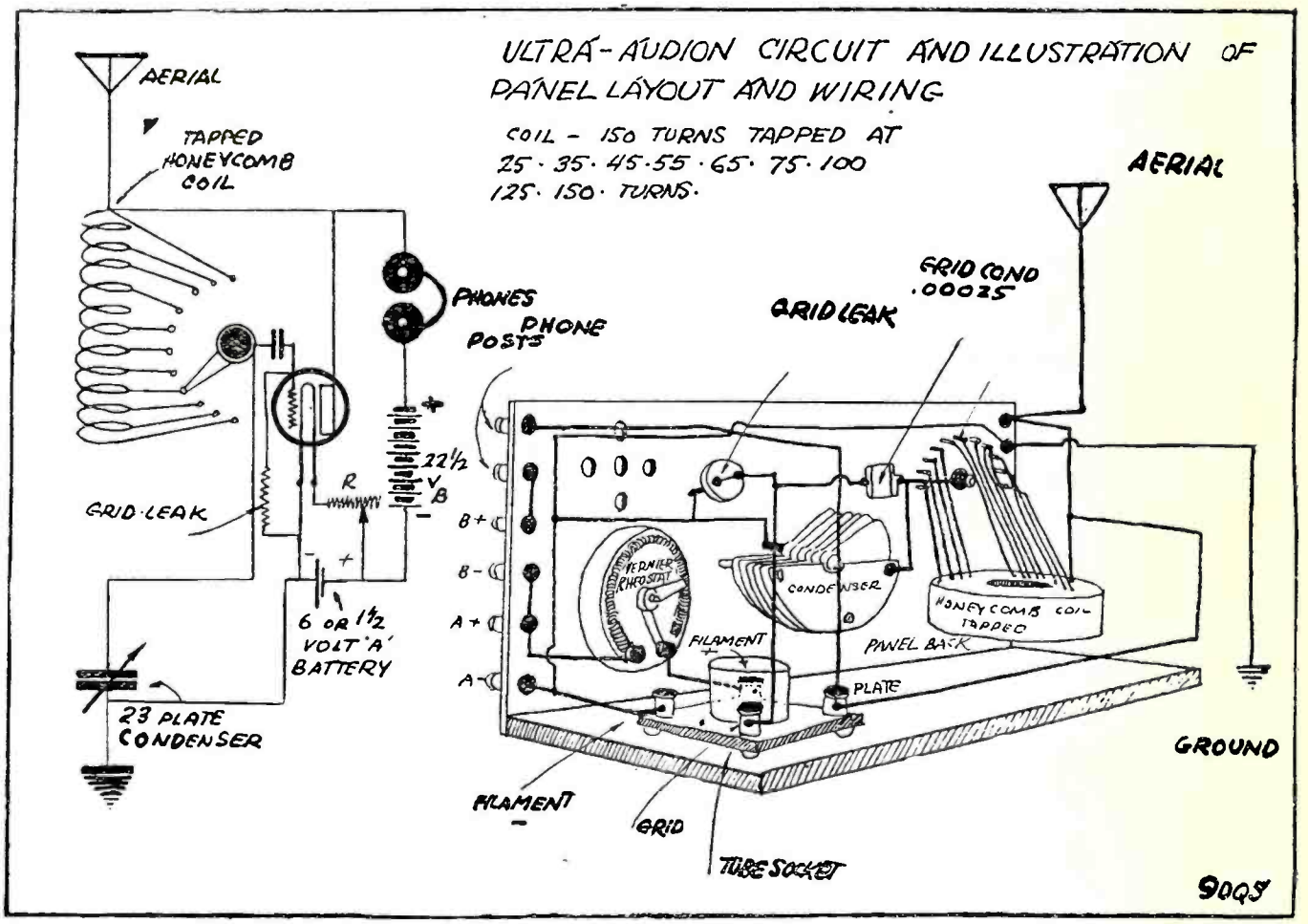


Figure 2. The receiver used last winter at station 9DQS. It is much like the ones now in use, and has to its credit reception from stations some 3,000 miles away.

How to Make an Ultra-Audion Receiver

By the Technical Assistant



ONE OF the oldest and most efficient tube circuits evolved in the course of vacuum tube experimentation is the Ultra Audion circuit, which during the years of its use has not changed appreciably, and which remains one of the most efficient single circuit systems now in use.

A set of this type is simple to construct, requires a minimum of apparatus, and is not difficult to operate.

The layout and circuit, shown in the accompanying illustration, shows plainly the simplicity of such an outfit, and it may be an interesting experiment for our readers to construct one.

The parts required for such a circuit are a honeycomb coil tapped at the intervals specified, a 23-plate condenser, preferably a vernier, a vernier rheostat of the type suitable for the tube used, a grid leak of 1 megohm resistance, and a grid condenser of .00025 microfarads capacity, with the necessary accessories, tube socket, binding posts, panel, mounting board and connecting wire.

A coil as specified is now on the market, and can be secured from your local dealer; if not it may be wound on a fibre or cardboard tubing 3 inches in diameter with the required number of turns using number 22 D C C wire.

Connections are made as shown in the accompanying working drawing, and should be firmly soldered at all points. The set is adaptable to both dry cell and wet battery tubes, and functions equally well with all of them.

It will be noted that the grid leak occupies a different position in the circuit than that of the usual position, and that the B battery is connected to the positive A battery with the negative to the ground.

Tuning, while not as sharp as that of a two-circuit set is accomplished by the 23-plate condenser, the taps on the coil, and the vernier on the rheostat.

One of our readers, using this circuit has heard stations 1,000 miles distant, using one tube, under conditions far from favorable; and this feat may be duplicated almost at any time if the set is carefully and intelligently constructed.

Story Writing

Believing that a great proportion of the public either write or think that they can write as well as some of the stories they see in the current magazines, Westinghouse Radio Station WBZ, at Springfield, Massachusetts, has arranged with Dr. J. Berg Esenwein, a short story critic, to give a course of short story writing in ten lectures by the radio. The course will cover the elements of writing, with lectures on plot interest, climaxes, etc.

At the end of the course each of the persons taking the course will be allowed to submit a short story and the best story will be awarded a prize of $25. Second and third prizes of $15 and $10 will be given the next best stories.

In his course, Dr. Esenwein will outline the specifications for the contest and entrants will have to listen closely to each talk, as the stories will naturally be written so as to follow the rules laid down. In fact, the best story will be judged first from the point of view of correct story writing.

The course commenced on Thursday, September 13, at 7:40 p. m., and the succeeding nine lectures will be given on Thursday of each week at the same time.

Wyoming Indians, enroute to England, camped in New York City and were entertained by a radio concert. Left to right, Red Turtle, Mrs. Red Turtle, Sitting Eagle, White Bull and Red Fox. The brave at the extreme right is not identified. Kadel & Herbert Photo.

Meet the Marvelous Trio, Grid, Filament and Plate

Written by H. M. Freeman, Research Engineer of the Westinghouse Electric & Manufacturing Company

MOST radio amateurs know what a vacuum tube looks like. Most of them have already passed through the preliminary stages where anything that would receive the local station was good enough, and are taking advantage of the tremendously increased range of the tube set. Others are still satisfied with the cheap and convenient crystal set, and are content to hear only the local stations. It is the large and growing class of those who are just beginning to ask: "How can I get these distant stations that my friends are talking about?" for whom this article is written.

In the first place, what can we do with a tube set that makes it so much more desirable than a crystal set? A simple crystal set furnishes perhaps the least complicated way of receiving local broadcast material. You can receive good clear music and speech within a radius of twenty-five or thirty miles from one of the large broadcasting stations. Under exceptional conditions it may be possible to get dependable results over distances somewhat greater than this. There are no replacements of wornout parts to make, and with reasonable care a set is always ready to pick up a concert with a minimum of preliminary adjustment.

By way of comparison, let us look at the ordinary tube set. We find that we have batteries to buy occasionally as old ones wear out; the tube itself is a fragile piece of apparatus and liable to breakage, and altogether there is a rather more complicated set of adjustments to make for reception than is the case with the crystal set. Wherein then lies the advantage? A tube set with a single tube, will increase the reliable listening range three or four-fold over the crystal set. In other words, you can live 100 to 150 miles from one of the big broadcasting stations and be perfectly sure of receiving their concerts and speeches at any time. In addition, with reasonably good conditions it will be possible to hear stations hundreds of miles away and to participate in the fascinating sport of "listening in" with the possibility of hearing concerts or lectures or news from a dozen widely separated sections of the country. I shall try to describe very briefly the properties of the vacuum tube that makes it possible to obtain such wonderful results in receiving.

YOU fellows who are well along in the radio art and who know that electrons are not eaten off a plate and that the grid has nothing to do with a football—we are not talking to you.

But for those among our readers who have not understood the almost miraculous accomplishments of these three elements of the vacuum tube called WD-11 we recommen a careful reading of this article.

The tube is only one of the various developments which have brought the wonders of wireless transmission within the reach of appreciative millions. Mr. Freeman has written a clear description without flourish of rhetoric but between the lines it is a fairy story in every respect—except that it is all true.

Much has been written about the mechanism by which the sound at the broadcasting station is converted into electrical energy and is sent out from the transmitting antenna in all directions in the form of ether waves. A receiving antenna lies in the path of these waves and therefore picks up a very minute fraction of the electrical energy sent out from the transmitting station. This energy exists in the form of an extremely small electric current in the receiving antenna and must be converted back into a form suitable for making the audible signal which is heard in the telephone receivers. It is the function of the receiving tube to perform this conversion process which is necessary before the energy collected from the transmitting station can be perceived by the ear.

(Continued on page 30.)

Amateurs Meet in Chicago

THE participation of French radio amateurs in the proposed transatlantic tests of the American Radio Relay League with European radio men in December of this year was assured by Monsieur Leon Deloy, operator of French station 8AB, at the Second National A. R. R. L. Convention held by the Chicago Radio Traffic Association, Sepetember 11 to 15.

Since he arrived for the purpose of studying amateur conditions, Monsieur Deloy has been conferring with delegates attending the convention on the precautions which must be taken in order to establish two-way communication between the continents. He says the difficulty lies in copying signals through heavy static and that with mild static low power signals could be more easily logged. Of the great number of amateur stations seen he said: "I have been impressed by the business-like way in which they are installed and operated.

"In France our transmitting stations are very much less numerous for we have been allowed to transmit only a year and a half, but if their number continues to increase as fast as it has of late we will soon have a great many stations. We are not allowed to exchange messages and we can only use our transmitters for experimenting. That is why the average station over there is built somewhat differently than here. In France we are greatly interested in transatlantic communication with the amateurs of this country. A big effort is being made now and many good stations should be ready to bridge the Atlantic very soon."

A world amateur radio relay league through which better understanding may be reached among the people of all countries by direct communication among private citizens using long distance code transmitters was prophesied at the opening banquet of the convention in a message from Hiram Percy Maxim, president of the American Radio Relay League, and by Irving Herriott, president of the Chicago Radio Traffic Association.

Natural obstacles to private communication between countries have been swept away through the advance of DX transmission and amateur radio is on the verge of a new era where international message handling will be an every day event, according to Mr. Maxim, who sent his greeting to the assembled delegates from a little cabin in the Maine woods where he is spending his vacation. The message was read to about 1,000 amateurs by R. H. G. Mathews, A. R. R. L. Central Division Manager.

"We have already been asked to help out the Australians, English and other amateurs," he stated, "and it is my belief that the time has come for the calling of an international convention and the organization of a world amateur radio league. I urge that you give it your thought so that we may have the benefit of the general study for consideration."

Irving Herriott, chief of the Chicago Radio Traffic Association, who was active in welcoming and entertaining delegates to the A. R. R. L. convention in Chicago.

The contact by radio between persons of two countries is bound to result in a better understanding between the peoples of those countries, Mr. Herriott assured the convention. The advent of broadcasting has done much already to knit together our own people and places which have been mere names are now brought home to us by radio.

Friendships made through the ether over many thousands of miles by men of amateur radio telegraph transmitting stations was responsible for the presence of a huge throng of radio men numbering upwards of 1,500, many of whom were scurrying about in search of pals whom they know only by conversation in the air.

The spectacle of hundreds of men seeking out other friends whom they can recognize only by station calls attached to their coat labels, is unprecedented except at a radio convention. All faces wore a searching look as amateurs peered here and there for a pal from New Orleans, Newark, Boston, Seattle or Kansas City, for there are few cities that were not represented by a delegation.

Some met on trains coming into the city, others on station platforms, while the Edgewater Beach Hotel, convention headquarters, is a scene of merriment which only a hamfest can cause. Cries of Hello 1XAD, 2AJ, 6KA or 7AB, representing all radio districts, brought looks of astonishment from outsiders bewildered by the queer mixture of numbers and letters, not knowing that to the key pounder mere names are secondary to the station calls.

One matter discussed by the division managers was the formation of an organized system to handle railroad communications in times of emergency. A study of the situation has been made jointly by the A. R. R. L. and the American Railway Association. The scheme is national in scope and will provide against the cutting off of wire telegraph communication during severe storms.

Methods of providing for prompt delivery of friendly messages, a new system of amateur abbreviations, quiet hours and amateur wave length were among routine league topics.

Radio Birds

Even the birds in Washington are radio fans, and their insistence upon attending broadcasting events is causing some of the local stations considerable embarrassment.

Engineers of the Chesapeake and Potomac Telephone Company, broadcasting station, WCAP, found themselves in difficulties during the broadcasting of the dinner given to Paul Whiteman in New York, received here by land wire from WEAF, because of the antics of a flock of swallows which had settled upon the station's antenna.

Shortly after the program began, the wave length of the station suddenly increased from 469 to 479 meters, the vacuum tubes in the transmitter began to heat up and the plate current increased tremendously. In order to save the tubes, it was necessary to reduce the plate voltage from 1,600 to 1,450 volts, but even after this reduction was made the plate current was 850 milliamperes instead of the normal 700 milliamperes.

Emergency apparatus was placed in readiness for immediate use, as the engineers scurried around seeking the cause of the trouble. One of the men went out to look the antenna over, and almost fainted to see a flock of swallows calmly roosted on the wires. The lead-in wire was shaken sufficiently to cause the unwelcome radio fans to seek some other resting place for the night, and conditions in the operating room returned to normal.

The experience is believed to be new in the history of radio broadcasting. Engineers of Station WCAP explain that the size of the antenna was increased by the size of the birds' bodies, thus increasing the wave length and causing a greater current to flow. They deny, however, that the birds were attracted to the antenna for a feast of mythical "wire worms" or that they are in the market for a radio scarecrow.

Here's a Secret

Fans who have listened to KYW, Chicago, have marvelled at the excellent voice of Simon H. Rhoades, singer of Irish ballads. They will not be surprised to learn that John McCormack called Rhoades one of the greatest singers of Irish ballads. But they probably haven't suspected that Mr. Rhoades is a Negro. Listen in some night and hear him sing, "Where the River Shannon Flows."

Radio Sends News from Arctics

THE latest word from the Dr. Donald B. McMillan Arctic Expedition before going to press with this October issue of RADIO AGE was received by J. Barnsley, station Canadian 9BP at Prince Rupert, British Columbia.

Mr. Barnsley copied two messages, each containing about five hundred words. These dispatches show that the "Bowdoin," the little ship in which the McMillan party ventured into the far north, is in winter quarters in Flagler Bay, near the 80th parallel, between Ellesmereland and Greenland.

The water is freezing rapidly, according to the messages and there is a foot of snow on the ground.

A significant bit of information contained in the messages ticked off by Donald Mix, the operator on the "Bowdoin," is the fact that the crew discovered a tablet presented to Dr. McMillan and buried in the provisions in such a manner that the tablet would not be revealed for some time after the ship had reached the far north.

The tablet was given by the Theta Delta Chi fraternity, members of an Eastern school. The significance of the fact that its discovery was reported in the dispatches received and transmitted by Mr. Barnsley is that nobody knew that the tablet was hidden in the provisions except E. F. McDonald, Jr., of the Chicago Radio Laboratory and the Zenith Edgewater Beach Hotel broadcasting station, WJAZ

Mr Barnsley, therefore, proves beyond a doubt that he is receiving messages from the "Bowdoin" when he mentions the tablet. The ship is equipped with sending apparatus in charge of Donald Mix, chosen by the American Radio Relay League for the important assignment The ship also carries a powerful Zenith receiving set.

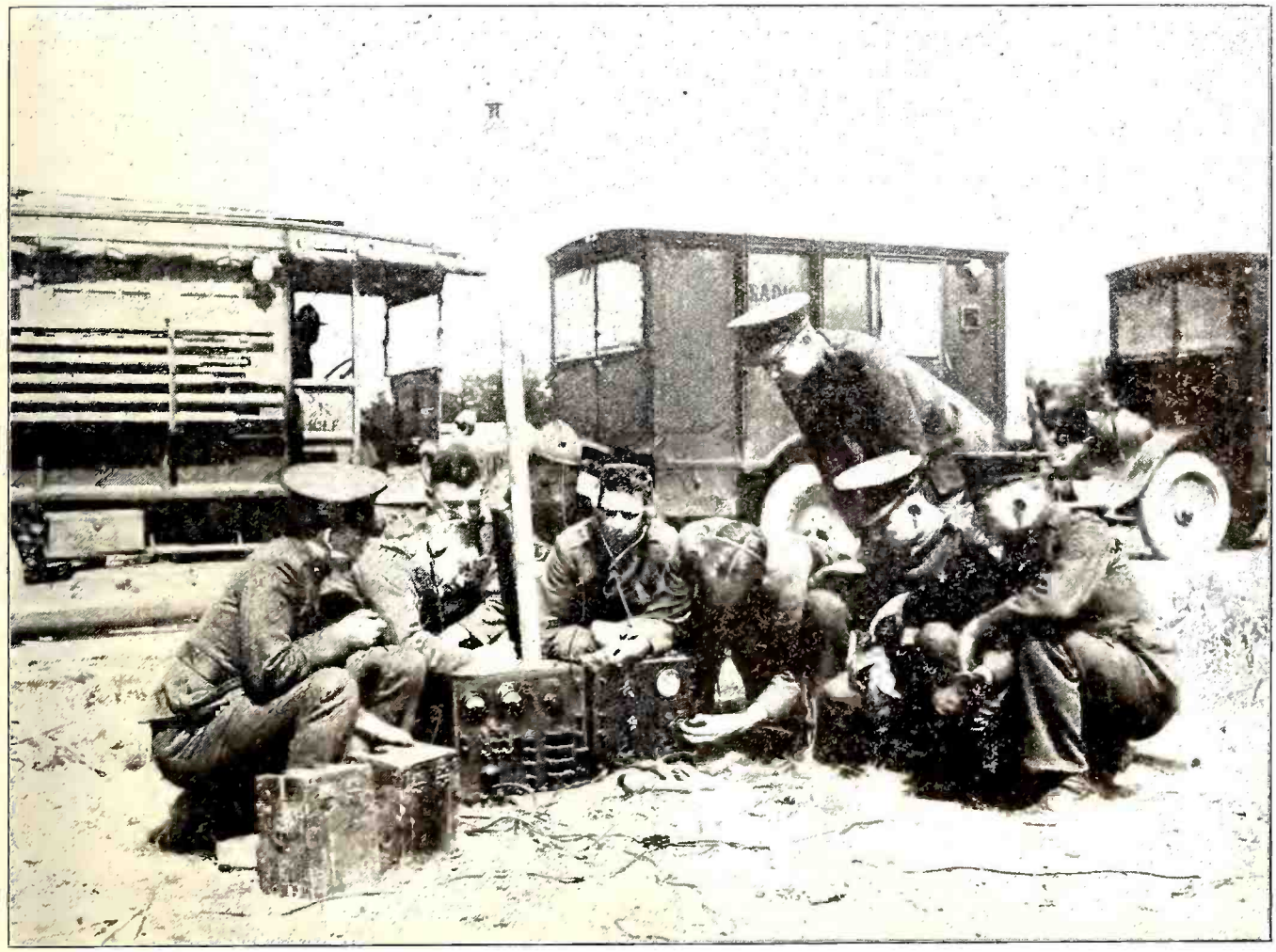
Captain MacMillan first got his idea of taking radio on his trip northward to the pole at a "duck dinner" given him in Chicago last spring At the dinner Captain McMillan met E. F. McDonald, Jr., who explained the value of a receiving set as a means of getting news, concerts and other matter from the States during the long stretches of Arctic solitude, which is the real hardship of the North, according to the captain.

At first the explorer explained that limited space prevented the installation of a set, but later he agreed that it would be fine for his men. As soon as he was "sold" on the receiving end, Mr. McDonald and a friend began to expound the greater value of a transmitting set, incidentally mentioning the possible distribution of information and stories to the world at home. The captain finally decided he wanted a complete radio outfit, and some declare that the equipment will make him the most popular Arctic explorer, whether he gets to the North Pole or not.

Shortly after the dinner, representatives of Mr. McDonald's firm, visited the Bowdoin, and outfitted her with sending and receiving equipment of the latest design. Through the cooperation of the American Relay League and the North American Newspaper Alliance, the world is now hearing of McMillan's progress, while he and his crew receive the daily broadcasts just as we all receive them here at home.

Though icebound and in darkness through the long winter months of the North Pole, trading posts in the Arctic zone will not be entirely isolated from civilization and life. According to plans made by the Hudson Bay Company, lonely posts will be provided with radio receiving sets so as to secure enter-

(*Continued on page 32.*)



U. S. marine radio experts held their annual maneuvers near Waynesboro, Va., in September. They can place this field set, with its forty-five foot aerial, in position and have it in full operation in less than two minutes. They have equipped trucks, airplanes and tanks with radio. Official Marine corps photo.

This is the way Ray D. O' Nutt solved (?) his lighting problem. Try it on your meter.

Round the World

Washington, D. C.—As a means of international communication, radio is spreading its invisible circuits throughout the world with increasing rapidity. During the past month plans for ten gigantic stations in as many countries have been reported to the communication experts of the Department of Commerce.

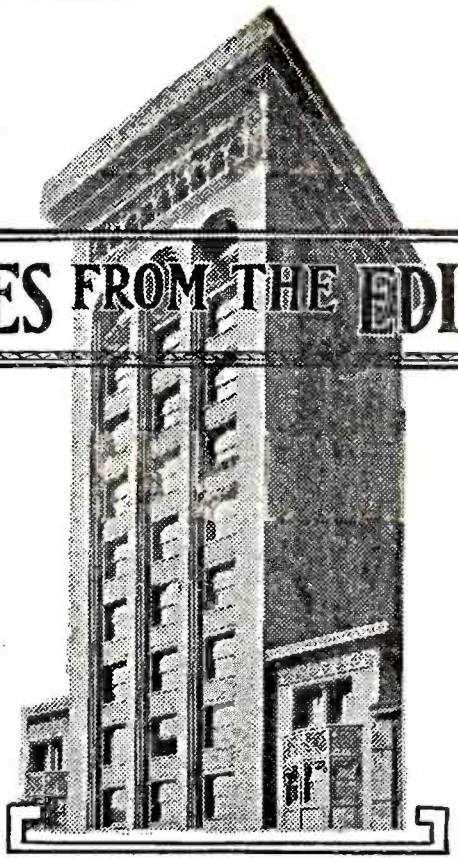
In Europe practically every country is negotiating for large commercial stations. A transmitting plant at Warsaw, Poland, will be opened for business within a few weeks; Italy has a new station at Coltano; Goetberg, Sweden, started up recently; while in Holland, a station at Kootwijk went on the air a short time ago, transmitting especially to the Netherlands Indies.

The French Wireless Company is building a 100 Kilowatt station, estimated to cost over $400,000, near Belgrade, Jugo-Slavia, for the government. This first big Balkan station will insure the immediate dissemination of news and information to the world. Russia has granted this French company a five year contract for the construction of several wireless stations.

The British government has adopted a new radio policy, it is understood, which will permit private or commercial .adio concerns to erect and operate high-powered stations in the United Kingdom and the Colonies. The government post officials, however, will not relinquish any part of the existing radio chain, but in addition will probably continue with the plans for a high-powered station at Rugby, England. The Marconi Company and the Eastern Telegraph Company have applied for licenses, the former having an agreement with the Union of South Africa and Canada for the establishment of stations capable of communicating directly with England. The Eastern Company hopes to link India with England by radio.

Difficulties in good radio transmission in Japan are expected to be overcome and bigger and better radio communication established as soon as rehabilitation is well underway. Recent advices from Nippon indicate that a land line from Tokyo to Iwaki has been strung, making through communication to the stricken city possible with the outside world for official and emergency traffic. Radio codes are prohibited temporarily for commercial messages in an effort to save errors and repetition.

China is perhaps the most backward of the Far Eastern nations to accept radio, but due to political handicaps there this country is relying on cable communication; there is, however, the United States Naval Radio station at Peking, which has a circuit with Cavite, direct.



THOUGHT WAVES FROM THE EDITORIAL TOWER

ADD the name of Taki Yonemura to your list of radio heroes. When you were reading those first thrilling accounts of the disaster that wiped out great sections of Tokio and Yokohama on September 1, you were reading the words that Yonemura was sending from the Japanese government wireless station in the little fishing village of Tomioka, 144 miles from Yokohama.

Yonemura was the only man in the station who knew anything of English. He knew it imperfectly. He had practically no knowledge of the continental wireless code.

Cables were broken and useless. Telegraph lines were down and the scene of the tragedy was utterly cut off. Ships in the historic harbor of Yeddo were battling a tidal wave. At any rate their radio equipment was not equal to the transmission of any adequate account of the terrible loss of life and property. If the world were to know about the earthquake, fire and tidal wave Taki Yonemura must tell the story. Taki told it.

For days he stuck by his station, translating Japanese into the difficult code, working his key when earth shocks threatened to trap him in the ruins of his station.

Taki transmitted about five thousand words before communication was established with other points in Japan. His was the first intelligence of one of the greatest disasters in history and his was the continued news service, hour after hour, that carried the story of the cataclysm around the world. Day after day he stood by, struggling with an unfamiliar language, answering every call that came 4,700 miles across the Pacific. When the earthquakes shattered his instruments he repaired them and came on the air again with characteristic Japanese apologies.

On this side of the Pacific his messages were picked up by Radio Corporation stations and transmitted to newspapers and press associations.

Taki Yonemura's construction of sentences was almost ludicrously involved. He wrote dispatches that reminded receiving operators of the famous "Letters of a Japanese Schoolboy," and when a particularly difficult passage in English confronted him he reverted to Japanese. At the end of each message he said, "Please, not no more this time."

The writer has lived in Tokio and Yokohama and he recognizes Taki as a type of the polite Japanese who may belong to the "Yes, we have no bananas" school of letters but he means to be courteous, even though he backs into somebody when making his bow. If you complain to a Japanese waiter that the soup is cold he will smile brightly and exclaim "I am very sorry for you."

Seriously, Taki Yonemura has proved several things to the world. He has again demonstrated the fact that radio has a utility that no longer can escape the thoughtful attention of the public. He has proved again that cables and wires can be dispensed with in emergency and that a new means of communication has been brought to a busy world. Any advance in methods of communcation means a step toward better civilization. Lastly, Taki Yonemura has proved again that the Japanese has steadfast courage.

The same radio that brought the news from Tomioka helped to broadcast appeals for the relief fund that will go to relieve the suffering in the Island empire. Yonemura's work hastened the organization of this world-wide act of human kindness and was therefore of untold benefit to his countrymen. The Japanese keenly appreciate heroism. Here's hoping the lone keypounder in the little fishing village will not be overlooked when the empire awards its laurel wreaths for noble action done in the hour of horrid tragedy.

As for America, Taki, our hats are off to you.

His Last Sermon

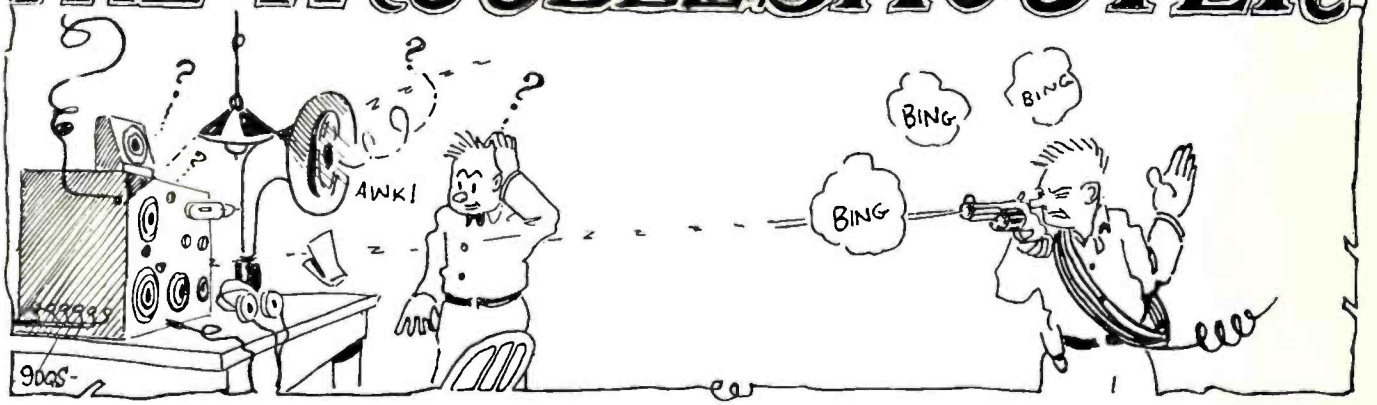
An aged resident of Trumansburg, N. Y., on his deathbed, listened in with members of his family to a radio sermon delivered by the Rev. G. A. Bierdemann, pastor of the Trinity Evangelical Lutheran Church, of Albany, N. Y. The sermon was broadcast from WGY, the Schenectady station of the General Electric Company. Thomas J. Carman, in writing WGY of the reception of the sermon by his father-in-law, stated:

"My father-in-law, who is past ninety, is on his deathbed, and although he can live but a few days, he still has all his faculties. He has always been a sincere Christian. Yesterday morning I asked him if he cared to hear a sermon. He said he did, so we moved our receiving set to his bedside and we all listened to the Rev. G. A. Bierdemann's sermon through your station. After the service father said he heard every word. His wife and I also listened in. Had Dr. Bierdemann prepared his sermon especially for us he could not have made it more comforting."

Radio's Useful Voice

Chicago is using radio in bringing to the people the lesson that the motorist must not speed and must not drive carelessly. With almost five hundred fatal accident thus far this year, Chicago is making a determined effort to bring about a traffic reform. The mayor's safety commission has enlisted the broadcasting stations in the work of carrying warnings to the public and the same educational campaign is being conducted on movie screens and in newspapers.

THE TROUBLESHOOTER



The technical department sends out many replies to questions in each day's mail. In order to assure prompet service to our subscribers the direct reply method hereafter must be restricted to those fans who are on our subscription list.

Fans who are not subscribers may obtain this service by enclosing 50 cents with their question and the reply will be mailed at once, accompanied by circuit diagram where illustration is needed.

All inquiries should be accompanied by self-addressed and stamped envelope.

R. B. T., Chicago, Ill.

Question: Will you kindly advise me the best kind of wire, and dimensions to use on an indoor loop antenna? Would it work just as well to arrange wires upright as in a loop? Any information you can give me will be appreciated. The range I would like to cover is about 1,500 miles with an indoor antenna.

Answer: You will require a very sensitive circuit to do this work, and I am showing in Figure 2 an arrangement which will work very nicely if you have a door handy. The number of turns used on this loop will be entirely a matter of experiment. Another method which you may use is to run a No. 18 D C C wire of the common bell wire type around the picture moulding the number of times depending upon the size of the room and the type of set used.

A. E., Chicago, Ill.

Question: I have assembled a two-stage radio, detector and two-stage audio receiving set on which the stations WMAQ and WJAZ come in so terrifically loud that I am compelled to burn the detector tube very dim. Stations KYW, WDAP and WPAD on 360 meters come in very faint with all of the five tubes burning and I can seldom hear stations on waves lower than 360. Can you give any remedy for this?

Answer: The limitations of your set are probably caused by the fact that the radio frequency transformers which you are using were not designed for wavelengths of 360 meters and lower, and therefore do not respond to signals of these lower frequencies. Your transformers are probably designed for use on waves of from 400 to 500 meters. The only thing to do would be to use either tuned radio frequency or to substitute transformers of the correct design for the 360 meter wave.

E. C. Westmount, Montreal, Canada.

Question: I constructed the Hopwood circuit as published in the July issue of RADIO AGE, using a 23-plate condenser in the aerial instead of a 43-plate. I have tuned in to date ten stations all over 500 miles away but have much difficulty with reception because of body capacity. All the parts of the set squeal when I touch them, even the rheostat and headset. What can I do to prevent some or all of the body capacity? If I put a 43-plate condenser in the aerial would it improve reception?

Figure 7

Answer: I am glad to hear that you are getting such good results with the set, and would advise that some of the body capacity may be removed by placing the condenser in the ground lead with the rotary plates to the ground. You might try shielding the panel with tinfoil, and if it is possible, set the variometers back further in the cabinet with extended shafts so that the hands do not come in proximity to the apparatus. Another good experiment is to ground the negative filament. When a set is affected by body capacity, it is a good sign that the set is very sensitive, and that the least change in the capacities and the parts surrounding will change the wave length of the set. The rearranging of the apparatus might help.

C. D. W., Jr., St. Louis, Mo.

Question: Last spring I built a Kopprash set according to the article in the April issue of your magazine, and have had excellent results with it. Even through the summer months of static, I was not bothered appreciably by atmospherics and could get stations as far as WGY with only one stage of audio. I would like to know if any improvements have been made in the Kopprash hookup since the article was published, and if it would be possible to add radio frequency with any degree of satisfaction. If so, please advise whether tuned or untuned radio frequency would be the best to use, what make and ratio transformers would give the best results, and whether the WD11 and 201A valves could be used in connection with the above addition.

Answer: Sorry, but we have no circuits of the addition of an RF stage to the Kopprash circuit as yet, but are glad to inform you that the engineers of the Technical Department are now

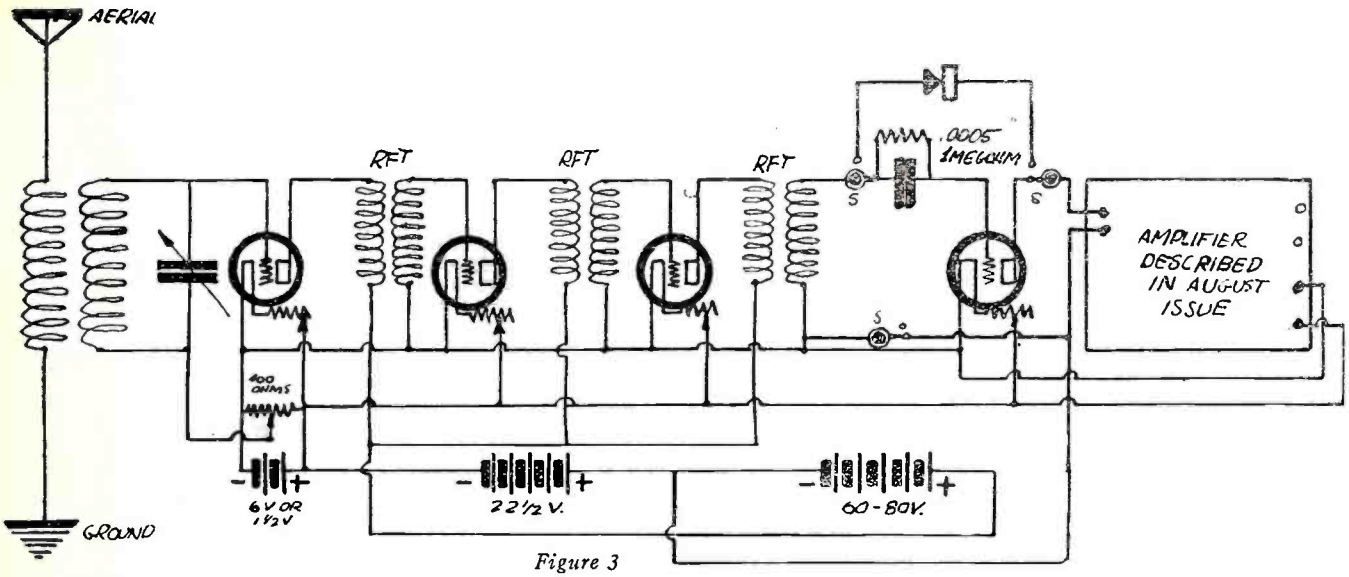


Figure 3

busily engaged in a series of tests with the above circuit in connection with the radio frequency component, and we will as soon as the experiments bear fruit publish a resumé of the best arrangement to use. As soon as the information is ready, I shall promptly send you a copy of the circuit.

J. K., Bridgeport, Conn.

Question: Please print a diagram of a circuit employing three stages of radio frequency and three stages of audio frequency with two variable condensers and a variocoupler as tuners. I would like to have this circuit contain a vacuum tube detector and also a crystal with an arrangement so that either crystal or valve detection may be used. Would the use of one potentiometer on each stage of radio frequency and one on the first stage of audio frequency increase the efficiency of my set?

Answer: I am printing in Figure 3 the circuit you wish. The use of the crystal detector on signals of average audibility will give a clear, undistorted signal, while the tube may be used while doing long distance work. Either arrangement may be used by turning the series-parallel switch bo the proper points. I do not think much will be gained by the use of more than one potentiometer. It should be placed in the first stage of RF and connected across the A battery as indicated on the circuit diagram.

W. E. B., Chicago, Ill.

Question: I am a very recent subscriber, but am taking advantage of your offer to answer questions without loss of time. My aerial consists of two 7 strand copper wires, 57 feet long, about 35 feet high, with a lead in of about 40 feet. Would suggest using three or four wires instead of two? Please advise me. I have just made a Reinartz set with detector and one stage of AF amplification, using UV 199 tubes. I am using two 14-plate vernier variable condensers, and have not been able to get the higher wave lengths. I have room for a 23-plate condenser in the set, and would like to ask if you think this will help if I put it in the place of the 14-plate in the antenna circuit? There is a hum in my sets, (I have used several) which I think comes from a transforming station of the local power company, about four blocks from my home. Is there any suggestion you can make to help this? I am enclosing a sketch of my aerial.

Answer: From your sketch I conclude that your antenna is a good one, and would not advise your adding more wires to the present number, as it will only make it tune broader and make it more susceptible to atmospherics. About the only improvement you could make is to connect the two wires of the antenna together at the end opposite the lead in. This will make the wires tune more sharply. The September issue contains the information necessary for the loading of the Reinartz circuit. I am printing in Figure 1 a trap circuit which is sometimes effective in excluding the interference from the 60 cycle power lines. Would advise that you place your aerial at right angles to the source of interference if possible. This interference might not necessarily be due to the transforming station, but might be due to supply line or transformer leakage in your immediate vicinity. Would advise that you make a careful search to ascertain whether your aerial does not run parallel to some supplying line or does not run close to a power transformer.

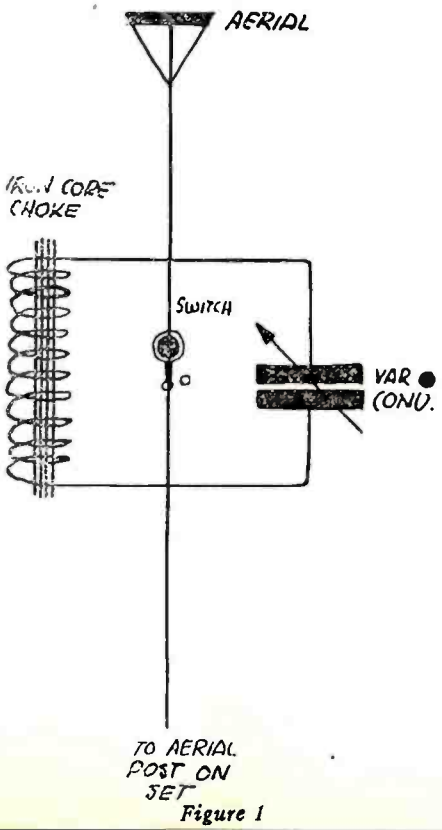


Figure 1

E. McG., Eau Galle, Wis.

Question: Here's shooting some questions at you. In the Hazeltine Neutrodyne circuit, I notice the tuning range is from 180 to 500 meters. How could it be made to reach 540 meters? What is your opinion of the latest Erla 3 tube reflex circuit? Is it better than the Neutrodyne? What I am after is the most efficient 2 RF detector and 2 AF set out. What is your answer from the many good circuits. I want ease of tuning and quiet or not too noisy while doing it, if possible. Is the Cockaday Four Circuit tuner a better circuit than the Reinartz?

Answer: The wave length range of the Hazeltine Neutrodyne circuit may be raised by the proper addition of additional turns on the transformers, more capacity in the condensers and the use of a larger coupler. Have not had any experience with the circuit mentioned, but if it is recommended by the Erla people, you will no doubt find it reliable. You will find a Reinartz circuit, of which I am enclosing a sketch of the type of circuit you desire. The Cockaday and Reinartz give about equal results, depending upon construction, operation and the location in which the set is operated. You will find the Reinartz easier to tune and operate, and less expensive to construct. The approximate wave length of the Cockaday set with the average antenna is from 550 to 180 meters.

I. J. H., Chicago, Ill.

Question: Would like to know if it is possible to obtain a copy of the Grimes Circuit with a list of the parts required to build the set. I am very much interested in radio and would like to get a diagram of a set that will receive from distant stations and also be able to tune out some of the local stations. I have built several sets from diagrams taken from different magazines, and none of them seem to be able to pick up distance. If you people have a diagram of a set that you believe to be good, please let me have a copy.

Answer: The description and circuit of the Grimes Inverse Duplex System was printed in the July issue of RADIO AGE. I am enclosing herewith a list of circuits of efficient nature which are all close tuning sets, but would advise that you construct the circuit marked X of which there appears a diagram in the September issue of RADIO AGE in the Troubleshooter section Figure 2. This with a trap or filter as described in the July issue, "Little Things that Help," section should make about the most efficient tuning arrangement I know of.

C. H., Milwaukee, Wis.

Question: As a subscriber to your interesting magazine, I would like you to help me out in the following matter. I have an All-American audio frequency transformer, ratio 10 to 1 of the unshielded type, and find the binding posts marked only P and S. I am at a loss to know which to connect to the plate and B battery, and which to the grid and negative filament. What would you suggest?

Answer: I am enclosing herewith a sketch showing the possible connections of this transformer. Would further advise that you trace the wiring from the binding posts to the coils to determine where the winding starts and where it ends. The start of the primary winding marked P is usually connected to the plate of the detector tube and the other end of the winding P is connected to the positive 22½ volt B battery in the detector circuit. The start of the S (secondary) winding is usually connected to the grid, while the other end is connected to the negative filament. The best way is to experiment with the connections to the primary and secondary coils and when results are realized to mark them down and choose the best.

L. M. C., Washington, D. C.

Question: Will you please publish in your magazine a diagram showing me how to hook up an Atwater-Kent variocoupler and detector unit with a variometer and condenser of 23 plates. I have the above instruments but do not know how to assemble them, and would appreciate your help very much.

Answer: A circuit adaptable to your apparatus was published in the July issue of RADIO AGE on page 17, Figure six. The set is a very efficient one, and using the apparatus you mention, the set should have a substantial range.

E. J. D., Minneapolis, Min.

Question: I am located in Minneapolis, and am having trouble with interference from amateur stations. Please give me correct information on an ideal antenna.

Answer: In our June number of RADIO AGE an article was published on the design, construction and maintainance of wireless antennae, and would refer you back to that issue. If you are having trouble from amateur sources would advise the use of an aerial of about 35 to 40 feet in length and not over 35 feet high. With lead in, it should not exceed 65 feet. This will enable you to tune more sharply. With a regenerative tuner, such as shown in Figure 2 in the September Troubleshooter section, you should have no trouble in tuning them out. Or you might use a set such as was described in the April issue. Would prefer the three circuit set in connection with a wave trap as shown in the July number. Restrictions have been placed on all amateur stations, forbidding them to transmit between the hours of 7:30 and 10 p. m., local standard time, and during local church services.

W. F. K, Chicago, Ill.

Question: Will you please publish a diagram of the four-circuit tuner, showing two stages of audio frequency amplification, together with the switch arrangement employed by Mr. Cockaday, for controlling the tone. Will you also please advise if the W. D. 11 or W. D. 12 dry cell tubes can be used, and what changes, if any, are necessary to make their use possible.

Answer: Figure 4 shows the Cockaday four-circuit tuner with two stages of audio frequency amplification together with the tone control arrangement, which you will find very effective. The tone controller consists of a switch lever, three switch points and a fixed mica condenser of .001 M. F. capacity, connected as shown in the diagram. Dry cell tubes will not afford as great a volume when used as amplifiers, but this handicap can be greatly overcome by the use of a C battery in the grid circuit. This will enable you to use a heavy plate voltage and will step up the volume to a marked degree. Connect the C battery as shown in the diagram, taking care that the negative side of the C battery is toward the grid. An ordinary three-volt flashlight cell can be used for this purpose, as little current is drawn from the cell.

H. W. S., Philadelphia, Pa.

Question: I have completed the Grimes Inverse Duplex system and have had very good results in Philadelphia, but have been unable to pick up any out-of-town stations. If you can help me in any way I will appreciate it very much. I am using all the parts specified in RADIO AGE, and hope you can help me.

Answer: I am glad to learn that you are having good results on local stations, and before I go any further would like to remind you that it is still summer, and the weather is not as favorable to radio as it might be. First try rearranging the sequence of the bulbs, i. e. try the different tubes in different sockets. Reverse the transformer connections. Procure a variocoupler, and connect it in the usual way to the aerial, connecting the secondary in place of the loop. If the set is working properly, this should surely give the desired results, providing your location is favorable. If all of the above fail, tear down the set, and test the RF component for the best results, and adjust the plate battery of the detector tube until you get the signals you wish to hear.

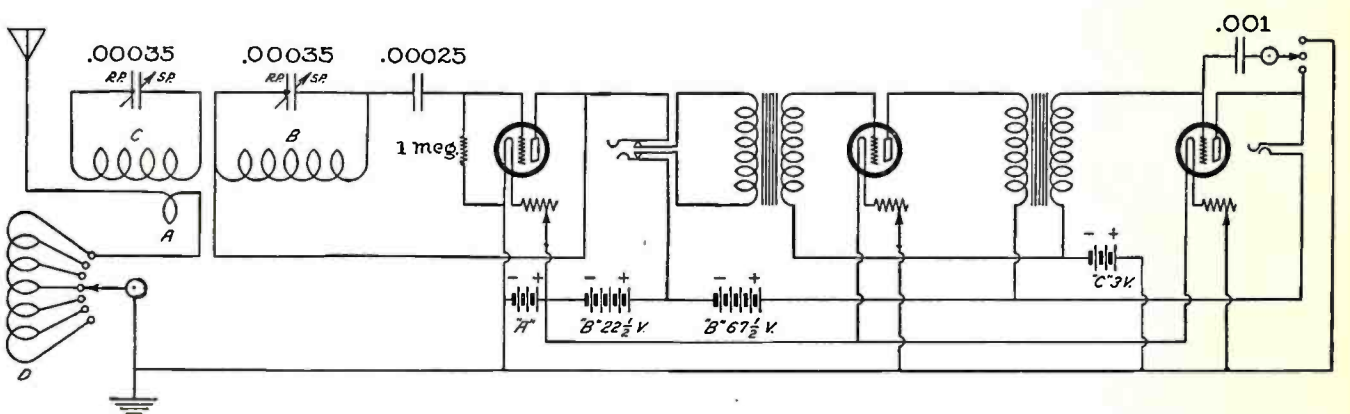


Figure 4. This shows the Cockaday Four Circuit Tuner in connection with the tone modifying arrangement and with C batteries, used when W D 11 tubes are used as amplifiers.

Pick-up Records by Our Readers

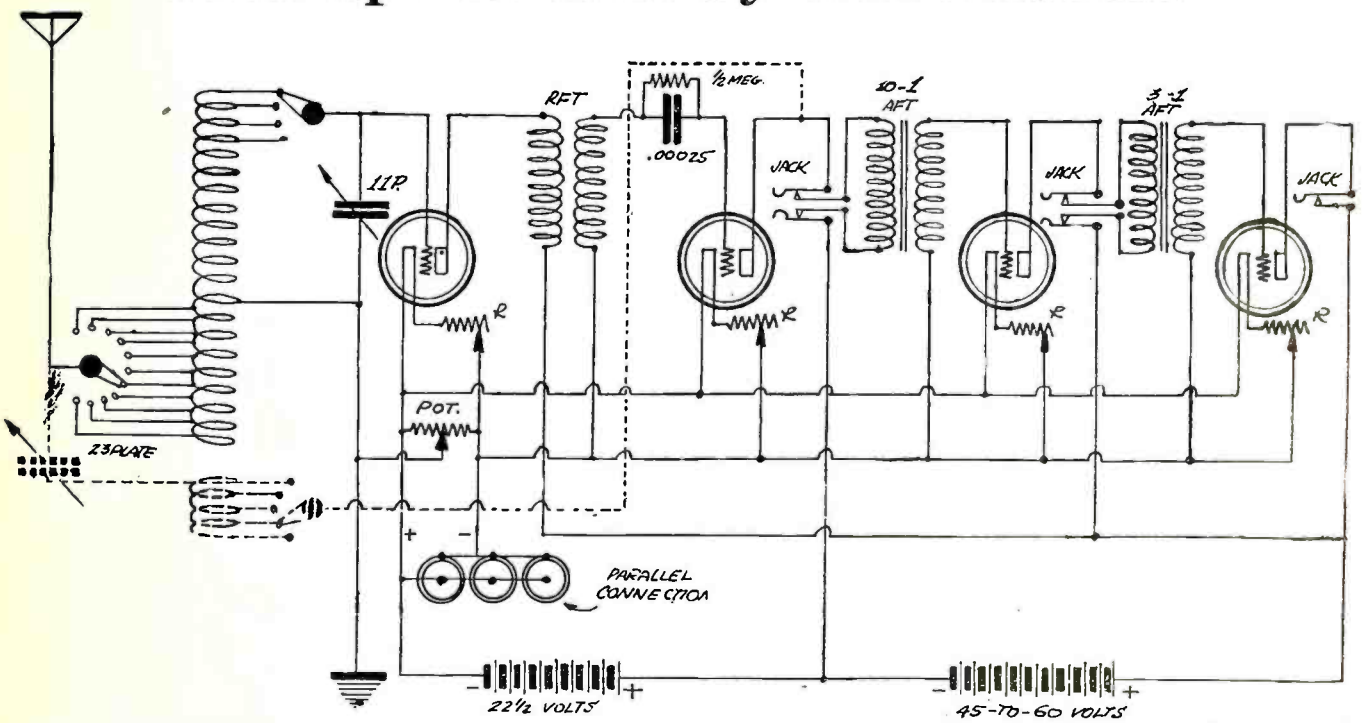


Figure 1. This is the Reinartz circuit, showing how Mr. Tuck changed the circuit by taking out the plate coil. This is indicated by the dotted lines.

THAT summer weather and Old Man Static couldn't phase some of the bugs is evinced by many letters from our interested readers. Many have been successful in hearing distant stations right through the worst atmospherics and fading, and write us that they had much fun in listening under adverse conditions. Now that ideal radio weather is prevalent and that our ranges are increasing "day by day in every way" we should be getting more pleasure and satisfaction out of the game. If you do any consistent or unusual DX work or have any helpful hints, drop us a letter with the detail concerning the matter, and let the rest of the BCLS hear about it. Don't forget that photos of your station are always welcome. Give us a buzz.

THE EDITOR.

RADIO AGE,
Gentlemen:

I wish to thank you for the hookup you sent me and to tell you what results I am having with it. I have heard the following stations with it in the single week since I got your information: WDAP, WSAI, WOAW, WOC, WFAA, WJAZ, WSB, and WMC. As the weather improves and conditions are more favorable, I expect to do even better. The stations here in town are all within six blocks of my set, and are going until late so I don't get much opportunity to do more. I have read every radio magazine sold at the news stands and I can truthfully say that RADIO AGE is *far* superior to any magazine I have as yet read or seen. Again thanking you for the hookup, I remain,

Yours very truly,
S. A. STEVENSON.
2590 Grand Avenue, Kansas City, Mo.

Mr. Stevenson's set is a simple one-tube circuit in connection with a one-stage audio frequency amplifier, It tickles the Technical man pink when he gets a letter showing that the fellows get good results from his suggestions, and we modestly thank Mr. Stevenson for his generous comment on RADIO AGE.

Even the fans up in Canada are wise to the value of RADIO AGE as a *real* radio magazine, Read the following letter from a Canadian BCL who lets the hookups appearing in RADIO AGE be his guide:

Gentlemen:

I have been using a Reinartz with two stages of Audio amplification since last September and have had wonderful success with the set. This month I decided to add one stage of radio frequency to the set, but after making the connections found that it would not work quite properly. My transformer is the best that can be bought and I took particular care to solder all points in the wiring. By accident I discovered that by throwing out the switch on the inner coil, and setting the feedback condenser at zero, I could not only get results but the stations came in much louder and clearer than ever, and the set tuned much sharper than I have ever heard it before. Today I removed the condenser and switch, also the wire to the plate of the detector tube and the music from Schenectady and Pittsburgh came in so loud that you would think the programs were being executed in the same room with you. It looks like a good improvement to me as the set is very selective and has only the one condenser to tune with. Stations come in one degree apart on the condenser, and do not cause interference. I would like to have Mr. Pearne give his opinion on the subject. I am enclosing a photo of my set which was taken before adding the Radio Frequency. The horn is from an old phonograph and I use a type C Baldwin receiver to make up the loud speaker. Last winter I heard, in all, sixty stations in the United States and Canada all on the loud speaker. Of course not all of them were loud enough to be of entertaining value.

I am enclosing herewith my subscription renewal as I think it has just about run out, and ask that you write me your opinion on the above as I value your judgment above *all* others having tried out several hookups recommended by your technical writers in RADIO AGE.

Very respectfully yours,
H. ORVILLE TUCK.
Box 164, Grimsby, Ontario, Canada.

A diagram of Mr. Tuck's set is shown in Figure 1. The photo of his station appears in Figure 2. That's clever stuff, Mr. Tuck, and we are certainly glad to have you continue as one of our readers. Mr. Pearne says that when the plate coil and feed-back condenser were removed, you removed the regenerative phase of the Reinartz set. Quoting the September issue PP 32:

"Regeneration when used with radio frequency does not always give gratifying results, and the experiment is left entirely to the judgment of the builder."

Fine business, Mr. Tuck. This is probably just what many of our readesr using this circuit are interested in trying, and we feel very grateful for your kind letter and comment.

Little Things That Help

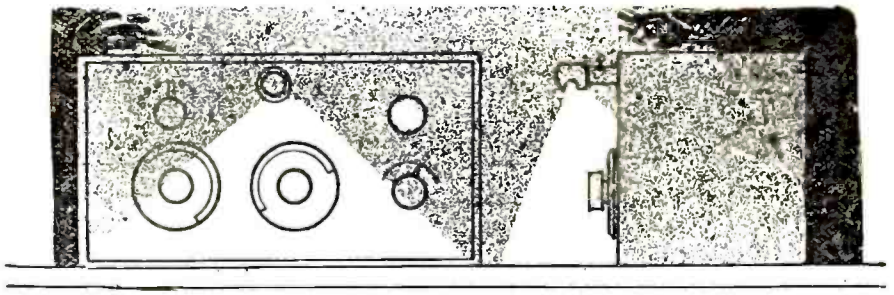


Figure 1. You can improve the appearance of your set by adding this simple accessory, at the same time solving a problem which has been the source of much trouble.

A Solution for the Fan's Electric Light Bill

By Mrs. Luella B. Lyon

A BCL, no matter what sort of lighting fuel he is consuming nightly, finds it a bit of worry. Lights keeping the family awake or the roomer with a radio and the landlady watching the transom to see how long the light burns and so on is, and has been a constant source of trouble. My husband determined to cut such a meter bill in half, and spent considerable time in devising a scheme that would do this cheaply and efficiently.

Eureka! He has at last found it. He has purchased one of those ordinary shaded dash lamps for an automobile and mounted it slightly above the center of our set as shown in Figure 1, where it throws out its beams from one end of the panel to the other. No more glaring lights when only a light for the operator is needed. This simple device is fastened on the panel by two small screws and the wires behind the panel coming from the storage battery. He believes in the near future all sets will be sold with these lamps on them and perhaps inverted into the panel, which would be even more desirable. The lamp draws so little current from the storage battery that its cost is negligible.

Read these letters from fellows who "Let our Hookups be Their Guide."

RADIO AGE,
Gentlemen:

After reading of a report of Mansfield, Ohio, receiving Omaha on one tube, using Reinartz hookup (August issue), I am prompted to advise you that I listened to WHAZ, WGY, WLAG, and WDAF on August 27, using Reinartz hookup with a U V 199 and dry cell batteries. This was during an electrical storm and the static was very bad, according to old-timers. I am a novice and had some trouble with my set as I built it from an article appearing in the ——— which was probably written before the change in wavelengths. I added two L 25 coils one each in the primary and secondary circuits and find it helped quite a bit. This was done according to the directions as appeared in the September number. The night I mention above was the first "silent" night here after I finished my set. I had the same stations on the 3rd of this month and in addition, listened to WOS at Jefferson City, Mo.

Very truly yours,
W. E. BENTLEY.

4431 North Maplewood Avenue, Chicago, Ill.

Mr. H. Robert, of 227 Union Street, Schenectady, N. Y., writes: "Please allow me to commend you for the plain drawings and hookups that appear in your paper from time to time,"

We are glad that we could help Mr. Bentley out, and wish to hear from him again. Thanks, Mr. Robert—we're glad you like our illustrations, and wish to say, that many others believe the only real way to get radio information is to read RADIO AGE, and *let our hookups be your guide.*

Here's a letter from a twelve-year old boy, evidently a radio bug to the core; RADIO AGE:

I think I can equal or pass up any records that have been made by people during the summer months and I know that I can sass Ross T. Hatton of Omaha, Nebr. It was the first time in two weeks that I tuned the set, which is a three-tube set, using two stages of audio frequency. Here's a list of seventeen stations I picked up on August 24:

WDAP WIP KYW KDKA WMAF WFI WLW WRC WHAS WOO WGY WJZ WEAR WHAZ WCX WHN and NAA.

It required only one hour and forty-eight minutes to do my stuff. I am twelve years old.

Very respectfully yours,
WILLIAM HABERCAM.
503 E. 35th Street, Baltimore, Md.

That's the detector's cat whisker, ain't it? A lot of old-timers will have to take a back seat for this little dyed-in-the-wool radio bug.

And you radio bugs with eight tube sets, plug in another stage of radio frequency and audio frequency and gnash your teeth while you read this one:

Helping the Fan Roll His Own

By Mrs. Luella B. Lyon

Dial pointers are not easily purchased at a small town dealer, so my husband solved his own problem by going to the local ten cent store, where he purchased a small box of aluminum-headed thumb tacks. He placed the tack in his small table vise and proceeded to file the head of the tack until it took on the shape of an arrow. The sharply pointed end was by far handier than glue, and enabled him to tack these arrows thus made directly into the panel above the dials in the manner shown in Figure 2. This pointer method improves operating, inasmuch as the degrees of the scale on the dial can be accurately recorded for station settings, and the stations can be tuned in at will by only setting the dials at the corresponding numbers.

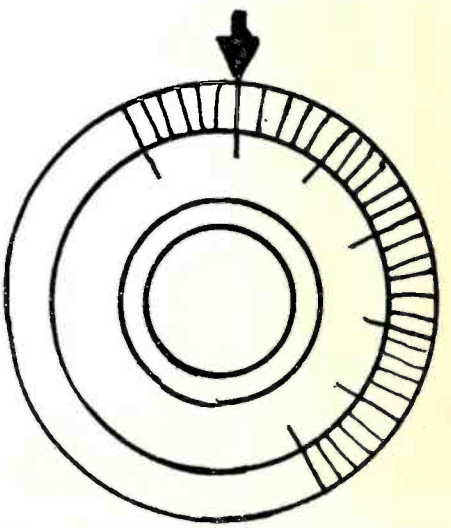


Figure 2. On homemade sets, the builder usually scratches an indicating mark on the panel. Here's another method of solving this really necessary operation.

Hook-up Ideas Are Worth $1

EACH radio fan who experiments finds something about design or operation that will help his fellow fan. Send in your new hook-ups and other original devices, accompanied by clearly drawn diagrams. Radio Age will pay $1 for all such orignal articles and drawings used. Text should be limited to about two hundred words.

Radio Saves Lives

An example of the value of auxiliary radio power in the form of batteries on seagoing vessels and the necessity of their frequent inspection, is found in the report on the total loss of the steamship "Advance."

When the "Advance" went aground off Halifax recently, the operator found that his power was cut off soon after grounding, as it was feared there might be a boiler explosion. This made it necessary for him to shift to his emergency batteries for transmitting S O S calls to ships and shore stations. His batteries stood up for one and a half hours, when it became necessary to abandon ship. All lives were saved, due to the bringing of aid by radio.

There would undoubtedly have been a loss of life if the batteries had not been in good shape.

View showing 125-foot antenna towers of Station KYW, on the roof of the Edison Building, Chicago. The top of these towers marks one of the highest points in the business district of Chicago. The wave length of KYW, is now 536 meters and it is one of the strongest in the country.

Chicago's Show

The second annual Chicago Radio Show is getting under way with a speed which is surprising even to its backers. Although the doors of the famous Coliseum will not swing open on the exposition until November 20, more than half the space allotted for exhibitors has already been contracted for and the strongest program of features ever arranged for a radio show is rapidly taking shape.

More than sixty per cent of the exhibitors in the Chicago Radio Show last year have signified their intention of again taking space and the large number of applications received from new exhibitors has been a surprise. Manager James F. Kerr states that the six large spaces fronting on the main aisle were the first to go, being taken by the Chicago Radio Laboratory, Colin B. Kennedy, Frost, American Radio Research, Crosley and Grebe. Practically the whole center of the Coliseum was sold before September 15.

The show this year, in addition to being the largest manufacturers exposition ever held, will be featured by amateur displays planned to bring the attendance to a record point. For this reason contests have been arranged for the best homemade radio receiving set constructed by any amateur in the United States and for the most unique one tube or crystal set built by any school pupil in Cook County, Ill.

In the open amateur contest three prizes of $100, $75 and $50 will be awarded for the three sets judged best by a committee of radio engineers. In the contest for the most unique set three prizes of $50, $35 and $25 will be awarded a committee of competent judges. All of the winning sets will be shown at the show, along with other receiving sets showing all of the popular type of hook-ups.

"We have some other interesting and very unusual contests which we will announce in a short time and which will serve to interest most of the owners of receiving sets in the country," said Mr. Kerr. "From all indications the manufacturer, the jobber and the retailer are interested in the Chicago Radio Show. We intend to interest every radiophan, especially in the middle west. This is the great central market for radio just as much as for all other products and we want to get the trade into closer touch with the ultimate consumer."

There will be broadcasting from the show every afternoon and evening during the six days it is open, by means of sealed wires to one or more of the powerful broadcasting stations located in Chicago. The programs, which are already taking shape, will all be marked by unusual features.

Ten Good Rules

THERE are ten good rules for broadcast listeners:

1. Don't try to hear Australia in midsummer. Be satisfied to enjoy the nearer stations most of the time.

2. Don't be disappointed if an occasional storm interferes with your summer radio evening. There are many fine concerts coming. You can't expect to find a pearl in every oyster nor to receive a record-breaking concert every night.

3. If you want louder signals, use a longer aerial, more tubes, higher plate voltage, more sensitive loud speakers and careful tickler and receiver adjustment.

4. A pleasant signal filling a moderate size room should be enough to give satisfaction. It is not worth while producing signals which deafen the neighbors. It is wasteful to insist on tremendous signals which are generally less pleasant than moderate signals.

5. If your local station comes in too loudly and drowns others out, a smaller aerial will help in tuning him out, with a smaller condenser connected between aerial and ground. And if all measures to get rid of the local station fail, why not enjoy his concerts? He is working hard for you and it is nobody's fault that you are so close to him that you are bound to hear him. Broadcast stations have to be closer to some people than to others.

6. For the new longer waves above 450 meters, use a condenser connected between the aerial and ground terminals of your set.

7. A little patience in learning to handle your receiver yields rich returns in satisfaction from fine signals. Remember that "Rome wasn't built in a day" and keep on getting more and more familiar with your set and how it works.

8. It is a good idea to read the radio column of a newspaper or a good radio magazine or two. It helps you to know how your set works and keeps you up-to-date in radio. Information of this sort is an aid in getting the concerts loud and clear.

9. Ask your radio dealer for advice; he can probably tell you what you want to know and will be glad to do so. The manufacturer of your set also is willing to help you get the desired results from its use.

10. Do not throw away the direction sheets or booklet that came with your set and with the tubes. Read all such material carefully now and then. If you have lost the direction sheets, write to the dealer or manufacturer for another. The direction sheets must answer most of the questions which have been puzzling you and preventing you from getting the best out of your set.

Dutch Radio

Radio telephony, particularly for amateurs, has enjoyed increasing popularity in the Netherlands during recent years. According to opinions in the trade, the next few years should see even greater development in amateur radio telephony in that country. The main activities in Holland are centered in the sale of parts and accessories, but the number of complete sets sold is relatively small, since most amateurs purchase the parts and erect their own stations.

According to best estimates there are at present no less than 4,000 amateur receiving stations in Holland; following the war there were only a score or more receiving stations. The management of Posts and Telegraphs advises that there are about 477 other receiving and transmitting wireless stations in the country.

Permits for receiving stations are readily granted in Holland. Dealers in radio materials are now negotiating with the government for authority to erect a general broadcasting station. The plan is to broadcast concerts and news on a much larger and better scale than is done at present by any Netherlands broadcasting service to amateurs.

Germany has been getting the bulk of Holland's import business, but the greater portion of German goods coming into the country are old war stocks. These goods cost usually anywhere from forty to fifty per cent below American and other competitors in price. Germany, of course, has advantages in the Netherlands on account of proximity of market.

The United States is gaining a better foothold in this market, however, and imports of radio material are increasing. Whereas in the full year 1919 the United States sent only $1,600 worth of radio material to this market, during the first half of the year 1923 there were $12,800 (normal) worth entered.

American goods will probably continue to enter the country on an improved scale, and competent members of the business express the opinion that if American parts and systems were made to conform more to local needs a much larger business would be done. American instruments in this market are as a rule designed for wave lengths averaging around 360 meters. In Holland most radio owners desire around 1,050 meters average and, in a good many cases, up to 2,000 meters is required.

Ready entry of radio material is provided for in Holland, since there are no governmental regulations or restrictions governing imports. The import duty on parts and whole sets is five per cent *ad valorem*.

New French Station

An attempt is being made by local business men in Marseilles, France, to establish a broadcasting station in collaboration with the newspapers of the city. A local dealer in French-made sets is said to be the prime mover in the project.

Complete Corrected List of U. S. and Canadian Broadcasting Stations

Complete Each Issue

THE list of broadcasting stations on these pages is brought up to date each month by additions of new stations and deletion of those which have suspended operation. The list is the product of a vast volume of correspondence and its completeness is due in large measure to the assistance of our special news service in Washington, D. C. Suggestions, corrections and additional data will be welcomed from readers. Broadcasters: Send in your program schedules.

IXAD, Pawtucket, R. I. 1000 miles; Special license experimental; Standard Radio & Electric Co.
KDKA, E. Pittsburg, Pa.; Class B station Westinghouse Elec. & Mfg Co.
KDDW, Steamship America, New York.
KDPM, Cleveland, Ohio Westinghouse Elec. & Mfg. Co.
KDPT, San Diego, Calif.; 244 meters; 50 watts; Southern Electrical Co.
KDYL, Salt Lake City, Utah; news music, entertainment, Telegram Publishing Co.
KDYM, San Diego, Cal.; Savoy Theatre; 252 meters 100 watts
KDYQ, Portland, Ore.; Oregon Inst. Technology.
KDYS, Great Falls, Mont.; Class B, Great Falls Tribune.
KDYW, Phoenix, Arizona; Smith Hughes & Co.
KDYX, Honolulu, T. H; 12:15 to 1.15 p. m., stock reports and weather; 6:30 to 7:30 p. m., music, lectures; Sunday, 11 a. m. to 12:30 p. m., sermons; Honolulu Star-Bulletin, Ltd.
KDZB, Bakersfield, Calif.; Frank E. Seiffert.
KDZE, Seattle, Wash.; 455 meters; 500 watts; The Rhodes Co.
KDZF, Los Angeles, Calif.; Automobile Club of Southern California.
KDZI, Wenatchee, Wash.; Electric Supply Ca.
KDZK, Reno, Nev. Wednesday 8 to 9 p m; Friday 8 to 9 p m. Musical and news features; Nevada State Journal, Nevada Machinery & Electric Co.
KDZQ, Denver, Colo. Pyle & Nichols, 1247 Broadway.
KDZR, Bellingham, Wash; 261 meters, 50 watts; Bellingham Pub. Co.
KFAD, Phoenix Ariz.; Class B, McArthur Bros. Mercantile Co.
KFAE, Pullman, Wash.; State College of Washington.
KFAF, Denver, Colorado; George S. Walker, Western Radio Corporation; musical programs, news items, etc., daily except Tuesday and Sunday, 8 to 9 p m; mountain standard time.
KFAJ, Boulder, Colo.; University of Colorado.
KFAN, Moscow, Idaho; Electric Shop.
KFAP, Butte, Mont.; Standard Pub. Co.
KFAQ, San Jose. Calif.; City of San Jose.
XFAR, Studio Lighting Service Co., Hollywood, California 280 meters, 200 watts.
KFAU, Boise, Idaho; Class B, Boise High School.
KFAV, Venice, Calif.; Abbott Kinney Co.
KFAW, Santa Ana, Cal.; 280 meters; 10 watts; Radio Den.
KFAY, Central Point, Ore.; W. J. Virgin Milling Co.
KFBB, Havre, Mont.; F. A. Buttrey & Co
KFBC, Phoenix, Ariz.; Nielson Radio Supply Co.; 238 meters; 10 watts.
KFBE, San Louis Obispo, Calif.; R. H. Horn.
KFBG, Tacoma, Wash.. First Presbyterian Church.
KFBK, Sacramento, Calif., 283 meters; 100 watts; Kimball Upson Co.
KFBL, Everett, Wash.; Leese Bros.
KFBU, Thomas, Bishop, N. S., Laramie, Wyo.; 283 meters, 50 watts.
KFCB, San Diego, Calif.; 278 meters; 20 watts; W. K. Azbill.
KFCD, Salem, Ore.; F. S. Barrin.
KFCF, Walla Walla, Wash.; Frank A. Moore.
KFCH, Billings, Mont; Elec. Service Station.
KFCK, Colorado Springs, Colo.; 242 meters; 10 watts; Colo. Springs Radio Co.
KFCL, Los Angeles, Calif.; Los Angeles Union Stock Yards.
KFCM, Richmond, Calif., Richmond Radio Shop.
KFCQ, Casper, Wyo., Motor Service Station.
KFCP, Ogden, Utah, Ralph W. Flygare.
KFCV, Houston, Tex., Fred Mahaffey, Jr.
KFCY, Le Mars, Ia.; Western Union College.
KFCZ, Omaha, Neb.; 258 meters; 100 watats; Omaha Central High School.
KFDA, Baker, Ore.; Adler's Music Store.
KFDB, San Francisco, Calif.; Mercantile Trust Co.
KFDD, St. Michael Cathedral, Boise, Idabo. 252 meters. 10 watts.
KFDH, Tucson, Ariz.; Univ. of Arizona.
KFDJ, Corvallis, Ore.; Oregon Agri. College.
KFDL, Denver, Colo.; Knight Campbell Music Co.
KFDO, Bozeman, Mont.; Everett H. Cutting.
KFDP, Des Moines, Ia.; Hawkeye Radio & Supply Co.
KFDR, York, Nebraska; Bullock's Hardware & Sporting Goods.
KFDS, San Francisco, Calif.; John D. McKee.
KFDU, Lincoln, Nebr; Nebraska Radio & Elect. Co.; 240 meters; 20 watts.
KFDV, Fayetteville, Ark., Gilbrech & Stinson.
KFDX, Shreveport, La.; First Baptist Church.
KFDY, Brookings, S. D.; South Dakota State College of Agriculture and Mechanical Arts.
KFDZ, Minneapolis, Minn.; Harry O. Iverson.
KFEC, Portland, Ore., Meier & Frank Co.
KFEJ, Tacoma, Wash.; Guy Greason.
KFEL, Denver, Colo., Winnen Radio Corp.
KFEP, Denver, Colo., Radio Equipment Co.
KFEQ, Oak Nebraska; J. L. Scroggin.
KFER, Ft. Dodge, Iowa; 231 meters. 10 watts; Auto Electric Service Co.
KFEV, Douglas, Wyo; Radio Elect. Shop, 263 meters; 100 watts.
KFEX, Minneapolis, Minn; 261 meters, 100 watts Augsburg Seminary.
KFEY, Kellogg, Idaho; Bunker Hill & Sullivan Mining & Construction Co.
KFEZ, St. Louis, Mo.; American Society of Mechanical Engineers.
KFFA, San Diego, Calif.; Dr. R. C. Shelton.
KFFE, Pendleton, Ore.; Eastern Oregon Radio Co,
KFFO, Hillsboro, Oregon; Dr. E. H. Smith.
KFFP, Moberly, Missouri; First Baptist Church.
KFFQ, Colorado Springs, Colo.. Marksheffel Motor Co.
KFFR, Kirk, Jim, Sparks, Nev.; 226 meters, 10 watts.
KFFV, Lamoni, Iowa; Graceland College.
KFFX, Omaha, Neb; 278 meters. 250 watts; The McGraw Co.
KFFY, Alexandria, La; 275 meters; 100 watts; Pincus & Murphy Inc.
KFFZ, Dallas, Texas; 226 meters, 20 watts; A. G. Barnes Amusement Co.
KFGC, Baton Rouga, La; 254 meters, 100 watts; Louisiana State University.
KFGD, Chickasha, Okla.; 248 meters, 20 watts; Chickasha Radio & Elect. Co.
KFGF, Mt. Vernon, Wash.; Buchanan, Stevens & Co.
KFGH, Stanford Univ., Calif.
KFGJ, St. Louis, Mo.; 268 meters, 100 watts; Nat'l Guards Missouri 138 Infantry.
KFGL, Arlington, Oregon; Arlington Garage.
KFGP, Cheney, Kansas; 229 meters, 10 watts; Cheney Radio Company.
KFGQ, Boone, Iowa; 226 meters, 20 watts; Crary Hardware Co.
KFGV, Utica, Nebraska; 224 meters, 10 watts, Heidtorder Radio Supply Co.
KFGX, Orange, Texas; 250 meters, 500 watts; First Presbyterian Church.
KFGY, Baudette, Minn; 224 meters, 15 watts; Gjelhayg's Radio Shop.
KFGZ, Berrien Springs, Mich. 268 meters, 10 watts. Emmanuel Missionary College.
KFHA, Gunnison, Colo.; Colorado State Normal School.
KFHB, Hood River, Oregon, P. L. Boardwell.
KFHD, St. Joseph, Mo.; 226 meters, 10 watts; Utz Electric Co.
KFHF, Shreveport, La 268 meters, 150 watts; Central Christian Church.
KFHR, Seattle, Wash; Star Elect & Radio Co; 270 meters; 100 watts.
KFHM, Neah Bay, Wash.; Ambrose McCue.
KFHI, Wichita, Kansas; 224 meters, 20 watts; Charles V. Dixon.
KFHJ, Santa Barbara, Calif., Fallon Co.
KFHL, Oskaloosa, Ia.; 227 meters, 10 watts; Penn College.
KFHQ, Curtis Bros. Hardware Store, Los Gatos, Calif.; 242 meters, 5 watts.
KFHS, Dow, Clifford J., Lihue, Hawaii, 275 meters, 30 watts.
KFHS, Nelson, Robert Washington, Hutchinson, Kansas; 229 meters, 50 watts.
KFHU, Sateren, M. G., Mayville, N. D.; 261 meters, 50 watts.
KFHY, McEwan, R. S., Trinidid, Col.; 242 meters, 50 watts.
KFIB, St. Louis, Mo.; 214 meters, 10 watts; Franklin W. Jenkins.
KFID, Iola, Kansas. 246 meters, 20 watts; Ross Arbuckle's Garage.
KFIF, Portland, Ore., Benson Tech. Student Body.
KFIK, Gladbrook, Ia; Gladbrook Electric Co; 234 meters; 20 watts.
KFIO, Spokane, Wash.; North Central High School; 252 meters; 50 watts.
KFIQ, Yakima, Wash.; 224 meters, 50 watts; Yakima Valley Radio Broadcasting Association.
KFIU, Alaska Elect. Light & Power Co., Juneau, Alaska, 226 meters, 10 watts.
KFIV, Broyles, V. H., Pittsburg, Kansas; 240 meters, 20 watts.
KFIX, Reorganized Church of Jesus Christ, of Later Day Saints, Independence, Kans.; 240 meters, 500 watts.
KFIY, Seattle, Wash; 236 meters 15 watts; Brott Laboratories.
KFIZ, Fond du Lac, Wisc., 273 meters; 100 watts; Daily Commonwealth.
KFJB, Marshalltown, Ia., 248 meters, 10 watts; Marshalltown Electric Co. Inc.
KFJC, Seattle, Wash.; 233 meters; 100 watts; Post Intelligencer.
KFJD, Greeley, Colo.; Weld County Printing & Publishing Co; 236 meters; 100 watts.
KFJF Oklahoma City, Okla; 252 meters; 20 watts; Nat'l Radio Co.
KFJH, Selma, Calif.; 273 meters; 10 watts; The Sugar Bowl.
KFJI, Astoria, Ore.; 252 meters; 10 watts; Liberty Theatre.
KFJJ, Carrollton, Mo.; Carrollton Radio Shop; 236 meters; 50 watts.
KFJK, Bristow, Okla.; 233 meters; 100 watts; Delano Radio Elect. Co.
KFJM, Grand Forks, N. D., 229 meters, 100 watts; University of North Dakota.
KFJU, Kearney, Neb., 234 meters, 10 watts; Central Power Co.
KFJQ, Grand Forks, N. D., 252 meters, 5 watts; (portable Station), Radio Division of Valley Electric Co.
KFJR, Stevensville, Mont., 258 meters, 50 watts; Ashley C. Dixon & Son.
KFJX, Cedar Falls, Iowa, 229 meters, 50 watts; Iowa State Teachers College.
KFI, Los Angeles, Calif.; radius covers entire U. S. and Canada; Daily, 6:45 to 11 p. m. Sunday 10 to 11 a. m., 4 to 4:30 and 8 to 11 p. m.; entertainment and educational features; station operates three remote control stations; Earle C. Anthony, Inc.
KFKH, Denver Park Amusement Co; Lakeside, Colo; 226 meters, 10 watts.
KFU, Gridley, Calif.; The Precision Shop.
KFZ, Spokane, Wash.; Doerr-Mitchell Elec. Co.
KGB, Tacoma, Wash.; Mon. Wed. and Fri. 7 to 9 p m, News sport bulletins, lectures, entertainment, weather, tide tables, and time. Tacoma Daily Ledger, Tacoma, Wash.
KGG, Portland, Ore.; Hallock & Watson Radio Service.
KGN, Portland, Ore., Northwestern Radio Mfg. Co.
KGU, Honolulu, Hawaii, Waikiki Beach, Marion A. Mulroney; Honolulu Advertiser
KGW, Portland, Ore.; Oregonian Pub. Co.
KGY, Lacey, Wash.; St. Martin's College, (Rev. S. Ruth).
KHJ, Los Angeles, Calif.; Daily except Sunday: 12:30 p. m. to 1:15 p. m. news and concerts; 7 to 7:30 p. m. Children's Half Hour; 8 to 9:30 p. m. De Luxe program of music, news and educational features; Sunday: 10 to 11 a. m. Scripture reading, sermon, prayer and sacred musical program; Pacific time; Times-Mirror company.
KHQ, Seattle, Wash.; Louis Wasmer.
KJQ, Stockton, Calif.; C. O. Gould.
KJS, Los Angeles. Calif.; Bible Inst. of Los Angeles.
KLB, Pasadena, Calif.; J. J. Dunn & Co.
KFDC, Spokane, Wash; Radio Supply Co.
KLN, Monterey Electric Shop, Monterey, Calif.; 261 meters, 10 watts.
KLS, Oakland, Calif.; Warner Bros.
KLX, Oakland, Calif.; Tribune Pub. Co.
KLZ, Denver, Colo.; Class B, 485, Reynolds Radio Co.
KMAZ, Macon, Ga., Mercer University.
KMC, Reedley, Calif.; Lindsay-Wetherill Co.
KMJ, Fresno, Calif. Max. 2576 Miles; Musical program, San Joaquin Light & Power Corp.
KMO, Tacoma, Wash., Love Electric Co.; Tacoma Times.
KNJ, Roswell, New Mexico; 250 meters; 150 watts; every evening at 8; news, weather reports, stock markets, concerts, sermons; Roswell Public Service Co.
KNT Aberdeen, Wash., North Coast Products Co.
KNV, Los Angeles, Calif.; 256 meters; 20 watts; Radio Supply Co. of Cal.
KNX Los Angeles, Calif.; Electric Lighting Supply Co.
KOB, State College, N. Mex.; time signals and weather reports 12 noon and 10. p m. mountain time, music and lectures Monday, Wednesday and Friday, 7:30 to 8:30 p m; New Mexico College of Agriculture and Mechanical Arts.
KOE, Spokane, Wash.; Spokane Chronicle.
KDP, Detroit. Mich., Detroit Police Dept.
KDQ, Modesto. Calif., Modesto Evening News.
KPD, San Francisco, Calif., Hale Bros.
KQI, Berkeley, Calif., Univ. of California.
KQP, Hood River, Oregon; Apple City Radio Club.
KQV, Pittsburgh, Pa., Doubleday-Hill Elec. Co.
KQW, San Jose. Calif., Chas. D. Herrold.
KRE, Berkeley Daily Gazette, Berkeley. Cal.; 278 meters, 50 watts.
KSC, San Jose, Calif., O. A. Hale & Co.
KSD, St. Louis, Mo.; 1700 miles; grain, livestock, cotton, New York stocks, poultry and butter market, metal market, official weather and news at 9:40, 10:40, 11:40, 12:40, 1:40, 2:40 and 4 p m; 8: p m 400 meters, musical and other features; Pulitzer Publishing Co., St. Louis Post Dispatch.
KSS, Long Beach, Calif., Frost & Dean Radio Research Lab.
KSU, Wenatchee, Wash.
KTW, Seattle, Wash., First Presbyterian Church.
KUS, Los Angeles, Cal. 500 miles; setting up exercises daily, 7 to 7:30 a m and 12:00 noon to 12:30 p m; concert, 65 voices, 6 to 6:45 p m, Wednesdays and Fridays, City Dye Works.
KUD, San Francisco, Calif., Examiner Printing Co., San Fran. Examiner,
KUY Del Monte, Cal., 256 meters, 50 watts; Coast Radio Co.
KWG, Stockton, Cal. Daily Market reports, music and news 4 to 5 p m; Music, 2 to 3 p m, Sunday; Tuesdays and Fridays, music, 8 to 9 p m. Portable Wireless Telephone Co.
KWH, Los Angeles, Calif., Los Angeles Examiner.
KXD Modesto, Calif., Herald Publishing Co.
KYQ, Honolulu, T. H., The Electric Shop.
KYW, Chicago. Ill.; Westinghouse Elec. & Mfg. Co. 345 meters.
KZM, Oakland, Calif., Western Radio Inst.; Preston D. Allen.
KZN, Salt Lake City, Utah, The Deseret News.
KZY, Wenatchee. Wash., Wenatchee Battery & Motor Co.
NDF, Anacostia, D. C., U. S. Navy Dept.
PWX, Havana, Cuba, Cuban Telephone Co.
WABD, Dayton, Ohio; 286 meters, 10 watts; Parker High School.
WAI, Dayton, Ohio, McCook Field, U. S. Army.
WAAB, New Orleans, La., Valdemar Jensen.
WAAC, New Orleans, La., Tulane Univ.

(Continued on next page.)

Complete Corrected List of U. S. and Canadian Broadcasting Stations

WAAD, Cincinnati, Ohio, Ohio Mechanics Inst.
WAAE, St. Louis, Mo., St. Louis Chamber of Commerce.
WAAF, Chicago, Ill., Chicago Daily Drovers Journal.
WAAH, St. Paul, Minn.; Commonwealth Electric Co.
WAAK, Milwaukee, Wis., Gimbel Bros.
WAAL, Minneapolis, Minn., Minnesota Tribune Co. & Anderson-Beamish Co.
WAAM, Newark, N. J. 209 miles; musical and code, every week day 11 to 11:55 a m, 3 to 4 p m; Wednesday evenings 8 to 9; L. B. Nelson Company.
WAAN, Columbia, Mo., Univ. of Missouri.
WAAP, Wichita, Kans., United Elec. Co.; Otto W. Taylor.
WAAS, Decatur, Ga., Georgia Radio Co.
WAAT, Jersey City, N. J., Jersey Review.
WAAW, Omaha, Neb., Omaha Grain Exchange.
WAAZ, Emporia, Kans.; Daylits 100 miles; nite 500-1000 miles; each Tuesday and Thursday from 7 to 8 p m. Acknowledge all communications at 7:15 p m. The Hollister Miller Motor Co.
WABB, Harrisburg, Pa; 286 meters, 10 watts; Dr. John B. Lawrence.
WABC, Anderson, Ind; 299 meters, 10 watts, Fulwider-Grimes Battery Co.
WABD, Dayton, Ohio; 286 meters, 10 watts; Parker High School.
WABE, Washington, D. C; 283 meters, 50 watts; Y. M. C. A.
WABF, Mt. Vernon, Ill; 234 meters, 250 watts; Mt. Vernon Register-News Co.
WABG, Jacksonville, Fla; Arnold Edwards Piano Co. 248 meters; 10 watts.
WABI, Bangor, Me; Bangor Railway and Elect. Co.; 240 meters; 50 watts.
WABJ, South Bend, Ind; The Radio Laboratories; 240 metars; 50 watts.
WABM, Doherty, F. E. Saginaw, Mich.; 254 meters, 100 watts.
WABD, Lake Avenue Baptist Church, Rochester, N. Y.; 252 meters, 30 wetts.
WAJT, Marshall, Me., Kelly-Vawter Jewelry Co.
WAJU, Yankton, S. D., Yankton College.
WABH, Sandusky, Ohio; 234 meters, 100 watts; Lake Shore Tire Co.

WBAA, W. Lafayette, Ind., Purdue University.
WBAD, Minneapolis, Minn., Sterling Elec. Co. & Journal Printing Co.
WBAE, Peoria, Ill., Bradley Polytechnic Inst.
WBAF, Moorestown, N. J., Fred M. Middleton.
WBAG, Bridgeport, Pa., Diamond State Fibre Co
WBAK, Harrisburg, Pa.; 360 meters; Pennsylvania State Police.
WBAM, New Orleans, La., 1. B. Rennyson.
WBAN, Patsrson, N. J., Wireless Phone Corp.
WBAO, Decatur, Ill.; 160 miles; occasional music; sermons; James Millikin Univ.
WBAP, Fort Worth, Tex.; 4000 miles; Markets and News; Feature concert Monday to Friday inslusive; 9:30 p m to 10:45 p m, Central Time; Quiet nights Saturday and Sunday. The Star-Telegram.
WBAQ, South Bend, Ind., Myron L. Harmon.
WBAU, Hamilton, Ohio, Republican Publishing Co.
WBAV, Columbus, Ohio, Erner & Hopkins Co.
WBAW, Marietta, Ohio; Marietta College; 216 meters; 100 watts.
WBAX, Wilkes-Barre, Pa., John H. Stenger, Jr.
WBBA, Newark, O.; 240 meter, 20 watts; Newark Radio Lab.
WBBC, Sterling, Ill; 229 meter, 50 watts; Sterling Radio Equipment Co.
WBBD, Reading, Pa; Barbey Battery Service; 224 meters; 50 watts.
WBL, Anthony, Kans; T & H Radio Co; 261 meters; 100 watts.
WBS, Newark, N. J.; Radius 500 mi.; Musical and Educational, week days: 10:30 to 11 a. m.; 1:00 to 1:15 p. m.; 2:15 to 2:30 p. m.; 7:30 to 8:30 p. m.; Sundays: 9 to 10:30 a m; 1 to 3 p m; D. W. May, Inc.
WBT, Charlotte, N. C. 1200 miles; 11: a m weather report 485; 4:30 p m mechanical music; 8: p m Market Report; 8:30 Tuesday and Friday regular concert; 7:30 p m Sunday, Church Southern Radio Corp.
WBU, Chicago, Ill., City of Chicago.
WBZ, Springfield, Mass., Westinghouse Elec. & Mfg. Co.
WCAD, St. Lawrence University, Canton, N. Y.; 280 meters, 50 watts.
WCAE, Pittsburgh, Pa.; 12:30 news and reports; 3:30 weatehr reports; 4:15 Closing Market reports; 7:30 Late news and lecture; 8:30 musical programs; Kaufmann Baer Co.
WCAG, New Orleans, La., Daily Statss Pub. Co.
WCAH, Columbus, O. Daily program 11:30 to 12:30; Every Tuesday evening at 7, musical program; C. A. Entrekin Electric Co.
WCAI, San Antonio, Texas, Southern Equipment Co.
WCAJ, Univ. Place, Neb., Nebraska Wesleyan University.
WCAK, Houston, Texas, Alfred P. Daniel.
WCAL, Northfield, Minn., St. Olaf College.
WCAM, Villanova, Pa., Villanova College.
WCAO, Baltimore, Md., Sanders & Stayman Co.
WCAP, Chesapeake & Potomac Tel. Co., Washington, D. C.; 469 meters, 500 watts.
WCAR, San Antonio, Texas, Alamo Radio Elec. Co.
WCAS, Minneapolis, Minn., Wm. H. Dunwoody Industrial Inst.
WCAT, Rapid City, S. Dak., South Dakota School of Mines.
WCAU, Philadelphia, Pa.; 1000 miles; Daily 10:30 a. m.; 2:30 p. m.; 6:30 p m; regular concert 10 to 12 noon; Tuesdays, Fridays, Saturdays; Durham & Co., Inc.
WCAV, Little Rock, Ark., J. C. Dice Elec. Co.
WCAW, Omaha, Nebr., Woodmen of the World.
WCAX, Burlington, Vermont, University of Vermont.
WCAY, Milwaukee, Wis., Kesselman O'Driscoll Co.
WCBA, Allentown, Pa.; Chas. W. Halmbach; 280 meters; 5 watts.
WCBB, Greenville, O.; 240 meters, 100 watts; K. & K. Radio Supply Co.
WCBD, Voliva, Wilbur Glenn, Zion, Ill.; 345 meters, 500 watts.
WCE, Minneapolis, Minn., Findley Elec. Co.
WCK, St. Louis, Mo., Stix Baer & Fuller.
WCM, Austin, Texas, Univ. of Texas.
WCX, Detroit, Mich., Detroit Free Press.
WDAD, Lindsburg, Kas.; Central Kansas Radio Supply.
WDAE, Tampa, Fla., Tampe Daily News.
WDAF, Kansas City, Mo; Kansas City Star; 411 meters; 500 watts. Regular concerts on Mon, Wed. and Fri. nights from 8 to 9:30. Concerts from 3:30 to 4:30 p m each afternoon except Sun. Baseball scores 3:25, 4:00, 4:30, 5:00, and 5:30 p. m. Marketgram and weather forecast 5:55 nightly, except Sun. Educational features and musical program 6 to 7 o'clock each night except Sunday. "Nighthawk" Frolic, Coon Sanders orchestra at the Hotel Muehlebach nightly except Sun. 11:45 p. m. to 1 a. m.
WDAG, Amarillo, Texas, K. Laurence Martin.
WDAG, Brownsville, Pa., Hartman-Riker Elec. & Mach.Co.
WDAH, El Paso, Tex.; Trinity Methodist Church.
WDAJ, Ervins El. Co., Parson's, Kan. 258 meters, 15 watts.
WDAI, Syracuse, N. Y., Hughes Electrical Corp.
WDAK, Hartford, Conn., Hartford Courant.
WDAL, Jacksonville, Fla., Florida Times Union.
WDAO, Dallas, Texas, Automotive Elec. Co.
WDAP, Chicago, Ill., markets, and concerts 360; Daily on all business days: 9:30 a. m. receipts and shipments; estimeted car lots; local weather report; opening futures market in wheat, corn, oats, rye, barley, pork, lard and ribs. 10 a. m. Future quotations, live stock receipts and prices; 10:30 a. m. futures quotations; 11 and 11:30 a m. same; 12 noon, futures and cash grain prices; 12:30 and 1 p. m. futures quotations; 1:20 p. m. closing futures quotations and high and low for day. Cash grain prices. Gross bids for cash grain to arrive. 6 p. m. closing quotations; news items. On Saturdays closing prices at 12:05 p. m. instead of 1:20 p. m. Visible supply changes sent when posted. Regular concert schedule 10 p. m. Tuesdays, Thursdays and Saturdays. Sunday evenings 9 p. m. and 10 p. m. Chicago Board of Trade official station.
WDAR, Philadelphia, Pa.; Lit Brothers.
WDAS, Worcester, Mass., Samuel A. Walte.
WDAU, New Bedford, Mass., Slocum & Kilburn.
WDAX, Centerville, Iowa; First National Bank 268 meters, 100 watts.
WDAY, Fargo, N. D.; 244 meters, 50 watts; Fargo Radio Service Co.
WDBF, Phillips, Robert G., Youngstown, Ohio; 261 meters, 50 watts.
WDM, Washington, D. C., Church of the Covenant.
WDT, New York, N. Y., Ship Owners Radio Service.
WDZ, Tuscola, Ill., James L. Rush.
WEAA, Fallain & Lathrop, Flint, Mich.; 280 meters; 150 watts.
WEAB, Fort Dodge, Iowa, Standard Radio Equip. Co.
WEAE, Blacksburg, Va., Virginia Polytechnis Inst.
WEAF, New York City, N. Y., Western Electric Co.
WEAG, Edgewood, R. I., Nichols-Hinsline-Bassett Lab.
WEAH, Wichita, Kans.; 244 meters; 100 watts; Wichita Bd of Trade.
WEAI, Ithaca, N. Y., Cornell University.
WEAJ, Vermilion, S. Dak., University of South Dakota.
WEAK, St. Joseph, Mo., Julius B. Abercrombie.
WEAM, North Plainfield, N. J., Burough of N. Plainfield.
WEAN, Shepard Co., The, Providence, R. I.; 273 meters, 100 watts.
WEAO, Columbus, Ohio, Ohio State University.
WEAP, Mobile, Ala., Mobile Radio Co.
WEAQ, Berlin, N. H., Y. M. C. A.
WEAR, Baltimore, Md., Balt. American & News Pub. Co.
WEAS, Washington, D. C., The Hecht Co.
WEAU, Sioux City, Iowa, Davidson Bros. Co.
WEAY, Houston, Texas, Will Horwitz, Jr.
WEAZ, Waterloo, Iowa, Donald Redmond.
WEB, St. Louis, Mo., The Benwood Co., Inc.
WEV, Houston, Texas, Hurlburt-Still Elec. Co.
WEW, St. Louis, Mo., Market and weather reports at 9 a. m., 10 a. m., and 2: p m; no other regular program; St. Louis University.
WEY, Wichita, Kansas, Coaradio Co.
WFAA, Dallas, Texas. A. H. Belo & Co.
WFAB, Syracuse, N. Y., C. F. Wcoso.
WFAC, Superior, Wis., Superior Radio Co.
WFAF, Poughkeepsie, N. Y., H. C. Spratley Radio Co.
WFAH, Port Arthur, Texas, Elec. Supply Co.
WFAJ, Asheville, N. C., Hi-Grade Wireless Instrument Co.
WFAK, Brentwood, Mo., Domestis Electric Co.
WFAM, St. Cloud, Minn., Granite City Elec. Co. and Times Pub. Co.
WFAN, Hutchinson, Minn., Hutchinson Electric Service Co.
WFAQ, Cameron, Mo., Cameron Radio Co. and Mo. Wesleyan College.
WFAT, Sioux Falls, S. Dak.; also Argus-Leader.
WFAV, Lincoln, Nebr., Univ. of Nebr. Dept. of Elec. Engineering.
WFI, Philadelphia, Penn., also Strawbridge & Clothier.
WGAC, Brooklyn, N. Y., Orpheum Radio Stores Co.
WGAD, Ensenada, Porto Rico, Spanish-American School of Radio-telegraphy.
WGF, Des Moines, Iowa 800 miles; Musical and entertainment Tuesday and Friday 7:30 p m; Church Services Sunday at 5 p m or 7:45 p m as announced; Special programs as announced Register and Tribune.
WGAJ, Shenandoah, Iowa, W. H. Gass.
WGAL, Lancaster, Pa.; Lancaster Elect. Supply Co. 248 meters; 10 watts.
WGAN, Pensacola, Fla., Cecil E. Lloyd.
WGAQ, Shreveport, La., Glenwood Radio Corp.
WGAR, Fort Smith, Ark., Southwest American.
WGAU, Wooster, Ohio; 226 meters, 20 watts; Marcus G. Limb.
WGAV, Savannah, Ga., B-H Radio Co.
WGAW, Altoona, Pa., Ernest C. Albright.
WGAY, Madison, Wis., North Western Radio Co.
WGAZ, South Bend, Ind., South Bend Tribune.
WGI, Medford Hillside, Mass., Am. Radio & Research Corp.
WGL, Philadelphia, Pa., Thos. F. J. Howlett.
WGR, Buffalo, N. Y., Federal Tel. & Teleg. Co.
WGV, New Orleans, La., Interstate Elec. Co.
WGY, Schenectady, N. Y., General Elec. Co.
WHA, Madison, Wis., Univ. of Wis.
WHAA, Iowa City, Ia; 500 miles; 8:30 p m, Monday, Instruction; Tuesday, concert, Wednesday, popular lecture; Friday, University News; public lectures and concerts irregularly; State University of Iowa.
WHAB, Galveston, Texas, Clark W. Thompson (Fellman's Dry Goods Co.)
WHAC, Waterloo, Iowa, Cole Bros. Elec. Co.
WHAD, Marquette Univ., Milwaukee, Wis.; 280 meters, 100 watts.
WHAG, Cincinnati, Ohio, Univ. of Cincinnati.
WHAH, Joplin, Mo; radius, 1384 mi.;Concerts, markets, weather, etc. Tuesday and Thursday evenings: 8 to 10; Daily except Sundays: 10 a. m. to 2 p. m.; Saturday night special: 11 to 12:30; Hafer Supply Co.
WHAI, Davenport, Iowa, Radio Equip. & Mfg. Co.
WHAJ, Bluefield, W. Va., Bluefield Daily Telegraph and E. K. Kitts.
WHAK, Clarksburg, W. Va., Roberts Hdwe. Co.
WHAL, Lansing, Mich., Lansing Capitol News.
WHAM, Rochester, N. Y. Daily—Weather reports 2:40 p. m.; Organ 2:45, 5:00, 6:45; Orchestra 3:00, 7:00; Bed-time stories, Sport results, Business reports and market reports, the latter on 485 meters, 7:15 p m; Sunday—Radio Chapel Service, 3:15 p m; University of Rochester.
WHAO, Savannah, Ga., Frederick A. Hill; every evening 8 to 9; Saturday nights, 12:30 1:30 a. m.
WHAP, Decatur, Ill., Dewey L. Otta.
WHAQ, Washington, D. C., Semmes Motor Co.
WHAR, Paramount Radio & Elect. Co., Atlantic City, N. J.;231 meters, 15 watts.
WHAS, Louisville, Ky., Courier Journal and Louisville Times Co.
WHAV, Wilmington, Del., Wilmington Elec. Spec. Co.
10 p m Wednesday evenings; Central Standard time; Iowa Radio Corp.
WHAY, Huntington, Ind., Huntington Press.
WHAZ, Troy, N. Y., Rensselaer Polytechnic Inst.
WHB, Kansas City, Mo., Sweeney Auto & Tractor School.
WHD, Morgantown, W. Va., W. Va. University.
WHK, Cleveland, Ohio, Warren R. Cox.
WHN, Ridgewood, N. Y., Times Printing & Pub. Co.
WHU, Toledo, Ohio, Wm. B. Duck Co.
WHX, Des Moines, Iowa; 800 miles; 5:45 p m to 6:15 p m Daily; 8:00 p m to
WIAB, Joslyn Automobile Co., Rockford, Ill.; 252 meters, 50 watts.
WIAC, Galveston, Texas, Galveston Tribune.
WIAD, Ocean City, N. J., Ocean City Yacht Club.
WIAF, New Orleans, La; G. A. DeCortin, 10 Marlborough Gate; 234 meters, 10 watts.
WIAG, Norfolk, Nebr; 200 miles News and Markets 12:15, 3:30 and 5:30 p. m. The Huse Publishing Co. The Norfolk Daily News.
WIAH, Newton, Iowa, Continental Radio & Mfg. Co.
WIAI, Springfield, Mo., Heer Stores Co.
WIAJ, Neenah, Wis., Fox River Valley Radio Supply Co.
WIAK, Omaha, Nebr.; 7:45 a. m. Livestock receipts; 9:10 a. m. Livestock receipts and opening on hogs; 10:15 a m rainfall and temperature report and weather forecast for Nebraska and Iowa, Livestock market; 12 m cattle, hog and sheep market; 1:50 p m rainfall and temperature report and weather forecast for Nebraska and Iowa; market detail; 3:50 p m complete market reports and estimated receipts for next day; Daily Journal-Stockman.
WIAO, Milwaukee, Wis., School of Engineering.
WIAP, Springfield, Mass., Radio Development Corp.
WIAQ, Marion, Ind.; 226 meters; 10 watts; Chronicle Publishing Co.
WIAR, Paducah, Ky., Musical 3.30 to 4 p. m. and 7 to 8 p. m. except Sundays. Paducah Evening Sun; Albert Bennett, operator.
WIAS, Burlington, Iowa, Hawk-Eye Home Elec. Co.
WIAT, Tarkio, Mo., Leon T. Noel.
WIAU, Le Mars, Iowa, Am. Trust & Savings Bank.
WIAY, Neenah, Wis; 224 meter, 100 watts; Fox River Valley Radio Supply Co.
WIK, McKeesport, Pa., 234 meters, 500 watts; K&L Electric Co.
WIL, Washington, D. C., Continental Elec. Supply Co.
WIP, Philadelphia, Pa., Gimbel Bros.
WJAB, Lincoln, Nebr., American Radio Co.
WJAD, Waco, Texas. Jackson's Radio Engrng. Lab.

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Complete Corrected List of U. S. and Canadian Broadcasting Stations

WJAF, Muncie, Ind; 1800 miles; 7:30 to 8 Monday, Wednesday, Friday evening, music; 6:30 to 7 p m Saturday, music; 3:30 to 4 every afternoon, News; 10:30 to 12 M Sundays, Church service. Smith Electric-Muncie Press.
WJAM, Cedar Rapids, Ia; D. C. Perham, 268 meters, 20 watts.
WJAK, Greentown, Ind., 251 meters, 30 watts; Rev. C. L. White.
WJAN, Peoria, Ill; 280 meters, 100 watts; Daily except Sunday: 9 a. m. Peoria Livestock; 9:15 a. m. Special Weather information; 11:30 a. m. weather, opening livestock and market quotations; 1:30 p. m. Closing livestock and markets, official weather information; talk to women by Phyills Ann; Monday and Thursday, government agriograms; 5:30 p. m. baseball reports during season; Tuesday, Thursday and Saturday, special concerts as announced at 9:15 p. m.; One musical number preceeds each broadcasting. Peoria Evening Star.

WJAQ, Topeka, Kans., Capper Publications.
WJAR, Providence, R. I., The Outlet Co., J. Samuels & Bros.
WJAS, Pittsburgh, Pa., Pittsburgh Radio Supply House.
WJAT, Marshall, Mo., Kelley-Vawter Jewelry Co.
WJAX, Cleveland, Ohio. Union Trust Co.
WJAZ, Chicago, Ill., Chicago Radio Lab.
WJD, Granville, Ohio; 229 meters, 50 watts; Richard Harris Howe.
WJH, Washington, D. C., White & Boyer Co.
WJX, New York, N. Y., De Forest Radio Telephone & Teleg. Co
WJZ, New York, Radio Corp. of America; Aeolin Hall, 455 meters.
WKAA, Cedar Rapids, Ia.; Daily: weather reports, crop reports, government reports; Mondays, Thursdays and Saturdays; music; H. E. Paar, 268 meters, 100 watts.
WKAC, Lincoln, Nebr; Star Publishing Co; 275 meters; 100 watts.
WKAD, Looff, Charles, East Providence, R.I.; 240 meters, 10 watts.
WKAF, Wichita Falls, Texas, W. S. Radio Supply Co.
WKAN, Montgomery, Ala., Alabama Radio Mfg. Co.
WKAP, Cranston, R. I., Dutee W Flint.
WKAQ, San Juan, Porto Rico, Radio Corp. of Porto Rico
WKAR, Michigan Agri. College, East Lansing, Mich., 280 meter, 100 watts.
WKAS, Springfield, Mo., L. E. Lines Music Co.
WKAV, Laconia, N. H., Laconia Radio Club.
WKAW, Beloit, Wis; 242 meters, 10 watts; Turner Cycle Co.
WKAX, Bridgeport, Pa; W. A. McFarlane; 231 meters; 15 watts.
WKAY, Gainesville, Ga., Brenau College.
WKC, Baltimore, Md., Jos. M. Zamoiski Co.
WKY, Oklahoma City, Okla., Oklahoma Radio Shop.
WLAC, Raleigh, N. C., N. C. State College.
WLAG, Minneapolis, Minn., Cutting & Walsh Radio Corp.
WLAH, Syracuse, N. Y., Samuel Woodworth.
WLAJ, Waco, Texas, Waco Elec. Supply Co.
WLAK, Bellows Falls, Vt., Vermont Farm Machine Co.
WLAL, Tulsa, Okla., Tulsa Radio Co.
WLAN, Houlton, Me.; 283 meters; 250 watts; Putnam Hardware Co.
WLAP, Louisville, Ky., W. V. Jordan.
WLAQ, Kalamazoo, Mich., A. E. Schilling.
WLAT, Burlington, Iowa, Radio Specialty Co.
WLAV, Pensacola, Fla.; daily musical program, 8 to 9 p m; The Electric Shop.
WLAW, New York, N. Y., New York Police Dept.
WLAX, Greencastle, Ind., Greencastle Community Broadcasting Station.
WLAZ, Warren, Ohio, Huttor & Jones Elec. Co.
WLB, Minneapolis, Minn., Univ. of Minn.
WLW, Cincinnati, Ohio, Crosley Mfg. Co.
WLZ, Fairfield, Ohio, U. S. Army.
WMA, Anderson, Ind., Arrow Radio Lab.
WMAB, Oklahoma City, Okla., Radio Supply Co.
WMAC, Cazenovia, N Y; J. Edw. Page; 261 meters; 50 watts.
WMAE, Dartmouth, Mass., Round Hills Radio Corp.
WMAH, Lincoln, Nebr., General Supply Co.
WMAJ, Kansas City, Mo., Drovers Telegram.
WMAK, Lockport, N. Y., Norton Labs.
WMAL, Trenton, N. J, 100 miles; 7:30 to 9 p m, Mondays and Thursdays, musical programs, lectures etc; Trenton Hardware Co.
WMAN, First Baptist Church, Columbus, Ohio; 286 meters; 20 watts.
WMAN, Columbus, Ohio, First Baptist Church.
WMAP, Easton, Pa., Utility Battery Service.
WMAQ, Fair Store Building, Chicago; 4:35 to 5 p m, daily; 7 to 7:30 p m, Monday, Wednesday, Friday and Saturday; 7 to 8 p m, Tuesday and Thursday; 9:15 to 10 p m daily; Chicago Daily News and Fair Department Store.
WMAT, Paramount Radio Corp., Duluth Minn.; 266 meters. 25 watts.
WMAV, Auburn, Ala., Polytechnic Inst.
WMAZ, Macon, Ga., Mercer University.
WMAY, St. Louis, Mo.; 280 meters, 10 watts; religious services, Sunday 11 a. m. and 8 p. m. Tuesday at 7 p. m. Kingshighway Presbyterian Church.
WMC, Memphis Commercial Appeal; Memphis, Tenn.
WMH, Cincinnati, Ohio, Precison Equipment Co.
WMU, Washington, D. C., Doubleday-Hill Electric Co.
WNAC, Boston, Mass.; Monday 4 to 5 p. m. (silent at night) Tuesday 4 to 5 p. m. and 7 to 8:30 p. m. Wednesday 4 to 5 p. m. 9:30 to 11 p. m. Thursday 4 to 5 and 7 to 8:30 p. m. Friday 4 to 5 and 8 to 9:30 p. m. Saturday 4 to 5 and 9:30 to 11 p. m. The Shepard Stores; J. J. Fanning, announcer Samuel Curtis, operator, 278 meter, 100 watts.
WNAD, Norman, Okla., Okla. Radio Engineering Co.
WNAL, Omaha, Nebr., R. J. Rockwell.
WNAN, Syracuse, N. Y., Syracuse Radio Telephone Co.
WNAP, Springfield, Ohio, Wittenberg College.
WNAQ, Charleston, S. C., Charleston Radio Elec. Co.
WNAS, Austin, Texas, Radio Corp.
WNAT, Philadelphia, Pa. 1000 miles; Talks, Radio information, music, Chapel Service. Wednesday 7:30 p m; Saturday 7:30 p m; Sunday 2:30 and 4:30; Every day 12:15, 1 p m. Lennig Bros. Co.
WNAV, Knoxville, Tenn., People's Tel. and Tel. Co.
WNAW, Fortress Monroe, Va., Henry Kunzman.
WNAX, Yankton, S. Dakota; 244 meters, 100 watts; Dakota Radio Apparatus Company.
WNAY, Baltimore, Md., Shipowners' Radio Service.
WNJ, Albany, N. Y., Shotton Radio Mfg. Co., Inc.
WOAA, Ardmore, Okla.; radius 1,500 miles; Tuesdays and Fridays: musical and educational programs; Dr. Walter Hardy; station operated by G. H. Reitz.
WOAB, Grand Forks, N. D.; 280 meters; 10 watts; Valley Radio Co.
WOAC, Lima, Ohio, Maus Radio Co.
WOAE, Fremont, Nebr., Medland College.
WOAF, Tyler, Texas, Tyler Commercial College.
WOAH, Charleston, S. C., Palmetto Radio Corp.
WOAI, San Antonio, Tex; 385 meters; Southern Equipment Company; Programs Daily; 10:30 a m Opening markets, U S weather forecast, crop reports, road reports, cotton reports, money market, livestock quotations and news bulletins, daily except Sun. 12:15 n m. Livestock quotations, produce markets, and news bulletins. 3 p m Closing markets, cotton reports, grain and market futures and news bulletins. 7 p m Complete baseball scores from American National and Texas leagues, final reports on markets, and news bulletins. Daily except Sun. 9:30 to 10:30 p m Concerts. Tburs. 7:30 to 8:30 p m Musical and Community Programs. Sunday 11:00 a m Church Services, 5:00 to 6:00 p m Concerts.
WOAK, Frankfort, Ky., Collins Hardware Co.
WOAL, Webster Groves, Mo., 286 meters, 100 watts; William Evans Woods.
WOAN, Lawrenceburg, Tenn., James D Vaughan
WOAO, Omaha, Nebr. 100 miles; Woodmen of the World.
WOAQ, Portsmouth, Virginia; Portsmouth Kiwanis Club.
WOAR, Kenosha, Wis., Henry P. Lundskow.
WOAT, Wilmington, Del., Boyd Martell Hamp.
WOS, Jefferson City, Mo. Missouri State Marketing Bureau; 441 meters, 500 watts; first fifteen minutes of every hour from 8 a. m. to 2 p m.; markets and music at 5 p. m. Monday, Wednesday and Friday nights, 8 to 9:30 concerts. No Sunday program.
WOAV, Erie, Pa., Pa. Nat'l Guard.
WOAW, Omaha, Neb. 100 miles; Woodmen of the World.
WOAX, Trenton, N. J., Franklin J. Wolff.
WOAZ, Stanford, Texas, Penick Hughes Co.
WOC, Davenport, Ia. time signals, 10:55 a. m.; weather 11 a. m.; 360 meters, 11:05 opening market quotations, agriograms; 12:00 noon, chimes concert; 2:00 p m, closing stocks and markets; 3:30 p m, educational talk; 5:45 p m chimes concert; 6:35, sandman's visit; 7:00 musical program; 8 p m, lecture; Sundays, religious and musical and religious features. 9 a m to 10 p m; Palmer's School of Chiropractic.
WOI, Ames, Ia., Iowa State College.
WOK, Pine Bluff, Ark., concerts Tuesday and Friday evenings beginning at 9; Sundays, song service and sermons from churches at 11 a. m. and 7:30 p. m., Arkansas Light & Power Co.
WOO, Philadelphia, Pa., John Wanamaker.
WOQ, Kansas City, Mo., Western Radio Co.
WOR, Newark, N. J., L. Bamberger & Co.
WOV, Omaha, Nebr., R. B. Howell.
WPA, Fort Worth, Texas, Fort Worth Record.
WPAB, State College, Pa.
WPAC, Okmulgee, Okla., Donaldson Radio Co.
WPAD, Chicago, Ill., Wisholdt & Co.
WPAF, Council Bluffs, Iowa, Petersen's Radio Co.
WPAG, Independence, Mo., Central Radio Co.
WPAH, Waupaca, Wis., Wisconsin Dept. of Markets.
WPAJ, New Haven, Conn., Doolittle Radio Corp.
WPAK, Farso, N. D., North Dakota Agricultural College.
WPAL, Columbus, Ohio, Superior Radio & Tel. Equip. Co.
WPAM, Topeka, Kans., Awerbach & Guettel.
WPAP, Winchester, Ky., Theo D. Phillips.
WPAO, Frostburg, Md., General Sales & Eng. Co.
WPAQ, Wilmington, Del., Radio Installation Co., Inc.
WPAR, Beloit, Kans., R. A. Ward.
WPAT, El Paso, Texas, St. Patrick's Cathedral.
WPAU, Moorhead, Minn., Concordia College.
WPAZ, Charleston, W. Va., Dr. John R. Koch.
WPG, New Lebanon, O. Nushawg Poultry Farm; 234 meters, 50 watts.
WQAA, Parkersburg, Pa. 1500 miles; 10:30 p m every evening. Horace A. Beale, Jr.
WQAB, Springfield, Mo., Southwest Missouri State Teachers' College.
WQAC, Amarillo, Texas, E. B. Gish.
WQAD, Waterbury, Conn., Whitall Electric Co.
WQAE, Moore Radio News Station, Springfield, Vermont; 275 meters, 50 watts.
WQAF, Sandusky, Ohio, Sandusky Register.
WQAH, Lexington, Ky., Brock-Anderson Elect. Eng Co
WQAL, Cole County Tel. & Tel. Co., Mattoon, Ill.; 258 meter, 10 watts.
WQAM, Miami, Fla., Electrical Equipment Co.
WQAN, "The Voice of Anthracite," 280 meters, 150 watts; Scranton Times, Scranton, Pa., musical and informative programs thrice daily; 12:30, 4:30 and 7:30 p. m. except Sunday. Music, news, weather forecasts and reports baseball scores, market quotations, evening bedtime stories. Special musical programs by vaudeville and other artists on Tuesday and Friday evenings at 8 p. m.
WQAO, New York, N. Y., Calvary Baptist Church.
WQAP, Lincoln, Nebr., Am. Radio Co.
WQAQ, Abilene, Texas, West Texas Radio Co.
WQAR, Muncie, Ind., Press Publishing Co.
WQAS, Lowell, Mass.; Prince-Walter Company.
WQAV, Huntington & Guerry Inc., Greenville, S. C.; 258 meters, 15 watts.
WQAW, Washington, D C; Catholic University of America; 236 meters; 50 watts.
WQAX, Peoria, Ill.; Radio Equipment Co.
WQAZ, Greensboro, North Carolina; Greensboro Daily News.
WRAA, Houston, Texas, Rice Institute.
WRAB, Savannah, Ga.; Savannah Board of Public Education.
WRAF, Laporte, Ind; 224 meters, 10 watts; Radio Club, Inc.
WRAD, Marion, Kas.; 248 meters; 10 watts; Taylor Radio Shop.
WRAH, Providence, R. I.; Stanley N. Read.
WRAL, St. Croix Falls, Wis.; Northern States Power Co.
WRAM, Carthage, Ill., Robert E. Compton & Carthage College.
WRAN, Grover, Waldo C., La Crosse, Wis.; 234 meters, 100 watts.
WRAO, St. Louis, Mo., Radio Service Co.
WRAP, Winter Park, Fla.; Winter Park Electric Construction Co.
WRAR, David City, Nebr; J. C. Thomas; 226 meters; 20 watts.
WRAS, McLeansboro, Ill.; Radio Supply Co.
WRAU, Amarillo, Texas, Daily News.
WRAV, Yellow Springs, O., Antioch College.
WRAW, Good, Horace D., Reading, Pa.; 238 meters, 10 watts.
WRAX, Flexon's Garage, Gloucester City, N. J.; 268 meters, 50 watts.
WRAY, Scranton, Pa.; radius 400 mi.; Sunday Chapel service; Wednesday; Selective Musical program, 8:15 to 10; Saturday; 8:15 to 11; Radio Sales Corp., 280 meters, 100 watts.
WRAZ, Radio Shop of Newark, Newark, N. J. 233 meters, 50 watts.
WRC, Washington, D. C.; Radio Corporation of America, 469 meters, 500 watts.
WRK, Hamilton, Ohio, Doron Bros. Elec. Co.
WRL, Schenectady, N. Y., Union College.
WRM, Urbana, Ill., Univ of Ill.
WRR, Dallas, Texas, City of Dallas, Police and Fire Signal Dept.
WRW, Tarrytown, N Y; Tarrytown Radio Research Lab; 275 Meters; 50 watts.
WSAB, Cape Girardeau, Mo., Southeast Mo. State College.
WSAC, Clemson College, S. C.; Clemson Agricultural College.
WSAG, Davis, Loren V., St. Petersburg, Fla.; 244 meters, 10 watts.
WSAH, Chicago, Ill.; A. G. Leonard, Jr.; 248 meters, 500 watts.
WSAJ, Grove City, Pa. Grove City College.
WSAK, Daily News, The, Middleport, Ohio; 258 meters, 20 watts.
WSAL, Brookville, Ind.; Franklin Electric Co.
WSAN, Allentown Radio Club, Allentown, Pa.; 229 meters, 10 watts.
WSAP, New York City; Seventh Day Adventist Church.
WSAQ, Round Hills Radio Corp., Dartmouth, Mass.; 280 meters, 100 watts.
WSAR, Doughty & Welch Elect. Co., Fall River, Mass.; 254 meters, 10 watts.
WSAT, Plainview Elect. Co., Plainview, Texas; 268 meters; 20 watts.
WSAU, Chesham, N. H.; 229 Meters; 10 watts; Camp Marienfield.
WSAW, Canandaigua, N. Y.; 275 Meters; 100 watts; Curtlee & McElwee.
WSB, Atlanta, Ga., Atlanta Journal.
WSL, Utica, N. Y., J. & M. Elec. Co.
WSY, Birmingham, Ala., Alabama Power Co.
WTAB, Fall River Daily Herald, Fall River, Mass.; 248 meters, 10 watts.
WTAC, Johnstown, Pa., Penn. Traffic Co.
WTAD, Carthage, Ill.; 229 meters; 50 watts; Robert E. Compton.
WTAF, New Orleans, La.; 242 meters; 20 watts; Louis J. Gallo.
WTAH, Belvidere, Ill., 230 meters, 10 watts; Carmen Ferro.
WTAJ, Portland, Maine, 236 meters, 50 watts; The Radio Shop.
WTAL, Toledo, O., 252 meters, 10 watts; Toledo Radio and Electric Co.
WTAN, Matoon, Ill., 240 meters, 100 watts; Orndorff Radio Shop.
WTAS, Elgin, Ill; 275 meters, 500 watts; Chas. E. Erbstein.
WTAU, Tecumseh, Neb., Ruegy Battery & Elec. Co.
WTAW, College Station, Texas; Ag'c'ltle & Mech. College; 254 meters; 50 watts.
WTG, Manhattan, Texas, Kans. State Agri. College.
WVP, New York, N. Y. Signal Corps, U. S. Army.
WWAC, Waco, Tex; 3000 miles; Weather forecasts 11 a m daily; musical concerts, daily, 1:30 p m and on Wednesday and Saturday evenings at 8; Sanger Bros.
WWAD, Philadelphia, Pa., Wright & Wright, Inc.
WWAX, Laredo, Texas, Worman Bros.
WWB, Daily News Print Co., Canton, Ohio; 268 meters, 200 watts.
WWI, Dearborn, Mich., Ford Motor Co.
WWJ, Detroit, Mich., Evening News.
WWL, New Orleans, La.; Loyola University; 280 meters; 100 watts.

(Continued on page 32)

Complete Corrected List of U. S. and Canadian Broadcasting Stations

Canadian Stations

CFAC, Calgary, Alta., Can. Western Radio Co., Ltd.
CFCA, Toronto, Ont., Can. Toronto Star.
CFCS, Vancouver, B. C., Can. Marconi Co.
CFCE, Halifax, N. S., Can. Marconi Co.
CFCF, Montreal, P. Q., Can. Marconi Co.
CFCH, Iroquois Falls, Ont., Can. Abitibi Power & Paper Co., Ltd.
CFCI, Walkerville, Ont., Can. Motor Products Corp.
CFCN, Calgary, Alta., Can. W. W. Grant Radio, Ltd.
CFCX, London, Ont., Can. The London Advertiser.
CFPC, Fort Frances, Ont., Can. International Radio Develop. Co.
CFTC, Toronto, Ont., Can. The Bell Telephone Co.
CFYC, Vancouver, B. C., Can. Victor Wentworth Odlum.
CFZC, Montreal, Que., Can. Can. Westinghouse Co., Ltd.
CHSC, Calgary, Canada. W. W. Grant Radio, Ltd. (Morning Albertan.)
CHCA, Vancouver, B. C., Can. Radio Corp. of Vancouver, Ltd.
CHCB, Toronto, Can. Marconi Co.
CHCC, Edmonton, Alta., Can. Can. Westinghouse Co., Ltd.
CHCF, Winnipeg, Man., Can. Radio Corp. of Winnipeg, Ltd.
CHCQ, Calgary, Alta., Can. Western Radio Co., Ltd.
CHCS, London, Ont., Can. London Radio Shoppe.
CHCX, Montreal, Que., Can. B. L. Silver.
CHCZ, Toronto, Ont., Can. Globe Printing Co.
CHOC, Vancouver, B. C., Can. Can. Westinghouse Co., Ltd
CHVC, Toronto, Canada. Metropolitan Motors Co.
CHXC, Ottawa, Ont., Can. J. R. Booth, Jr.
CHYC, Montreal, Que., Can. Northern Elec. Co.
CJBC, Montreal, Que., Can. Dupuis-Freres.
CJCA, Edmonton, Alta., Can. Edmonton Journal, Ltd.
CJCB, Nelson, B. C., Can. James Gordon Bennett.
CJCD, Toronto, Can., T. Eaton, Co.
CJCE, Vancouver, B. C., Can. Vancouver Sun.
CJCF, Kitchener, Ont., Can. News Record, Limited.
CJGG, Winnipeg, Canada. Manitoba Free Press.
CJCH, Toronto, Ont., Can. United Farmers of Ontario.
CJCI, St. John, N. B., Can. McLean, Holt & Co., Ltd.
CJCN, Toronto, Ont., Can. Simone, Agnew & Co.
CJCS, Halifax, N. S., Can. Eastern Telephone & Telegraph Co.
CJCY, Calgary, Alta., Can Edmund Taylor.
CJGC, London, Ont., Can. London Free Prese.
CJNC, Winnipeg, Man., Can. Tribune Newspaper Co.
CJSC, Toronto, Ont., Can. Evening Telegram.
CKAC, Montreal, Can. La Preese.
CKCB, Winnipeg, Man. Can. T. Eaton Co., Ltd.
CKCD, Vancouver, B. C., Can. Vancouver Daily Province.
CKCE, Toronto, Ont., Can. Can. Ind. Telephone Co.
CKCK, Regina, Sask., Can. Leader Pub. Co.
CKCR, St. John, N. B., Can. Jones Elec. Radio Co., Ltd.
CKCS, Montreal, Que., Can. The Bell Telephone Co.
CKCZ, Toronto, Ont., Can. Westinghouse Co., Ltd
CKKC, Toronto, Ont., Can. Radio Equipment & Supply Co., Ltd.
CKOC, Hamilton, Ont., Can Wentworth Radio Supply Co., Ltd.
CKQC, London, Ont., Can. Radio Supply Co.
CKZC, Winnipeg, Man., Can. Salton Radio Eng. Co.

Funds for U. S. Radio

When the next session of congress takes up for consideration the appropriations to be made for the conduct of the federal government during the coming fiscal year, a greatly increased appropriation will be asked for the operation of the radio division of the Department of Commerce, which today is struggling along on funds but little greater than those available three and four years ago when broadcasting, as we know it today was non-existent.

If the radio division is to perform its functions efficiently, at least $100,000 more than is now appropriated will be necessary, it is believed. A greatly increased force of inspectors is needed if the broadcasting stations and amateur plants are to be checked up properly. At present, practically all of the time of inspectors on the coast is required for the inspection of ship stations and similar government work, and they are hard pressed for the time in which to make these necessary inspections of other stations. The recent reallocation of wave lengths, however, makes it necessary that every station be extremely sharp on its wave, if there is to be no interference, and careful checking up of the wave length used is necessary.

Few persons not connected with the work of the Department of Commerce realize what the district inspectors are doing. Many of them are out of bed and ready for their day's work before the last "ham" has signed off for the night. They travel great distances; most of them have automobiles for facility in covering their territory and run the speedometer up many hundreds of miles in the course of a month. All sorts of work come to the radio inspectors; the checking of broadcasting stations and the inspection of ship plants is but a part of their labor. Many complaints are received, some well founded and some imaginary; but all must be investigated, at a great expense of time.

Practically every inspector is heavily overworked, and it is the desire of officials in Washington to give them such assistance as may be necessary for them to carry on all of the many operations which go to make up an inspector's day. At the same time, the Washington offices are none too well supplied with labor, and hard work and long hours are necessary for the handling of the great mass of data, reports, complaints, letters, applications, etc. which pour in in a steady stream.

New Pamphlet

A publication giving an introduction to the subject of line radio communication has just been prepared, under the direction of the Chief Signal Officer of the army, in cooperation with the Bureau of Standards. The pamphlet gives an explanation of how messages are carried to distant points by radio frequency currents directed over ordinary telephone lines or power wires. The fundamental principles of radio and its relation to line radio telegraphy and telephony are discussed.

Copies of the work, known as Signal Corps Radio Communication Pamphlet, No. 41, and entitled, "Introduction to Line Radio Communication,' can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. at ten cents a copy.

Big Press Station

The Canadian Department of Marine has issued a license for the erection of a high-powered press radio station at St. Margaret's Bay, Nova Scotia, near Halifax, to C. F. Crandall of the British United Press, acting for the American Publishers' Committee. For over a year a group of American papers, including New York, Philadelphia, Chicago and other dailies, has been operating an experimental radio station at Dartmouth, across the bay from Halifax, for the reception of wireless press reports from London and Europe, and relaying them by land lines to the newspapers. The project will now be made permanent, a dispatch from Consul General Gunsaulus states.

Station in Balkans

Work has been started on a new 100-kilowatt radio station at Rakovica about four kilometers from Belgrade and on a receiving station at Laudon Trench, a suburb of that city. The station is being built by the French Wireless Telegraph Company and the total expense is estimated at 38,000,000 dinars ($402,800 at rate of exchange of September 1). On its completion the entire installation will be taken over by the state and the operating personnel will become employes of the Department of Posts and Telegraphs, the company maintaining one engineer as a technical adviser.

This particular station will be the first high power radio installation in the Balkans and because of the greatly increased facilities which it will afford for the dissemination of news and the rapid dispatch of information, it should soon become well known internationally, says Consul K. S. Patton, in a report to the Department of Commerce.

WGY Reaches Iceland

WGY is the first American radio broadcasting station to be heard in Iceland. In May, Snorri P. B. Arnar, chief radio operator at Reykjavik, 2,600 miles from Schenectady, N. Y., picked up the General Electric Company station regularly, sometimes strong enough to operate a loud speaker.

The Schenectady station has been heard at greater distances than Iceland but never before so far north, chiefly because of the limited number of stations in the thinly populated country. WGY has been heard in France, in Chile and in Hawaii.

Broadcasting a Book

Station WJZ, of the Radio Corporation, has been conducting an interesting entertainment feature by serializing William Johnston's Mystery novel, "The Wedding Cipher." A chapter is broadcast each Thursday evening at 8:45, central time, from the station in Aeolian Hall, N. Y.

Radio to Guide Zeppelin

By CARL H. BUTMAN

Washington, D. C.—Early in November, it is expected that the Zeppelin Company will point the nose of the great German-built ZR-3 toward the west and the long overseas journey of the navy's second airship will begin. On her maiden trip to her American home at Lakehurst, N. J., a distance of approximately 3,600 nautical miles, radio will guide this latest Zeppelin.

She will not be under radio control, as was the old battleship "Iowa," when sunk by naval gunfire, but radio will carry to her twice daily complete forecasts of the weather ahead and the meteorological conditions on the southern trans-Atlantic steamship route along which, it is understood, she will proceed under the direction of the German officers and crew. The only American officer who is certain of making the trip over is Captain G. W. Steele, U. S. N., her future commander, but it is possible that Commander Garland Fulton, Lieutenant Commander S. N. Kraus and Lieutenant R. G. Pennoyer, naval observers at Friedrichshafen, may be among the passengers.

Briefly, the characteristics of the new aerial passenger cruiser (she is not a war craft, at least, not yet) are: length 660 feet, slightly less than the American built ZR-1; diameter 90 feet; power, four 400-hp Maybach engines, giving a speed of approximately eighty miles an hour. In one sentence, she is the last word in old-world airships and it will be interesting to witness a comparison and test with the new world's ZR-1, with which ship she will share the gigantic double hangar at the Lakehurst Naval Air station.

Although the United States has no control over this craft during her flight over the Atlantic, nor, in fact, until she is officially delivered to the Navy as a reparation ship, the government is to cooperate in paving the way on her first cruise. Through arrangements between the weather bureau, navy, shipping board vessels and certain other north Atlantic ships, meteorological data from all along her route will be compiled and radioed twice a day to a station ship in mid-Atlantic. This vessel will have a powerful radio set and will transmit to NAA, Arlington, Va., bulletins for broadcasting to the ZR-3, both before and during her flight.

All details have been arranged between the navy and the weather bureau. The plan includes the receipt of storm warnings, forecasts and statements of weather both at sea and ashore which might in any way affect the passage of the great airship. Observations will start a full week before the craft leaves Germany, and the reports will be on the air until she is housed in her hangar.

Little is known of the radio equipment of the ZR-3 but it is said that it is of the latest German radio development, and that transmission and reception is assured all the way across the Atlantic, although half that range would be sufficient due to the cooperation of the station ship and NAA.

CORRECTION.

Sept. 7, 1923.

Radio Age,
500 North Dearborn St.,
Chicago, Ill.

Gentlemen:

On page 19 of the September issue of RADIO AGE you state that the capacity of .00005 microfarad can be obtained by connecting two .00025 microfarad condensers in series. I wish to call your attention to this mistake as the resultant capacity would be .000125 and not .00005.

On page 15, T. F. W., of Chicago, states that the hydrometer always registers 1200 after charging his Edison battery. I think that it would have been advisable in your answer to inform T. F. W. that a hydrometer reading of an Edison battery is no indication of its degree of charge as the specific gravity of the solution in the Edison battery does not change during charge or discharge. The voltmeter test is the only reliable one for an Edison battery. It might be well to caution readers against using a hydrometer to test Edison batteries as they are very apt to use a hydrometer which has been previously used to test a lead storage battery in which case some of the remaining acid would be introduced into the Edison battery with detrimental effect.

Trusting that you will accept these criticisms in the spirit in which they are given, I remain

Yours very truly,
K. E. HASSEL.

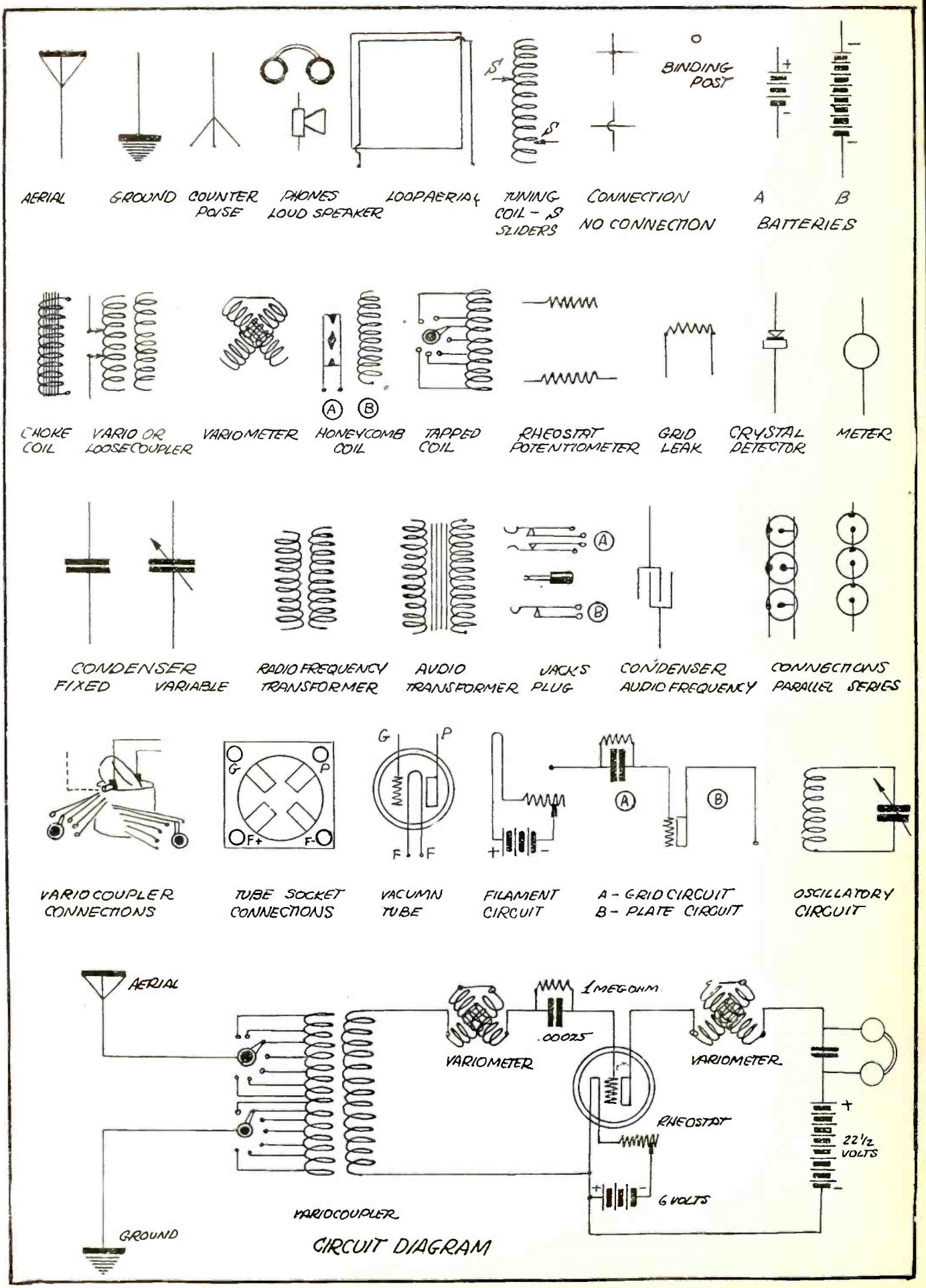
Zenith Incorporates

The Zenith Radio Corporation has been formed with a capitalization of $500,000, all common stock at a par value of $10. The new corporation has a contract to act as the exclusive selling agents of the Zenith long distance receiving and sending apparatus, manufactured by the Chicago Radio Laboratory, one of the original Armstrong licensees.

E. F. McDonald, Jr., is president and treasurer; Thomas M. Fletcher is vice president; N. A. Fegen is secretary, S. I. Marks is assistant treasurer and the directors are J. R. Cardwell, U. J. Herrmann and Irving R. Allen.

Announcement by Mr. Fegen says: "The Chicago Radio laboratory is now enlarging its factory and manufacturing facilities to enable it to take care of an output of 300 sets a day. All indications are that the demands will be so great this fall that the principal problem will be a matter of production, and the orders now on hand indicate the tendency of the buying public towards higher priced, better grade radio receiving instruments.

"We are expecting daily to hear of others to bear out our prophecy that the season 1923-24 will not only be the greatest radio season ever known, but will also be a stepping stone to future years with steadily increasing volume."


AERIAL
GROUND
COUNTER POISE
PHONES LOUD SPEAKER
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VARIO OR LOOSE COUPLER
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A
B
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RHEOSTAT POTENTIOMETER
GRID LEAK
CRYSTAL DETECTOR
METER
CONDENSER FIXED VARIABLE
RADIO FREQUENCY TRANSFORMER
AUDIO TRANSFORMER
JACKS PLUG
A
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CONDENSER AUDIO FREQUENCY
CONNECTIONS PARALLEL SERIES
VARIO COUPLER CONNECTIONS
G
P
F+
F-
TUBE SOCKET CONNECTIONS
G
P
F
F
VACUMN TUBE
FILAMENT CIRCUIT
A
B
A - GRID CIRCUIT
B - PLATE CIRCUIT
OSCILLATORY CIRCUIT
AERIAL
1 MEGOHM
.00025
VARIOMETER
VARIOMETER
RHEOSTAT
22 1/2 VOLTS
6 VOLTS
VARIOCOUPLER
GROUND
CIRCUIT DIAGRAM

What Will Your Set Look Like Five Years From Now?

(*Continued from page 7.*)

Since then various additions have been made until the set evolved into the arrangement shown in figure 2. This set was a marvelous success, judging from records made at that time, the writer having heard every district (radio division) in the United States, Canada and ships on the Atlantic Ocean.

Even some of the sets now in use using similar circuit—the Armstrong regenerative—have not anywhere near compared with this range, which is probably due to the increased interference caused by the many new stations and receivers.

The lower cabinet was a home-made variocoupler variometer set, with the upper cabinet one of the old types of amplifiers of the two-stage variety that the Chicago Radio laboratory used to make, (they made good apparatus way back, too) of the 1920 vintage.

The transmitter was increased to a quarter kilowatt spark, and its signals were heard over 800 miles from Chicago. Later this was replaced by one KW spark which was used until last winter when the writer realized that broadcast listeners were to be considered—rather they had to be, inasmuch as they threatened to cut down the sixty-foot masts used to support the antenna for the station. The cards on the wall are cards from other amateurs who heard signals from this station, and reported them.

A continuous wave transmitter is now being built for use next winter, and various circuits are being tried out, to find the best broadcast and amateur set possible.

The set shown in Figure 2 has been replaced by a three-circuit type using Amrad parts, with a rebuilt amplifier of the Zenith type. The best receiving record on broadcasting of this set is KHJ at Los Angeles, Calif., and of amateur stations in every district.

A Marvelous Trio

(*Continued from page 9.*)

There are three elements in the vacuum tube, filament, grid and plate, which are the vital parts of the receiving tube and, when connected into the receiving circuit in the proper way, act together to produce from the incoming electrical disturbance a form of energy which can be connected into a reproduction of the original sound initiated at the broadcasting station.

The exact action by means of which this result is obtained is rather complicated and is exceedingly difficult to discuss without the aid of diagrams or some such way of visualizing the process. At best, under the conditions imposed in a description of this kind, it is possible to give only a very rough idea of the physical phenomena, which are concerned in the action of the tube.

To begin with, in order to receive with a tube, the filament must be heated by passing an electrical current through it. When a metallic substance is heated in a vacuum it shoots out from its surface millions of extremely minute particles which are called electrons. These electrons are small negative charges of electricity, the smallest known subdivisions of matter and upon them the whole action of the tube is dependent. The filament is there for the sole purpose of shooting these electrons out into the space in the bulb where they can be made use of.

Having heated the filament of the WD-11 tube to a very dull red, we have a condition where electrons are being evaporated out of the filament at a rate determined by the temperature of the metal, and if the electrons have no place in particular to go, an equilibrium condition is reached where the filament is surrounded by a cloud of electrons which are in a state of constant agitation and change, a number coming out of the filament and an equal number returning to it each second.

Now let the plate be connected through the telephone receivers to the positive pole of a 22 1-2 volt battery, called the B battery. The negative pole of this battery is connected to one end of the filament. The plate is therefore "positive" in potential and the negative particles of electricity coming out of the filament are attracted towards the plate just as unlike poles of a magnet are attracted to each other. A stream of negative particles of electricity is pulled from the filament into the plate, and an electrical circuit is thereby completed, so that the B battery is forcing a current through a circuit containing the telephones and the space between plate and filament.

But in the space between plate and filament is the grid which normally allows the stream of electrons to flow freely through its mesh to the plate. If a voltage is applied to the grid, however, the stream of electrons will be deflected so that some of them go to the grid or are driven back to the filament, and the amount of current flowing between filament and plate is thus varied. Any variation in this current means a variation in the current through the telephone receivers and this of course means a sound. Therefore, an electrical impulse impressed on the grid of the tube appears as sound in the telephone receivers.

Station 9CPJ, built and operated by Charles G. Pelton of the Black Hawk Electric Company, of Waterloo, Iowa. 25 Watt C. W. 10 watt phone. With the receiver Mr. Pelton has picked up California, Canadian and New York stations.

It is this property of the structure of the tube which makes it possible to perceive with the ear the results of the electrical impulses intercepted by your antenna. The antenna with its tuning system is connected in such a way that the variations of electrical energy which form the incoming signal are impressed on the grid of your tube. Because of the way in which the electron stream is controlled, a very small amount of energy impressed on the grid will make a relatively large variation in the energy in the plate circuit which is supplied by the B battery. The incoming signal on the grid is therefore able by the control of this local source of energy to actuate the telephones much more strongly than would be the case of this amplifying property were not present, or the amplified energy in the plate circuit may be applied to the grid of a second tube and amplified again.

Because of this same amplifying property, the principle called "regeneration" may be employed. In this method of using the tube, the incoming energy is used to produce variations in the B battery energy in the plate circuit as described; and then part of this energy variation is taken out of the plate circuit and fed back onto the grid of the same tube where it again produces variations in the plate current which add to the variations previously obtained. In

this way, a feeble incoming signal may be reinforced and strengthened to produce a relatively large quantity of sound when it finally is converted into that form of energy. It is by the use of this regenerative action of the tube that stations operating at great distances can be heard with a single tube.

It will immediately appear that a further use of the amplifying property of the tube makes possible the building up of a signal which is barely audible in head telephones, until it is loud enough to furnish music for a large room.

To accomplish this result, the energy variation which actuates the telephone in the ordinary detector set is made to pass through the primary winding of a transformer or through a high resistance. The variations of voltage across the high resistance or across the secondary terminals of the transformer are impressed on the grid of a second tube. These voltage variations produce variations in the energy in the plate circuit of the second tube which are much greater than the variations in the plate circuit of the first tube, and which can be converted into sound by means of telephone receivers or can be used to actuate still another tube with corresponding amplification in the plate circuit of the last tube. In this way a signal can be built up without distortion to produce a volume of sound immensely greater than the feeble note you hear in the telephone receivers of your detector set.

The development of the WD-11 bulb, with its dry cell filament, by doing away with the necessity of the bulky and inconvenient storage battery for filament lighting, has placed the tube set upon such a footing that its use is entirely practicable for all home receiving stations.

Broadcasting at Limit

For the first time in many months no new broadcasters sought licenses for stations during the week ending September 8. This is a confirmation of predictions of Secretary Hoover and his radio aides that the saturation point has really been reached. That 567 were enough broadcasters nearly everyone agreed in August, and few regret that the number has fallen off four.

The point now established is that evidently those who contemplated entering the field also recognized this fact and refrained from taking out licenses. The activity in September was the least since February, 1922, but indicates a better state of stability in the broadcasting field.

During August, seven new stations came into being, thirteen transferred from Class C to Class A, and eleven ceased operation. This leaves the present number of broadcasters at 563 stations, a large percentage of which are good, reliable stations, likely to survive some time.

One Class B station, well known WGY, transferred from its classification to Class D, covering broadcasting development, and now shares this honor with Pittsburgh's KDKA.

Your First Tube Set

(*Continued from page 6.*)

honey-comb coil together with the other minor tube accessories make a circuit of a very efficient nature. The variometer is placed in the plate circuit as shown in Figure 5 and a 23-plate condenser is used to tune the secondary circuit. A 25-turn honeycomb coil is used to raise the wave of the circuit to enable the builder to apprehend the present higher waves now in use. Of all the circuits shown, the long distance crystal offers the greatest tuning possibilities.

Figure 6 illustrates how a two circuit crystal set using the loose or variocoupler connections are changed to accommodate the tube attachment. The circuit is practically the same as that of the long distance crystal, excepting that the plate circuit is not tuned. The only additional apparatus necessary is the bulb, batteries and the corresponding tube controls.

These circuits are probably the simplest of any to use with the named crystal sets, and are probably just as efficient as any of the more complicated sets requiring painstaking tuning and difficult construction.

Now that you have read how to change that crystal set of yours into a real set, look over your set, select the circuit which applies, and change your set into a valve set—we are sure the change will be a worth while change—and we know it will open new doors to radio listening to the crystal user, furnishing greater entertainment and a keener appreciation of the great broadcasting institution which has proven so popular in the last two years.

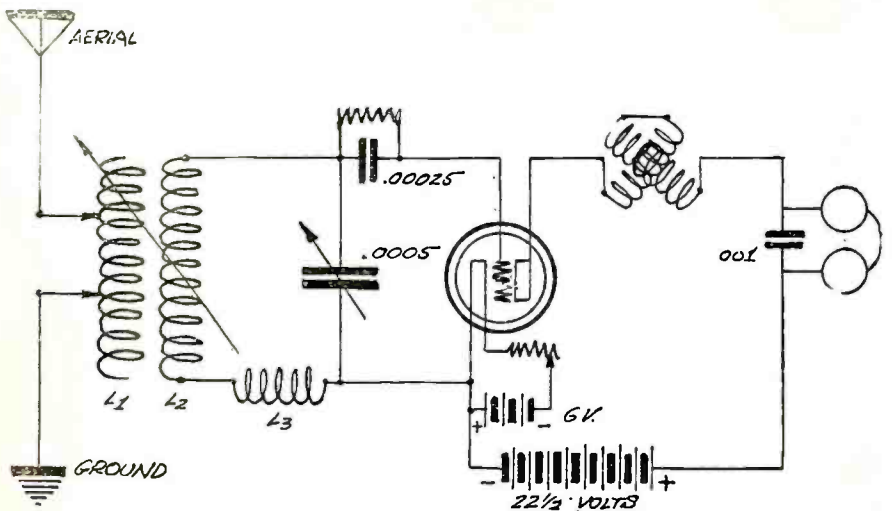

Figure 5—This is circuit used when the long distance crystal set is changed to a tube set.

Further information may be had by referring to the June, 1923, issue. Obtainable at the regular price.

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65,000 Letters

Since the inauguration of broadcasting by WGY, sixteen months ago, the General Electric Company has received 65,000 letters from listeners scattered over the United States and from points as widely apart as Hilo, Hawaii and London, England, Vancouver, Canada, and Valparaiso, Chile.

Some of these letters are typewritten and from the offices of business and professional men and some are penciled on scraps of paper from woodsmen and from forest rangers.

On Great Lakes

Weather bulletins and hydrographic information will be broadcasted twice daily by the Intercity Radio Company, located in Cleveland, on Lake Erie. The service is intended for the shipping on the Great Lakes, and will be broadcast on a wave length of 706 meters, spark. The call of the station is WTK. This station also is licensed to communicate with Rogers City, Mich., on a wave of 1764 meters.

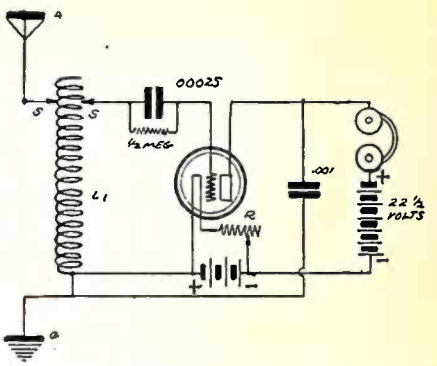

Figure 4—The two-slide tuning coil is connected to a tube much in the same way as a crystal is used.

Radio In Arctics

(*Continued from page 11.*)

tainment at any time. Two northbound ships, the S. S. "Bayeskimo" and the S S. "Nascopie" are carrying radio receiving sets to six of the posts above the Arctic circle.

In order to determine whether or not these posts will be able to hear the concerts from the United States next winter, the ships are listening in on their way north to the broadcasts as they steam to the frigid zone. Several nights ago, the Westinghouse station WBZ in Springfield, Mass., gave a special concert at 11 p. m. and radiograms received from the steamship "Bayeskimo" state that the music has been heard with great success.

There are hundreds of posts spread throughout Canada and North America, from above the Arctic Circle into James Bay. The ships have left for these trading posts and the factors will have their sets for next winter. Although the reports received so far from the ships are very encouraging, complete information on the results obtained will be obtained upon their return. The posts are so far removed from civilization that these will be the last news from the outposts until spring. The lanes of travel to these posts are entirely blocked on account of the heavy ice which accumulates.

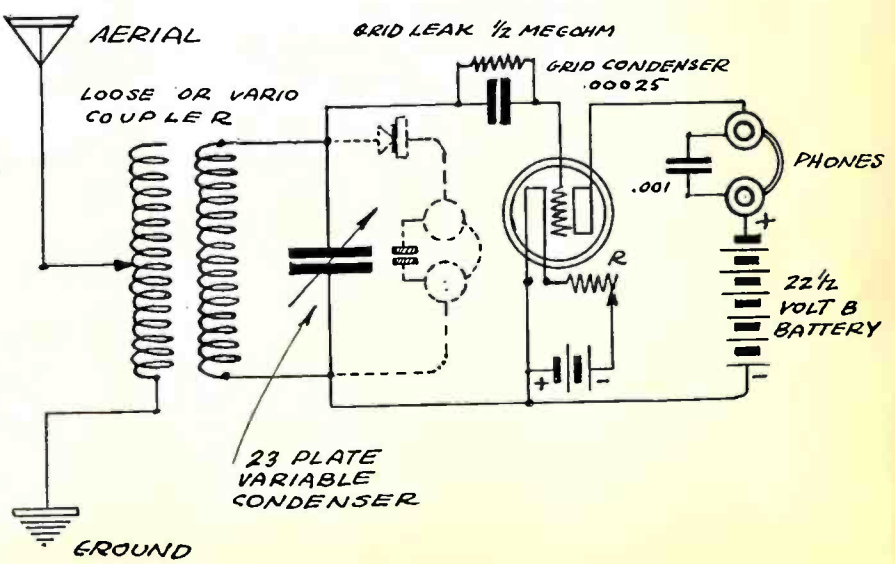

Figure 6—The dotted lines in the above circuit show the relative connections of tube and crystal in the two-circuit set.

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What If You Were An Explorer?

Supposing you had been sojourning in the North Pole region for sixteen years as has Dr. MacMillan, and all that time you had of company no more than your recollection, your crew of six or seven men, a pack of dogs, a few unimaginative and dull Eskimos, and the monotonous background of endless snow and ice. And supposing upon your return from an expedition you learned of the World War, increasing the more your disappointment over North Pole isolation, the worst of the Arctic hardships. Then suddenly science offered you its latest invention—radio—with which to annihilate both distance and loneliness. What radio set of the hundred different kinds would you select for getting news and sending word back home? Of course, no other than the best.

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