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52 Numbers

# RADIO

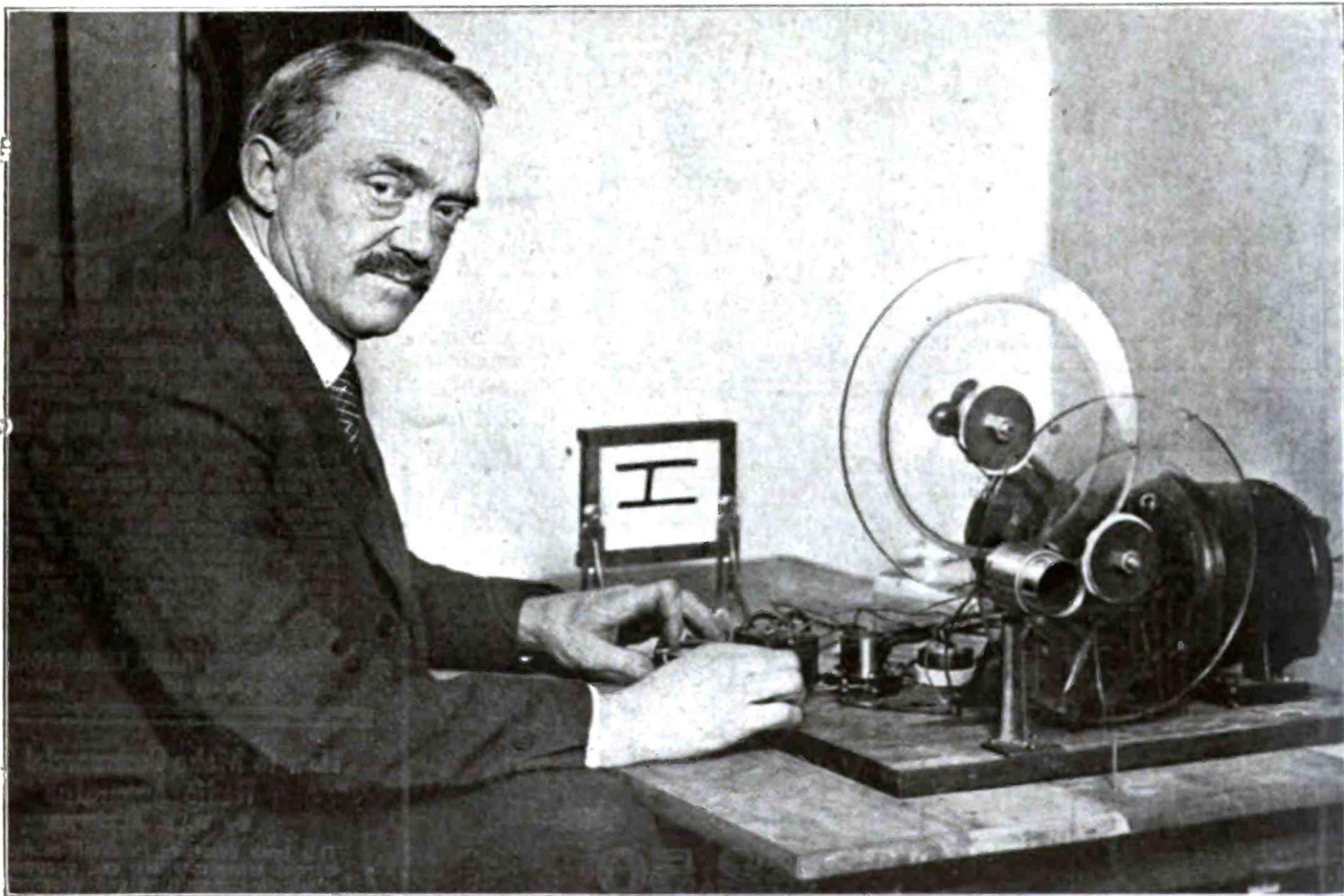
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# WORLD

ILLUSTRATED

WEEKLY

## PHOTOGRAPHS SUCCESSFULLY TRANSMITTED BY RADIO



(C. P. & A. Photos)

While sending photographs over land wires has been accomplished and has been done for some time, the first photograph to be sent and received successfully by radio was transmitted from Washington, D. C., to the Evening Bulletin, Philadelphia, March 3, 1923, a distance of 130 miles. Mr. C. Francis Jenkins, of Washington, is the inventor of the apparatus used.

The principle of the invention is to transform the light impulses or waves from the photographs into electrical impulses by means of special glass discs and light cells, and then to change them from electrical impulses to radio waves. In the reception of the photograph the process is reversed, the waves being received as radio impulses, transmuted into electrical impulses which actuate light cells and by means of the discs seen in the illustration above being impressed on a sensitized film as a photographic negative. The photograph thus received must be developed in the usual way. Some photographic detail was lost in the experiment due to outside interference which was not controllable at either the receiving or transmitting stations. These interfering impulses in the form of static, or signals from other stations, went through the apparatus and registered, thus causing the loss of detail. The pictures transmitted were those of President Harding, Vice-President Coolidge and Governor Pinchot, all of them being successfully received.

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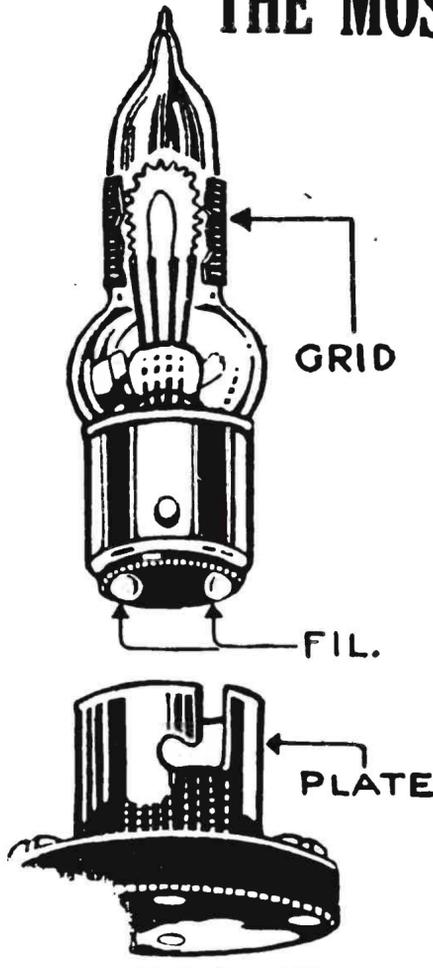
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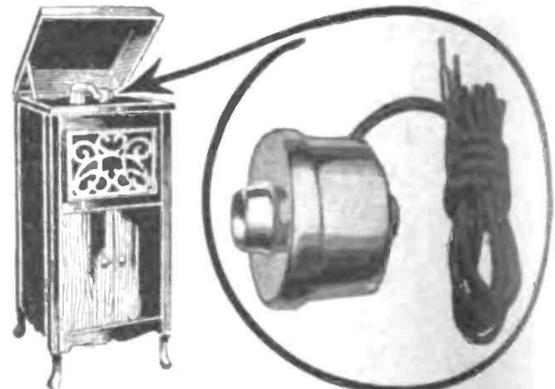
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1493 BROADWAY, NEW YORK

VOLUME TWO OF  
**RADIO WORLD**

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

**A Weekly Journal, Published Every Wednesday and Dated Saturday, by Hennessy Radio Publications Corporation from Publication Office, 1493 Broadway, New York, N. Y. Telephone: Bryant 4796.**

Vol. II, No. 25. Whole No. 51

March 17, 1923

15c per copy, \$6.00 a year

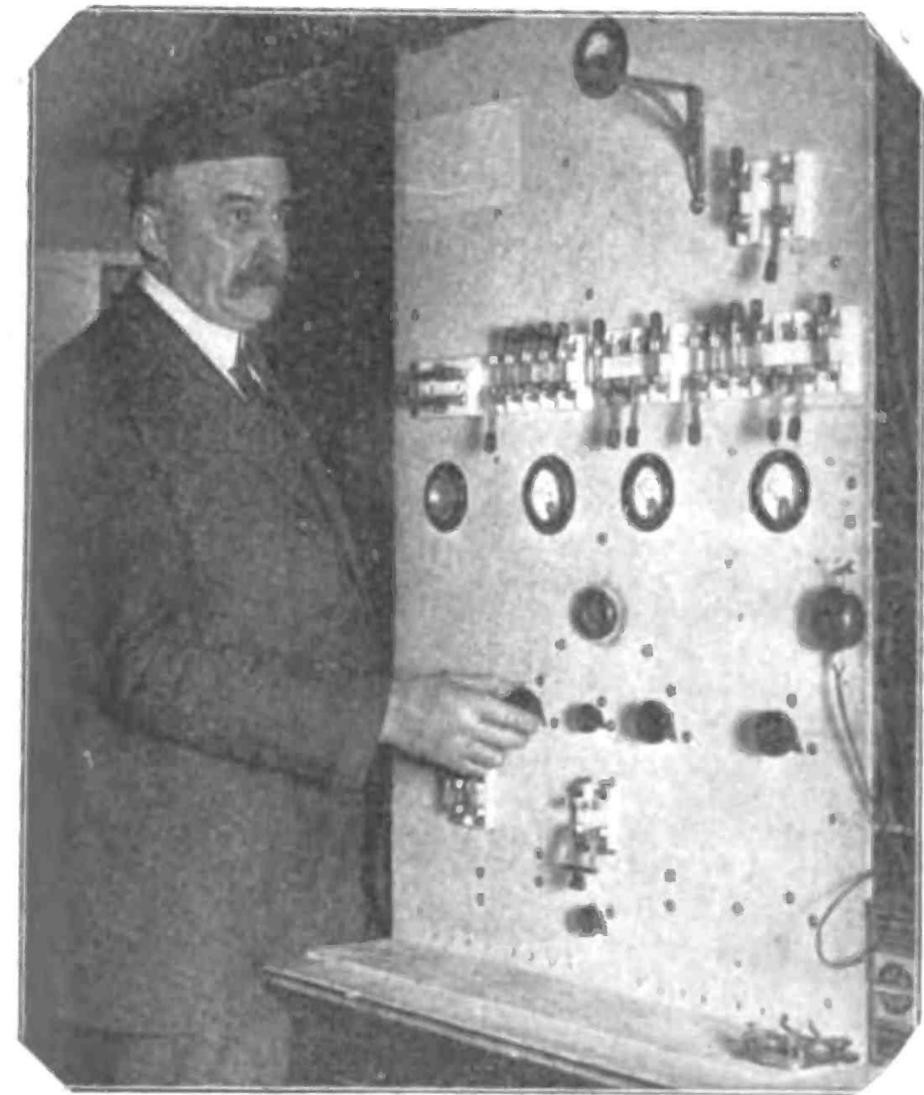
## The First Church Radio Broadcasting Station

**C**ALVARY Baptist Church, New York City, has installed a complete radio broadcasting system for sending out Dr. Straton's sermons and the special music in the regular services of the church. This is a regular licensed station and the call letters are WQAO. Calvary is the first New York church to install its own independent broadcasting station.

Dr. Straton, in speaking of this advance step in the church, said: "I am delighted with it. We have given the system a thorough test and it has proved very successful. I am a hearty believer in the use of radio for broadcasting the truths of religion. I believe that radio

"We had, too, another evening a most interesting and remarkable incident when we were testing out to see whether the system would successfully broadcast the music from our great new organ. In the preliminary announcement our operator had requested any outstations who picked up and heard the music to notify us, if possible, by telephone whether or not it was going successfully.

"While our Choirmaster was playing the organ here in the auditorium in this test, the telephone bell rang and my secretary answered. He was told that the music was coming perfectly to a receiving station far



(C. Kadel and Herbert)  
 Radio room of WQAO, the first church broadcasting station established. George F. Koester, sexton of Calvary Church, New York City, who installed and built the set.



(C. Kadel and Herbert)  
 Rev. John Rosch Straton, pastor of the Calvary Baptist Church, New York City, preaching a sermon into a special transmitter. This was the first church to operate its own broadcasting station.

is destined to take a place second only to the newspapers as a means for immediately and directly reaching the masses of the people.

"The people will not get any doubts or negations or question marks from the Calvary pulpit. I shall try to continue to do my part, as the Bible expresses it, in 'tearing down the strongholds of Satan' and I hope that our radio system will prove so efficient that when I twist the devil's tail in New York, his squawk will be heard across the continent!

"I gave a brief talk the other day from the Calvary pulpit simply to test the apparatus, and I was delighted with the responses that came in from far and near.

away, and when Mr. Wilson expressed his pleasure, the friend at the other end of the line said: 'It is just as clear as if I were sitting in the auditorium.' Then he said: 'Here, you can hear it over the phone; I will hold my amplifier horn to the telephone and you can hear it.' He did this and Mr. Wilson heard the music that was going out by radio from the Calvary auditorium to the far away radio receiving station, and then coming back to him over the telephone with perfect distinctness."

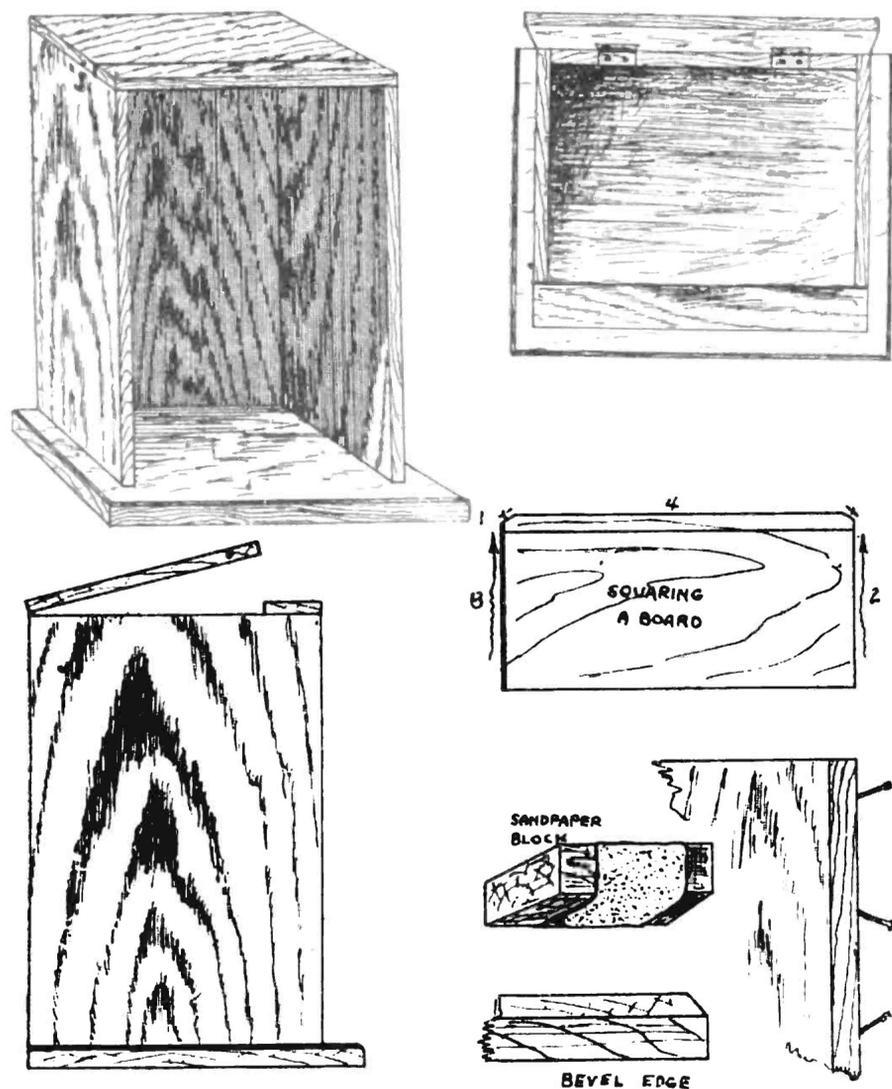
Dr. Straton has stated that, in his opinion, the broadcasting of sermons and services from the pulpit would not tend to keep people away from the church.

# How to Make a Cabinet for Your Radio Set

By *Kenneth Malcolm*

**M**ANY radio bugs devote their entire energies to the working of their sets and completely overlook the appearance. Some even believe that a shabby set will produce better results than one more carefully dressed up. However, it will be found that a correctly designed set will actually work better if the parts are neatly arranged and carefully wired. Further, if your set is properly housed in a good cabinet, it will find greater respect in the eyes of the outsiders who do not know and appreciate your set as well as you do; therefore, its apparent value will be increased.

Then, again, there are many other radio bugs who would like to have a good cabinet, but don't know just how to make one. It is for them that this article was prepared.



Diagrams illustrating the various steps in making a radio set cabinet.

The purpose is to help the person with limited means and few tools make an unpretentious but adequate cabinet to house his pet radio set.

All the tools necessary comprise a saw, hammer, screw-driver, try-square, pencil, foot-rule and several sheets of sandpaper of different grades. A plane, nail-set and small hand-drill would also be useful. For certain classes of finish a brush is necessary.

If you haven't all the tools mentioned, the first thing to do is to buy the best or borrow what you can. You can do better work with a few good tools than with many poor ones. If you can afford only one saw, get the cross-cut variety. Select a hammer and screw-driver to suit yourself. A smoothing plane with an 8 or 10-inch face will be best.

The wood, or stock, may be found about the house, or can be bought of a cabinetmaker or lumber dealer. The stock for the average size cabinet should be about three-

eighths of an inch thick. Heavier wood is clumsy and thinner wood is not strong enough for any but very small cabinets. The base may be thicker—say one-half to three-quarters of an inch. If you can get the wood "dressed," meaning planed smooth, at the place where you buy it, do so. In most cases you can have it cut to width on the machine; if you can, so much the better.

Choose wood to suit your taste and pocket-book. The better cabinets are usually of oak, mahogany, or walnut. Cheaper cabinets, easily made and finished up nicely, are made of bass or whitewood. This wood is good for beginners to practice with, at least until a certain amount of proficiency is achieved. It can be stained in any shade.

It is advisable to make out a list of necessary stock before you go to buy your wood. This will save the possibility of having too much or too little. Be careful to allow for the waste in cutting and truing to exact measurements. Always remember whether you are following inside or outside dimensions. The same general rules maintain for a cabinet of any size. Allow for the cover when determining the width of the back piece. Also allow for the cover when cutting the ends. Allow for the thickness of your panel when determining the projection of the front of your base. If you cannot get the side edges dressed be sure and allow extra width for smoothing and truing them up. It is customary for the grain of the wood to run in the direction of the longest dimension of a piece.

For those who must take wood as it comes there is a definite procedure for truing up. The drawings illustrate this clearly. Select an edge running with the grain and straighten it up with your plane. Move your plane in the direction the grain runs, and not against it. Try both ways if you are uncertain and you will soon recognize the right one. The mistake is made by many beginners of setting the cutter of the plane too heavy. Use the minimum projection of the cutter sufficient for smoothing, otherwise you only waste time and wood. This is edge No. 1. From this edge, with a pencil, mark the opposite parallel edge, at the correct distance. Now select the end that appears the most square and snip its farther corner off, within the waste space, with your plane. The plane should move in the direction of the little arrow. When you work on end grain you should set your plane cutter very fine, and instead of heading the plane straight along with the wood you should push it forward at an angle. Work toward the chopped off corner and never against it. When that end is true, and squared with the first side, mark it No. 2.

Next go to the other end and snip its corner off as you did with its neighbor. Carefully mark the length from the first end and plane down to the line, this time also moving in the direction of the cut end. Test occasionally with your try-square. Never try to make the plane do the work of a saw. If there is much wood to be taken down it is best to first saw near the line, and then true up with a plane. This is edge No. 3.

The truing of the remaining edge finishes the job. All pieces should be squared up the same way. If you have no plane, be careful and saw close to the line you have made. Some very good boxes may be cut out with the use of the saw alone.

The base takes on a more finished appearance if three of its edges are bevelled. This is done with a plane. As

(Continued on next page)

# Valuable Loop Antenna Hook-Up for Single Tube

By Arthur G. Shirt

**A**MATEURS who are not experimenting with the Flewelling super-circuit or with other circuits employing super-regeneration, find it very difficult to operate a single tube set on an indoor loop. A loop is a comparatively poor absorber of radio energy, but on the other hand, its directive powers make possible the bringing in of one station to the exclusion of all others. For this reason, it is preferred by some amateurs, while others use the loop because it is the only device they conveniently can use.

Whichever the case, the hook-up accompanying this article will prove of value. It is for use with a single tube regenerative set. It will be noted that the loop is grounded, which really makes it function more like an outdoor antenna than as an indoor loop. Some of the directive qualities are lost, of course, by having the loop connected to the ground in this way, but this is more than made up for in the increased efficiency of the circuit.

This circuit tunes very sharply and demands fine adjustment. For this reason a vernier condenser and vernier rheostat are recommended in their respective places as shown. For amateurs who cannot afford three, four or five tube sets, and who cannot, for

various reasons, employed an outside antenna, this hook-up, permitting a loop to be used successfully with

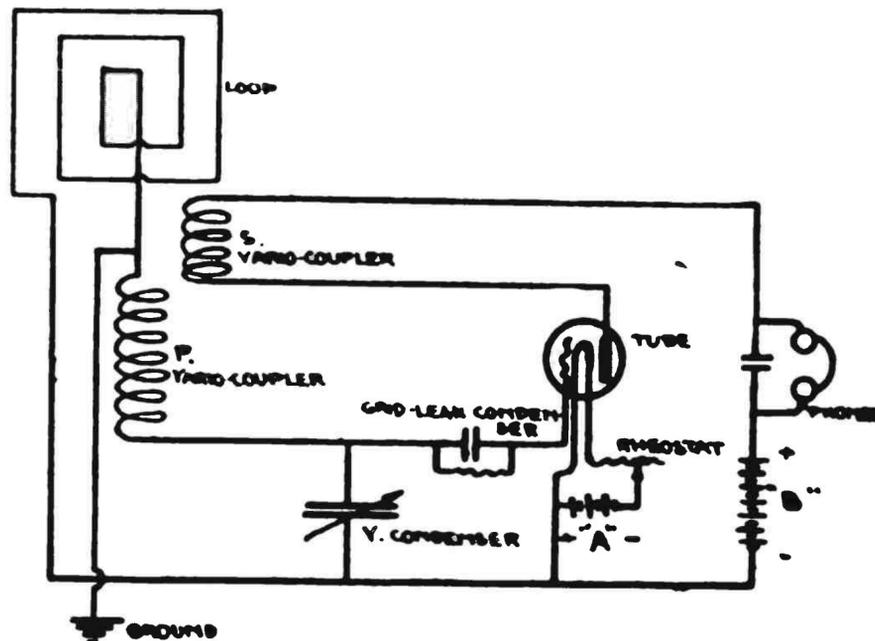


Diagram of connections for hook-up using a loop antenna.

a single tube, will prove of inestimable value. Other amateurs should find a place for it in their notebooks.

(Continued from preceding page)

the box must be as strong as possible, the top is sawed down its length about an inch and a half from one edge and the small piece is made stationary—that is, providing you want a hinged cover—otherwise the whole top is fastened down. Now comes the assembling of the parts.

Either nails or screws may be used for the joining. If properly driven, nails are entirely satisfactory. Gluing, in addition to nailing or screwing, will make a stronger job. Finishing nails an inch long are about right for cabinets using the size stock mentioned. If you use glue you might find the liquid prepared glue more convenient, although not quite as strong as the hot glue. Two little brass hinges will be needed, and also a little flat hook, if a hinged cover is wanted.

Coat the two edges (the edges that fit against the side pieces) with glue (if glue is to be used). Put it on thin, for it is the glue-coated surface and not the glue itself that is strong. Now nail or screw on the two end pieces. Don't drive the nails straight in, but at an angle, as shown in the drawing. Now put on the narrow top piece. Next you can fasten on the bottom. Flat-headed screws would be preferable to nails in this case. If you have a hand-drill you can first drill the holes for the screws in the bottom piece and then countersink them by twirling the tip of a knife blade in the hole. If the screws go in hard, a little soap or oil on them will ease them up.

The hinges can be fitted next. To do this you will have to place them in the position you want them to go and then carefully trace their outline on the wood. Between the lines where the hinges are to go the wood must be cut away to the depth of the thickness of the hinge plate. This may be done with a chisel or a sharp knife. It must be done on both the under side of the cover and on the top edge of the back. After this is done the hinges may be placed and fastened in position. The hook on the side can better be fitted after the finishing of the cabinet has been completed.

The next process is the sandpapering. In order to be able to get an even pressure, and to prevent rounding the edges, the sandpaper should be mounted over a block as shown. Use a medium coarse paper first, and then a fine one. Be sure and remove all the scratches and other sur-

face marks, for upon this preliminary work depends to a large extent the final finish. With the aid of a nail or a nail-set drive the heads of the finishing nails a little below the surface. Fill the holes above the heads with putty, wood plugs, or wood filler.

The most popular finish for radio cabinets seems to be mission or early English oak and mahogany. A wood dye or stain is the first thing to be applied. You can get this from any paint shop in the shade you want. It can be either applied with a brush or a piece of cotton waste and dries thoroughly in a few hours.

If you are using mahogany, oak, or any other rather open grain wood, or wood where the pores plainly show, you must use a filler for best results. This comes prepared in paste form in different tints. Use the tint that most nearly matches the stain. It can be applied with some blunt-edged tool, such as a putty knife. Be sure and fill all the little holes, but rub all off the surface of the wood, so that it is finally perfectly smooth. Close grained woods such as pine, birch and white wood do not need a filler.

Next comes the final finish. This usually consists of several thin coats of shellac. One coat should be applied with a brush and allowed to dry thoroughly—and be sure it is thoroughly dry. Now go over this surface with a piece of very fine sandpaper or a piece of steel wool, to take off any rough spots, and to make an anchorage for the next coat. Brush off any dust and apply the next coat. You must work fast with shellac, for it dries quickly. Two coats are generally sufficient to give a pleasant luster to your work. If you want a dull or satin finish you can go over the second coat with the fine sandpaper or with steel wool, and afterward give the cabinet a rubbing with furniture oil or with prepared wax. Use very fine sandpaper for this purpose—No. 00, preferably—otherwise you will ruin the work you have already done.

For those who prefer less trouble in finishing, what is known as a varnish-stain can be applied directly after the sanding. This stain contains both color and gloss, and while it does not make as nice a finish as the longer method, it is quite satisfactory for those whose requirements do not include a "piano" finish.

With the addition of the hook and screw-eye your cabinet is finished, and but awaits its panel and set.

# Make Your Taps Neater

By Arthur S. Gordon

**A**FTER you have wound the primary of that home-made variocoupler so tightly and have taken out taps that are the proud equal of any found on commercial instruments, it is somewhat discouraging to have them pull away from the cardboard tube, as most tapped turns have a habit of doing. The fault is not in the cardboard tube nor in the wire used, but in the method of taking out the taps.

The usual procedure is to bend back a loop in the wire and twist it close down to the tube, leaving a small eyelet to which the connecting wire can be soldered. While this arrangement will stay taut for a while, it is bound to loosen and, in many cases, the whole coil has had to be re-wound.

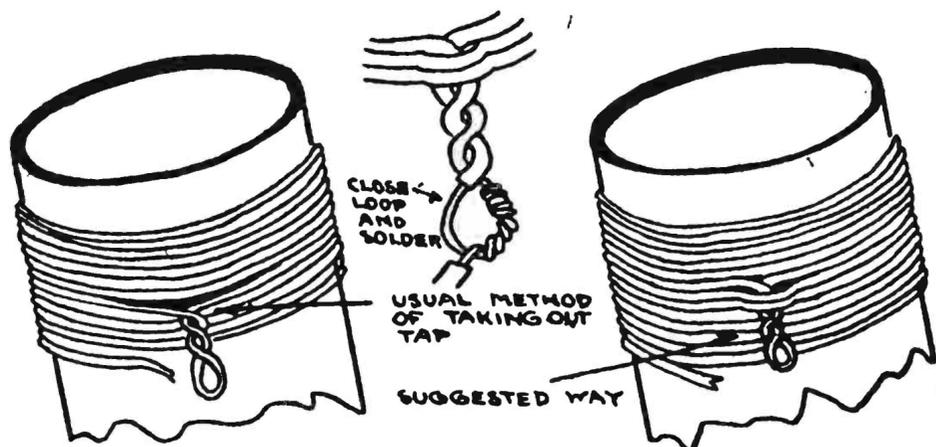


Diagram Showing Arthur S. Gordon's Method of Making Neat Taps.

In the interests of neatness and thoroughness, therefore, the following method of making taps is suggested: After you twist the loop as before, instead of going on with the winding, bend the tap down and wind the next two turns over it. Then bend the tap up again and continue until the next tap.

Now, with every tap held down by the two succeeding turns, there is no danger of stretching or loosening. Even if collodion or coil cement is not applied, the turns will hold together, and not only will you have a tuning coil that is exceptionally neat but you will also have one that will remain exceptionally neat until its last and probably distant day of service.

# Broadcasters Increase Eleven in February

**A**N increase of eleven broadcasting stations is shown on the records of the Department of Commerce during the month of February. On February 1 there were 570 stations licensed to broadcast entertainment data and news while on March 3 there were 581 broadcasters operating.

During the past month 24 new licenses were issued to broadcast, but 13 old stations ceased to function. Of the total stations transmitting entertainment today, 28 are Class B stations operating on 400 meters, the balance being on 360.

Four new stations licensed during the week ending March 3, follow:

Call	Station	
WSAC	Clemson Agricultural College, Clemson College, S. C.	500 watts
KFDV	Gilbrech & Stinson, Fayetteville, Ark.	100 watts
WWAY	Marigold Gardens, Chicago, Ill.	500 watts
WRAB	Savannah Board of Public Educa- tion, Savannah, Ga.	100 watts

The thirteen stations which were dropped during February follow:

Call	Station
KFED	Billings Polytechnic Institute, Billings, Mont.
WKAG	Bruce, M. D., Edwin T., Louisville, Ky.
WIAX	Capital Radio Co., Lincoln, Neb.
WNAF	Enid Radio Distributing Co., Enid, Okla.
WOH	Hatfield Electric Co., Indianapolis, Ind.
WLAF	Johnson Radio Co., Lincoln, Neb.
WDAR	Lit Brothers, Phila., Pa.
WLAR	Mickel Music Co., Marshalltown, Iowa.
WDY	Radio Corp. of America, Roselle Park, N. J.
WHAf	Radio Electric Co., Pittsburgh, Pa.
WJK	Service Radio Equipment Co., Toledo, Ohio.
WJAE	Texas Radio Syndicate, San Antonio, Tex.
WDV	Yeiser, Jr., John O., Omaha, Neb.

## Radiograms

**T**HE suggestion has been made that a course in the practical building of radio sets be established in the manual training departments of the public schools of the country. No better training for a boy could be imagined than this.

**I**N its issue for October 7, 1923, *Radio World* published a list, complete to that date, of the broadcasting stations of the United States and Canada. In earlier issues had appeared other complete lists. In response to numerous inquiries, *RADIO WORLD* is preparing another list of broadcasters which will be corrected up to the date of publication in an early issue.

**A** **S**NAPSHOT, taken by a wireless operator on a small Pacific coastwise steamer, is the latest clue in the possession of the authorities in the nation-wide hunt for Clara Phillips, former chorus girl, the escaped hammer murderess. The picture was taken secretly when the wireless operator, disguised as a waiter, carried a meal into the cabin occupied by the supposed "tiger woman."

**D**URING the year 1919 only 50,000 words were transmitted by Italian radio stations. Based on the year 1922 it is estimated that in 1923 Italian radio stations will transmit 7,000,000 words. Station IDO, Rome, operating on the 11,000-meter wave length, sends press messages direct to the *New York Times* radio-receiving station daily at 12 o'clock and 5 p. m. A new station at Coltano soon will be in operation with sufficient power to send traffic direct to New York.

**L**OHENGRIN" was the second complete opera to be broadcast from WJZ, following the success of "Die Meistersinger," which was given at the Manhattan Opera House to the radio audience via the Radio Corporation-Westinghouse station in Newark, New Jersey.

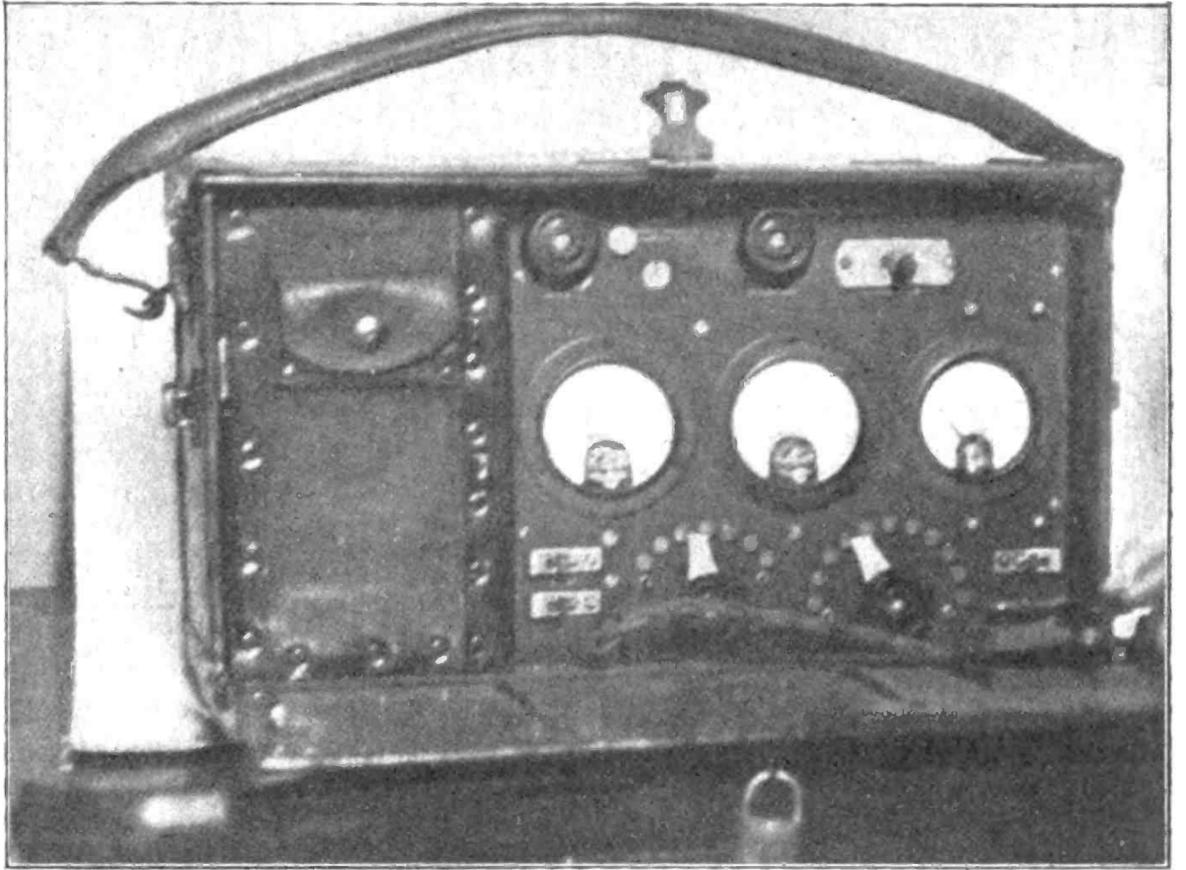
**A** WIRELESS press dispatch from Berlin, Germany, to the *New York Times* states that during the last few days experiments with a new system of wireless telephoning were made from a new sending station near Berlin. Letters received from Holland and Switzerland brought news that the German electric waves did not progress on their mission without fierce opposition from the Eiffel Tower in Paris.

**T**HE American Telephone and Telegraph Company proposes to increase its capital stock from the present authorized total of \$750,000,000 to \$1,000,000,000. If approved by stockholders, who will meet on March 27, this will make the company the largest corporation in the United States. No new stock offering is contemplated in 1923. The additional stock is needed to meet commitments under the offer made stockholders on August 24 last; for conversion of convertible bonds and for subscriptions already made under the employes' stock plan. During the year 1922 over 600,000 stations were added to the Bell System, a larger increase than in any preceding year, bringing the total to more than 14,000,000. Studies and experiments in wireless telephony have also been continued. The annual report refers to the series of trans-oceanic experiments which were undertaken by the company late in the year, which culminated in continuous messages being sent for a period of about two hours on January 14, 1922, which were distinctly heard in London.

## The Royal Flying Corps Designs a Compact Set

(C. Photonews, N. Y.)

The portable set designed by the Royal Flying Corps and used by them in great numbers. This set is enclosed in a leather case, smaller than the regulation suitcase, and is absolutely complete in itself. When not in use the cover folds up and the set can then be carried wherever it is necessary, with no more trouble than taking your dress suit to the train.



**T**HE Royal Flying Corps, of England, recently brought out a portable transmitter and receiver which for utility and usefulness, goes a long way toward being a perfect instrument. It is all contained in a small suitcase and when not in use can be carried very easily from place to place. In the matter of size, it is much smaller than the regular dress suit case, as can be seen by comparing the size of the meters and switches in the illustration herewith with the width of the case itself.

The compartment on the extreme left houses the necessary batteries for the operation of the set, in case the current that generally is furnished by the small

generators on the airplane should go out of commission. They are of course small and not capable of delivering much power, and therefore cannot be expected to operate the set over long distances.

The meters shown in the center are for the determination of the different current values such as the radiation current, etc., when the set is used in the air. This, of course, furnishes the operator with an accurate check on all his instruments and he can tell how his signals are going out.

The receiver is of the type in which the coupling is fixed, and the variation of the inductances is accomplished by means of the switches shown.



## London Restaurant Provides Radio for Patrons

(C. Keystone View Co.)

Four ardent English radio fans who have adopted an up-to-date restaurant in London as their recreation point because of the fact that the owner and proprietor of the restaurant has very thoughtfully equipped all the tables with receiving sets. A good way to draw trade and a tip American restaurateurs.

**W**HAT is probably one of the most novel developments in the way of radio entertainment was recently brought out by an enterprising London restaurateur. He had noticed that a great many of his patrons were radio fans and that instead of sitting quietly at the table after a bit of food they would all put on their hats and "go up to Romey's 'ouse, to listen to the radio." Now that couldn't be allowed. It was simply unbearable to the proprietor to see his trade jog away in such fashion. So he thought and thought and finally questioned himself something like the following: "Why not put up one of the bally things, and then instead of going to Romey's 'ouse, why they'll sit 'ere and henjoy a quiet

cup o' tea." No sooner said than done, and now the happy patrons can sit in "Jackie's" and have their bit to eat and then listen in at the same time they are having a quiet little game of rummy.

This innovation has not only helped the restaurant keeper to retain his old trade, but it has attracted a lot of new customers to his place because "it's the only place in deah ol' Lunnon where you can listen in while you're having your joint and ale."

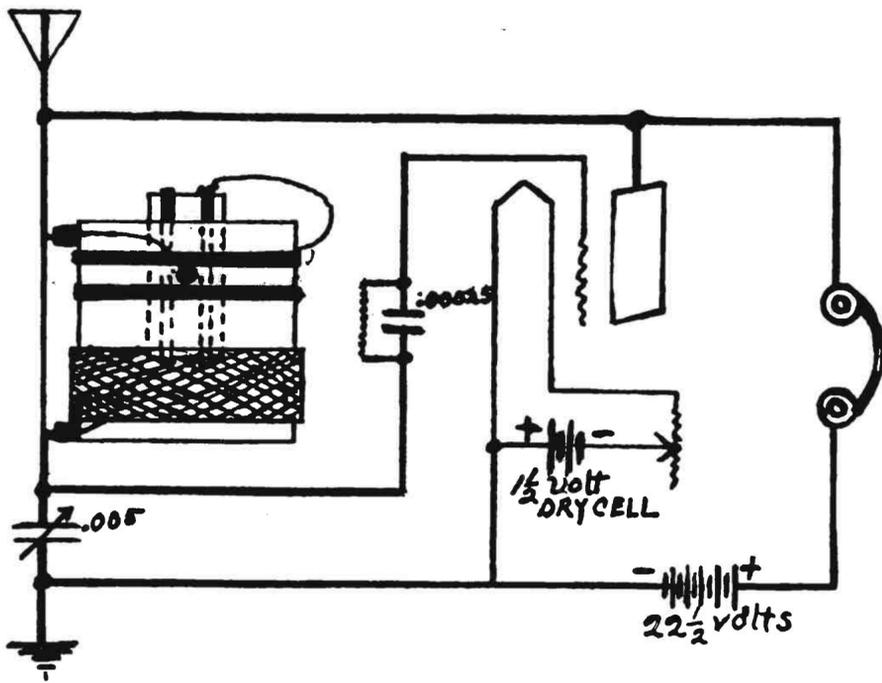
The above statement is not a mere supposition, but is an actual fact as can be seen by the illustration herewith, where is seen a group of radio fans enjoying a radio concert, while in the midst of an exciting game of "nap," a game that is somewhat similar to our rummy.

# How to Build a One Tube Dry Cell Set

By P. F. Albright

**S**INCE the publication of the report of my DX record with my WD-11 one tube dry cell set in RADIO WORLD of February 10, 1923, I have been fairly buried in inquiries from every state in the Union for a detailed description of my set. It is impossible for me to answer each inquiry directly. I am, therefore, asking RADIO WORLD to publish the following brief description of my set.

I do not claim that I have anything revolutionary in radio, but I do know that my set works, and works wonderfully well, for as I am writing, at Englewood, Col., I am hearing with surprising volume and clearness a program being broadcast over Radio WSY, Birmingham, Alabama, by the Booker T. Washington Glee



Club, of the Tuskegee Institute. I see no reason why any one cannot duplicate my experience, if he follows the description and uses care and patience in the construction of his set.

The only change I made in the Miller circuit as published in RADIO WORLD was the substitution of a specially wound inductance for the regulation fifty-turn honeycomb coil. This inductance was made as follows: At one end of a cardboard tube three inches in diameter and three inches long I wound fifty turns of No. 22 DCC wire honeycomb style. On the remainder of the tube was wound eight single turns of the same wire—plain winding—in two groups of four turns

each and connected to the inner end of the honeycomb winding. The two groups of four turns each function as the stator of a miniature variometer and are spaced about three-eighths of an inch apart so as to allow for a shaft carrying a rotor in the form of another cardboard tube one inch in length and of as large diameter as will turn in the larger tube and clear. This is also wound with eight turns of the same wire and spaced as on the stator, and is mounted on the shaft so that the rotor windings come directly under the stator windings. The coils of the rotor, stator and honeycomb coil are connected in series and placed in the circuit so that the aerial lead goes first through the rotor, then the stator, then through the honeycomb coil. This little variometer acts as a vernier on the inductance and accounts for the fine selectivity of the set. As many as six different stations have been tuned in within the range of a 100 degree dial without changing the condenser setting, and I am able to separate two stations with a movement of but four or five degrees on the dial.

I am giving herewith a diagram of the circuit and the values of the parts. I want to assure you that too much attention cannot be given to the grid leak as it is extremely critical. I used a Remler of the pencil mark type and a very hard pencil and then found that its adjustment required considerable patience. The rheostat must be of the vernier type for long distance work and the more sensitive it is the better. Mine is home-made. My set is wired with No. 14 tinned copper wire and every possible joint soldered. The parts are mounted on a 6x12 inch bakelite panel and carefully shielded with tinfoil and grounded. Mount the inductance as far from the variable condenser as possible to avoid capacity effects while tuning. My aerial is stranded copper 100 feet long and 25 feet high with lead-in at one end. A good ground is essential. Mine is a water pipe with connection made as near the entrance from the street as possible. These things may seem of minor importance, but I have found that one cannot be too fussy about such things as good ground, soldered joints, etc., if he expects his set to reach out and bring in the distant stations.

I shall be interested to hear from brother DX Night Owls who build their sets from this description telling me about their results.

## Amateurs Increase 601 Since January 1

**T**HERE is still great interest in amateur radio telegraphy. This fact is shown by the increase in general and restricted amateur licenses issued by the Department of Commerce since January 1, which number 601. On January 1, there were 17,102 amateur licenses in effect, and on March 1, there were 17,703.

These figures do not include 617 other non-commercial stations, which comprise 134 technical and training school stations, 297 experimental and 186 special amateur stations.

The distribution of special amateur licenses by districts is as follows, showing the Chicago District, including northern peninsula of Michigan, Wisconsin, Illinois, Kentucky, Indiana, Minnesota, Iowa, Missouri,

North and South Dakota, Nebraska, Kansas and Colorado, points:

District	Headquarters	Total March 1
1.	Boston	2,490
2.	New York	2,589
3.	Baltimore	1,919
4.	Norfolk	420
5.	New Orleans	825
6.	San Francisco	2,019
7.	Seattle	863
8.	Detroit	2,749
9.	Chicago	3,729
Total	Special amateurs	17,703

# A One Tube Super-Regenerative Loop Receiver

By W. S. Thompson

**T**HE trend in modern receiving sets seems to be toward simplicity in tuning and construction. This gives rise to the problem of simplifying the best circuits without losing their advantages. Probably the most powerful amplifier of signals that is known today is the set that Major Armstrong calls his "flivver." This set can be built using one, two or three tubes, depending upon whether each tube has one or more duties to perform. In the one-tube set one might say that the tube is made to work overtime, but as long as one tube can accomplish the work satisfactorily it would be extravagant to use more.

Our problem, then, is to design a one-tube, super-regenerative set, making the tuning and the construction as simple as possible without losing the tremendous amplifying power that is a characteristic of this circuit.

A loop to pick up signals is used because there seems to be no advantage in using an outdoor antenna. If we use an antenna and couple it to this set the coupling will have to be so loose to eliminate noise that we gain no signal strength. The simplest way to tune the grid circuit of a set using a loop is to make the loop of the correct number of

nearby stations than a long-distance receiver. For use on 360 to 400 meter work it will give amplification enough so that, using a good loud speaker, it will fill a small room when the station is within a radius of 75 miles. Therefore, this distance is practically the limit for broadcast entertainment. However, due to the peculiarities of the circuit, long-distance work may be expected on the amateur wave lengths. The above causes the writer to recommend this

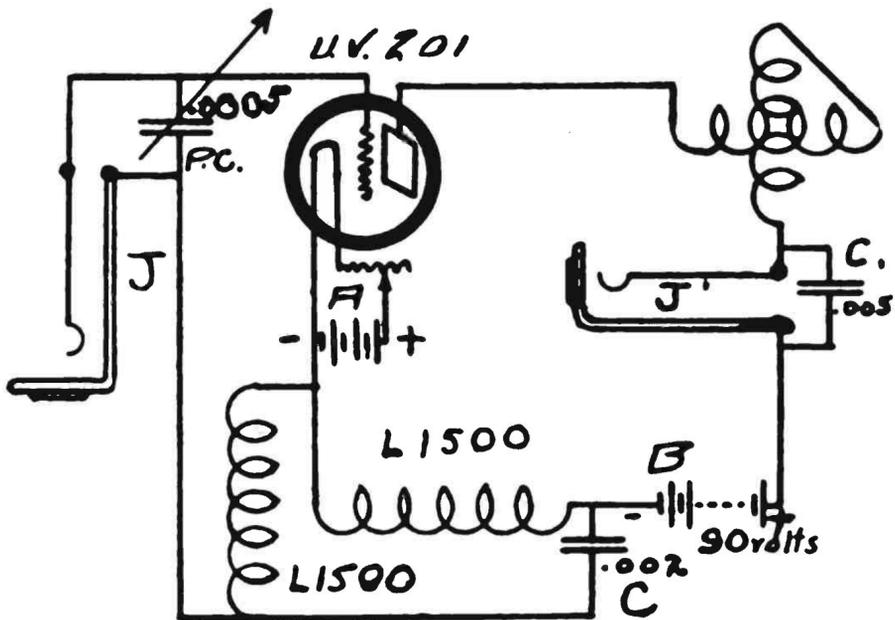


Fig. 1. Diagram of the super-regenerative set as described in the accompanying text. The jack J1 is for the insertion of either loop or antenna and ground.

turns and tune with a condenser in parallel with it. But to effect regeneration we must have a coupling between the grid and the plate circuits, so we will use the internal capacity of the tube for this purpose. This means we must have a tuned plate circuit, which is accomplished by placing a variometer in this circuit. The advantages of this type of regeneration are many, and, inasmuch as it suited our purpose, it was used. The next detail was how to make the tube oscillate at the high frequency necessary in this circuit. The usual method is to place in the grid and plate circuits honeycomb coils of high inductance, shunt them with variable condensers and couple them inductively. This method means that the operator must adjust the two condensers and the variable coupling in order to tune. By matching the honeycomb coils, omitting the variable condensers and coupling the coils with the fixed condenser, this part of the set needs no attention at all after once built. A rheostat for varying the filament current is necessary; so in the completed set there are only two tuning controls and the rheostat.

A word as to the advantages and limitations of this set. Primarily, it is more of a power amplifier for signals from

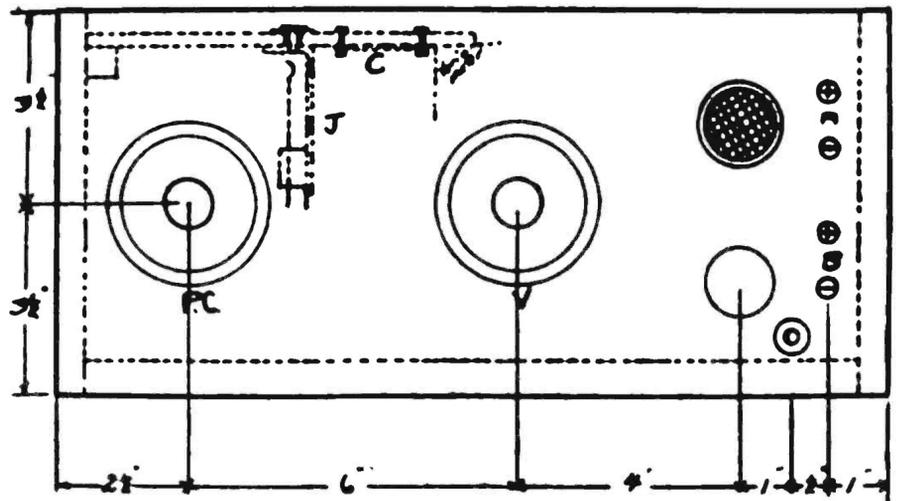


Fig. 2. Front view of panel layout, showing the method of mounting the jack on sub-panel so as to allow ease of manipulation of the loop.

set for home entertainment when near a broadcasting station or for a good long-distance receiver for short wave length work. The values for the constants that will allow either use have been given.

As to the construction, the writer does not want to bind the builder to any fixed measurements, but to give a few suggestions and pointers that may make the task a little simpler and the product a little better. A good loop can be made by winding ten turns of No. 18 copper wire around a form three feet square, spacing the wires about 1/2 inch apart. On the bottom of the vertical standard attach the brass parts of an ordinary torpedo plug. Most plugs easily can be fixed for this purpose by removing the tip posts and screwing the plug to the loop.

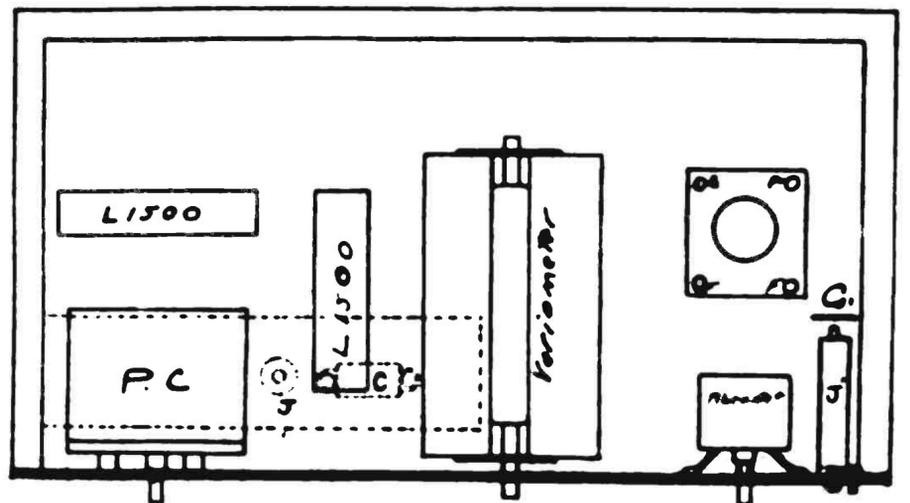


Fig. 3. Top view, showing the method of mounting all the instruments. Note the fact that the two honeycomb coils are mounted at right angles.

In Figures 2 and 3 the dotted lines represent the mounting of jack J for the loop and the coupling condenser C on a sub-panel back of the main panel. This sub-panel, as shown, is fastened to the top of the variometer and to a cleat on the end of the cabinet, or to a panel brace if the set is not to be enclosed in a cabinet. The sub-panel should

(Continued on next page)

# Radio Control Up to Secretary Hoover

**T**HE White radio bill died in committee along with a number of other important legislative documents when the 67th Congress adjourned on March 4th. The House and Senate do not convene until December 4th, when a new bill probably will be introduced—but that is nine months away.

Whether Secretary Hoover can manage to keep the ether from getting more jammed with broadcasts and other radio communications without legislation, remains to be seen. Lack of a new law makes it necessary for the Department of Commerce to continue under legislation enacted ten years ago when broadcasting was unknown and there were few commercial and amateur stations.

It is probable that the Secretary will undertake the partial re-allocation of wave lengths, within the limits of the existing radio law, in an effort to reduce interference and make for peace in the ether.

Just what plans the Department of Commerce has for improving conditions in the present radio pandemonium are not known but a plan for execution within a few months is being worked out, it is understood.

The decision of the District Court of Appeals requiring the Secretary of Commerce to re-issue a license to the Inter-City Radio Company of New York, although that station had been severely complained of due to interference will be appealed.

Secretary Hoover and his solicitor have taken the matter up with the Attorney General's office requesting that the case be appealed to the Supreme Court of the United States. It was the action of the Court of Appeals that caused Secretary Hoover to state recently that: "This removes the last shred of the department's authority over radio."

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## RADIO WORLD'S ANNIVERSARY NUMBER

RADIO WORLD is now at work on its Special Anniversary Number, dated March 31, published March 28.

This issue will celebrate the beginning of the third volume of RADIO WORLD, the great national illustrated weekly.

Last page of red form goes to press March 19. Last page of last black form closes March 23.

Our regular advertising rates will be in force as follows:

One page: One time—\$150.00.  
 Half, Quarter, Third and Two-thirds pages at proportionate rates.  
 On inch, one time—\$5.00. Per agate line, \$0.40.  
 On four consecutive issues, 10 per cent discount.  
 On thirteen consecutive issues, 15 per cent discount.  
 Cover and preferred position rates made known on application.

No extra charge for advertisements in two colors if copy reaches this office on or before March 19.

If you want your advertisement printed in two colors in this unusually important special number, say so and have copy reach publication office on or before March 19.

RADIO WORLD has been increasing in circulation and influence every week, and this has been especially noticeable since the advent of 1923. The radio public has learned that the columns of this publication reflect the news and developments in radio weeks ahead of the monthly publications.

Write or send copy and order now and get the best possible publication value by being represented in the Special Anniversary Number of RADIO WORLD.

RADIO WORLD, 1493 Broadway, New York City.

(Continued from preceding page)

Mounting the apparatus back of the panel, as shown in Fig. 3, allows the grid coil to be very loosely coupled to the variometer, thus aiding to stabilize the regeneration. Standard fixed honeycomb coil mountings can be used for this purpose, although any mounting that the builder may wish to use will be satisfactory. By using a vernier condenser for tuning the loop and a vernier rheostat the results obtained will be well worth the added expense. In purchasing the phone condenser and the coupling condenser be sure and get mica condensers and a type which have the plates and mica held firmly together so there will be no chance for the capacity to change. Always remember that added expense in buying the best apparatus pays good interest by giving better results. The popularity of the A battery is very important, for the grid should have a normal negative potential for best results. The value for the B battery depends upon the tube used, remembering that high voltage usually means greater amplification. Very satisfactory results have been obtained using the tube shown, with 90 volts for B battery, although the best results were obtained using the Signal Corps' tube, VT2, with a higher plate voltage. The two honeycomb coils should be placed perpendicular to each other, using the value for the coupling condenser shown. This value can be changed to suit the builder if he desires to change the pitch of the high frequency note. All connections should be soldered; no wires should be close together or run parallel, and the panel should be shielded, grounding the shield to the A battery.

The following apparatus will be necessary:

1 Vernier air condenser, 0.0005 mfd.....	\$4.00
1 Variometer .....	5.00
1 Hars amplifier tube.....	6.50
1 Vernier rheostat .....	1.85
2 Single-circuit jacks .....	1.00
1 Mica condenser, 0.005 mfd.....	.40
1 Mica condenser, 0.002 mfd.....	.40
1 Vacuum tube socket.....	1.00
1 Panel .....	2.50
1 Sub-panel .....	.50
Wire, binding posts, etc.....	1.00

Total ..... \$24.15

In tuning for the first time turn up the filament rheostat until a very high-pitched note is heard. The filament will usually be a little brighter than customary with the ordinary set. Now set the tuning condenser at about one-quarter mesh and then turn the variometer slowly. The first sign that the set is working properly is a roar that is always heard when a station is very nearly tuned in. When the correct setting is found this roar will stop and there will be no noise when the signals are being heard except those caused by static or other QRM. This set, due to its tremendous amplifying power, will amplify noises of the air so that there will always be some noise present, as with any other set; but this noise will not be found troublesome to any great extent.

# Another WD-11 Hook-Up to Try Out

By C. White, Consulting Engineer

THE diagram herewith shows nothing more than a variation of the common type of direct feedback. This style of regenerative circuit has come into amateur popularity largely owing to the fact that with its use it becomes possible to secure a smoother adjustment for the critical regenerative point. With the ordinary feedback system the tickler coil is usually placed in series with the "B" batteries and the phones. As the coupling between the tickler and the main tuning inductance would be increased the adjustment would suddenly begin to get extremely sensitive. With some outfits this adjustment at the correct point would be so sensitive that it would be next to impossible to hold a distant station without the most critical tuning.

To receive distant stations with one tube or one tube and two stages of audio-frequency, the detector tube must be

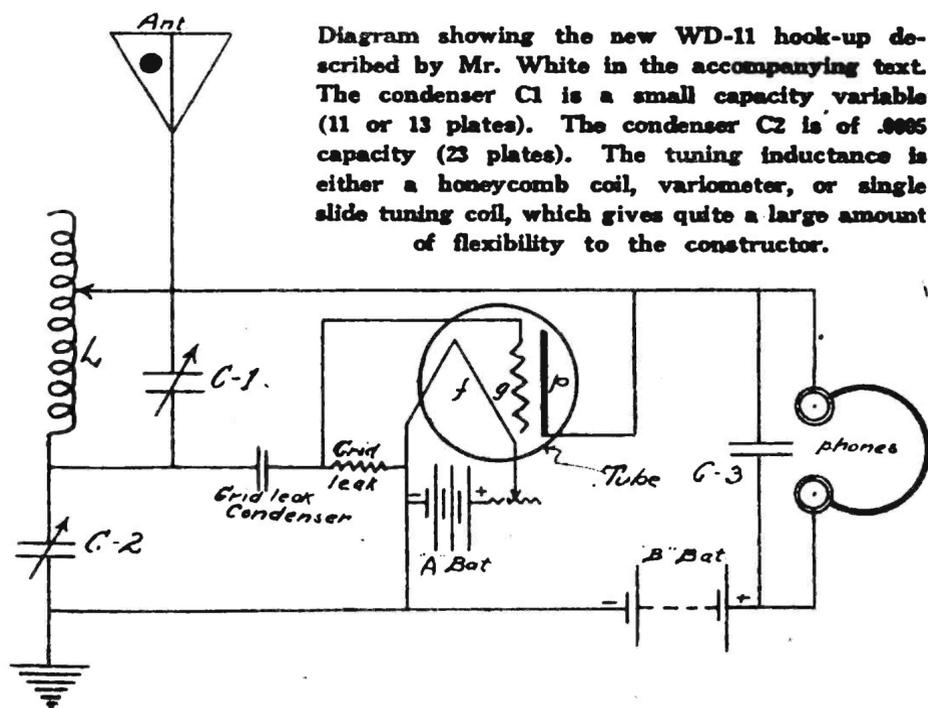


Diagram showing the new WD-11 hook-up described by Mr. White in the accompanying text. The condenser C-1 is a small capacity variable (11 or 13 plates). The condenser C-2 is of .0005 capacity (23 plates). The tuning inductance is either a honeycomb coil, variometer, or single slide tuning coil, which gives quite a large amount of flexibility to the constructor.

held on the verge of oscillation, but must not at any time go into oscillation. This particular point is called the maximum regenerative point, and by holding tube at the desired point the greatest volume of the rectified signal is obtained. If, however, the tube slips or rather jumps into oscillation then it is necessary to turn the tickler controls back and try again to approach the right point. The circuit outlined in this article has the advantage of being able to approach the regenerative point with ease and smooth adjustment without getting sensitive and causing the tube to jump into violent oscillation.

Like most good circuits it has a drawback, which is the fact that the value of grid leak resistance and grid leak condenser capacity is very critical, but after it is once ascertained by experiment for the particular bulb that is being used, no further trouble is encountered. Aside from the determination of the grid leak units, the receiver is very flexible as to its other parts. Many slight changes can be made in the types of tuning inductances and arrangement of the condensers without destroying the efficiency of the circuit. The ambitious amateur will try out several changes and additions before placing the set in a cabinet. Hook the parts up, change them around, try out several different

values of grid leak units, change the polarity of the A battery, and purchase an A battery potentiometer if any other type of tube besides the WD-11 is employed.

The condenser C-1 is an air variable containing 11 or 13 plates. C-2 should be of the same type but should have at least 23 plates. The grid leak condenser should be a small mica condenser. With a circuit that is critical as to the value of grid leak units, it is never good practice to purchase any grid leak condenser other than a mica insulated one, because the capacities of other types, such as the paper ones, are apt to be too variable and not hold their calibrated capacity under all conditions. Likewise, the grid leak should be of a good make. The types of grid leak resistances that are mounted in small tubes are very reliable.

Of course, it would not be a bad idea to purchase a good variable mica grid condenser and a variable grid leak resistance. The condenser C-3 is nothing more than the customary phone bypass condenser having a capacity about .001 mfd. Sometimes when one pair of phones only is used, better results are obtainable when C-3 is removed completely from the circuit. With more than one pair of phones in the plate circuit the omission of C-3 will be attended by rather serious and noticeable distortion, especially when voice or music is being received. The tuning inductance L is very flexible. It can be either a simple single slider tuning coil, a spider web coil, a variometer, or a honeycomb coil, although a coil of variable inductance is here preferable. If you are changing over from an old crystal hook-up which used an ordinary tuning coil with one or more sliders, try the circuit out with it first. For panel mounting, however, another style of inductance must be employed, since the single slider tuner does not lend itself well to panel style of control as does the variometer.

The spider-web and the honeycomb are theoretically in the same class, since their inductance can not be varied evenly. Good results have been obtained with both owing to the fact that, because they are practically free from distributed capacity, sharper tuning and selectivity is readily possible. But, on the other hand, their use makes it necessary to be still more critical in the preliminary determination of the grid leak capacity and leak resistance. A spider web coil with taps can be constructed in order to obtain variable inductance. This coil should be wound with No. 24 D. C. C. magnet wire on a form with a two-inch inner diameter and a five to six-inch outer diameter.

Taps should be made about every ten turns. It is far better to purchase a good grade of spider web form already cut out of reliable insulating fiber instead of cutting one yourself from weak cardboard. A spider web coil with taps in this style of circuit will certainly work wonders in bringing in the distant fellows with only one dry cell tube. By winding your own spider web instead of purchasing a variometer you can save enough to purchase a panel, although with a spider web you will have to buy switch points and a switch arm. Some amateurs have found, however, with this type of receiver a spider web coil is superior to a variometer, although costing less to install.

## United States Radio Exports in 1922

Radio exports shipped out of the country in December totaled \$163,236 in value, less than the total for November, which was \$223,180. The decrease is explained by officials of the Department of Commerce as due to large shipments of apparatus to Argentine in

November. In December, Canada took the largest amount valued at \$74,344.

Total exports of radio apparatus for 1922 amounted to \$2,897,799, being more than a thirtieth of the total electrical exports for the year, which amounted to over \$63,000,000.

# Capital Radiations

*By Washington R. Service*

**A** RADIO-CONTROLLED drill was a feature of the Annapolis Gymkhana held recently. The midshipmen in the drill team wore Ku Klux costumes and in their conical helmets were installed small radio receiving sets. From a sending station on the roof of the gymnasium, instructions were issued to the men in the drill. These were the only directions they received, yet they are said to have executed their orders in absolute unison. From another radio set the sound of a drum was furnished, to which they kept step. The whole gymnasium was quiet and the drill of the white costumed figures was weird due to the lack of audible orders.

\* \* \*

A pathetic letter from a blind man in Highmore, S. D., was received by the Department of Commerce asking which branch of the Government was distributing radio receiving sets to blind people. The department radio officials were forced to reply that the department had no sets to distribute and knew of no appropriation from which such donations could be made. It occurred to the government officials, however, that there was an opportunity for some charitable organization to perform a great public service for those who cannot see. Most blind, they point out, have no means of receiving information or instruction except when they are read to. Since radio offers an audible means of instruction and entertainment and 570 broadcasting stations furnish programs free during practically every hour of the day, Government radio experts urge that a fund be started from which inexpensive radio receiving sets could be purchased for those unfortunates who are forced to spend their days in darkness. Radio broadcasters are furnishing the material, and some believe there are individuals or organizations who will bring these broadcasts to the ears of those who need them most of all.

\* \* \*

France has introduced a new method of communication which combines the postal and radio service with her colonies. A service called "radio letters" has been established which, when printed, may be mailed to the transmitting station, radioed to a receiving station and there mailed to their destinations. The charge is said

to include postage at both ends of the route and two-thirds of the regular radio charges. The minimum involves a rate applicable to a twenty-word message. Radio letters follow the regular radiograms daily or are moved the second day as day messages.

\* \* \*

A circular describing how to build a tube set, the third pamphlet on radio construction to be published by the Bureau of Standards, is now available from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents. Write for Circular 133, "Description and Operation of an Electron-Tube Detector Unit for Simple Radio Receiving Outfits."

\* \* \*

The Mississippi River is now the dividing line between the "K" calls of the West and the "W" calls of the East, as far as broadcasting stations are concerned. All new calls issued to broadcasting stations east of the Mississippi will begin with "W" and those west with "K," so the stations can be immediately identified as Atlantic or Pacific when the initial letter is heard. The stations already listed under "K," including KDKA, will retain their original calls.

\* \* \*

The air traffic commissioner of Denmark recently ruled that all airplanes must be equipped with wireless telephone apparatus. This is held as an important advance in both aviation and communication in Denmark. It is a progressive step not yet taken in the United States. Although ships of the sea must be so equipped, aircraft do as they please. After many accidents in aerial traffic over sea routes, with some loss of life, two aerial navigation lines have voluntarily begun to equip their aircraft with radio as a safety precaution. Rear Admiral Moffett, chief of the Naval Bureau of Aeronautics, pointed out the necessity of radio equipment or at least pigeons on all aircraft several months ago. All army and naval planes are radio-equipped, at least when on long distance trips, and in addition carry pigeons. The need of legislation for aircraft and aerial navigation already has been pointed out by many American experts.

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## Government Warning to Broadcasters

**T**HE Department of Commerce has advised broadcasters, through the medium of the Radio Service Bulletin, that they must comply with regulations and confine their radio activities to broadcasting. A broadcasting license does not permit special tests of radio telephone or telegraph apparatus, communication with specific stations, either ashore or at sea, or any transmission except entertainment, market and weather reports, and news on 360 or 400 meters, as the license may specify.

Some stations have stopped acknowledging letters, telegrams and telephone calls, but they talk to one another, conduct contests, which approximate advertising, and some carry on experiments of various kinds. This practice has become so general that the departmental officials state some new regulations may have to be provided. Special licenses and waves are necessary for code work, station-to-station transmission and experimental work. There are too many stations licensed for such operation now, it is explained,

and when the broadcasters enter this field the interference increases.

All station owners are advised to give their licenses the "once over" and familiarize themselves with exactly what they are permitted to do.

In the interests of life-saving at sea, based upon "SOS" calls, broadcasting stations are cautioned by the Department of Commerce to maintain a careful watch while sending so that they can cease instantly when a distress call is heard and not interfere with the distress signals and messages relating thereto.

This applies particularly on and near the sea coasts. Recently four vessels issued distress calls near Seattle, Washington, on the same day, but so far as was reported by inspectors no broadcasters happened to interfere. The law provides a penalty in the event of interference with "SOS" calls, as is set forth in Section 4, Act of August 13, 1912.

# Methods of Measuring Properties of Electron Tubes

## Determination of Direct-Current Characteristics and Power Output of Generator Tubes

**T**HIS determination is the usual step-by-step method of determining the characteristic curves as described in any book on radio measurements (such as Bureau of Standards Circular 74, p. 203). Fig. 3 shows the measuring instruments that are necessary and the factors that it may be desirable to vary. The arrangement that has been found convenient to use is shown in Fig. 4 in which

1. Switch for connecting either milliammeter or sensitive galvanometer in the grid circuit.
  2. Grid ammeter short circuiting switch.
  3. Reversing switch for grid ammeter.
  4. Reversing switch for grid voltage.
  5. Switch and terminals for connecting grid voltmeter.
  6. Switch for connecting  $R_2$  in parallel with  $R_3$ .
  7. Switch for connecting to plate or small tube or terminal at 18.
  8. Grid return switch, connecting to + or - side of filament.
  9. Filament voltmeter connecting switch.
  10. Plate ammeter short circuiting switch and terminals.
  11. Plate voltmeter switch and terminals.
  12. Plate voltage disconnecting switch.
  13. Plate voltage disconnecting switch.
  14. Grid voltage terminals.
  15. Grid voltmeter.
  16. Filament voltage terminals.
  17. Standard receiving tube socket.
  18. Terminals for non-standard or high power tube.
  19. Plate voltmeter.
  20. Short circuiting switch and terminals for plate impedance.
  21. Short circuiting switch and terminals for grid impedance.
  22. [Terminals for plate voltage.
  23. ]
  24. Galvanometer shunt.
  25. Grid milliammeter.
  26. Filament voltmeter.
  27. Filament ammeter.
  28. Plate milliammeter.
  29. Grid voltage disconnecting switch.
  30. Filament voltage disconnecting switch.
- $C_1$  Mica condenser 0.2 /uf capacity.  
 $C_2$  Mica condensers 0.1 /uf capacity.  
 $R_1$  Grid voltage divided, 3,000 ohms.  
 $R_2$  Filament rheostat, fine adjustment.  
 $R_3$  Filament rheostat, rough adjustment.  
 $R_4$  Plate voltage divider, 2,000 ohms.

The operations necessary to obtain the characteristic curves of electron tubes consist of making filament, grid, and plate current measurements with the filament, grid and plate voltages set at any desired value varying one of these by steps over a range sufficient to give the desired curve.

The tube under test is placed in the socket, 17, and switch 7 thrown to the left, if it is a standard receiving or low power transmitting tube, or connected to the terminals, 18, and switch 7 thrown to the right if the tube is non-standard or for high power. The plate circuit is disconnected from the socket 17 and connected to terminal P at 18 for high power tubes in order to prevent a break down of the insulation on the small socket when the high voltage used on large tubes is applied. Switches 20 and 21 are closed.

The grid voltage, of a value slightly higher than the highest required for the measurement is applied to the terminals, 14, and connected by the switch, 29, which is fused with 0.5 ampere fuse wire, to the voltage divider  $R_1$  and by moving the slider on  $R_1$  the voltage applied to the tube may be varied continuously from zero to the value applied at 14. This voltage is measured by the voltmeter, 15, when switch 5 is closed, and may be reversed by means of switch 4; the grid being positive with 4 to the right and negative with 4 to the left. The grid voltage is ordinarily measured from the negative side of the filament, but by means of switch 8, the grid return may be connected to either side of the filament, to the negative with 8 left and positive with 8 right.

The grid current is read on the milliammeter 25, or on the sensitive galvanometer, either one of which is connected in the grid circuit by switch 1. The milliammeter is used to measure grid currents of about 0.02 to 200 milliamperes, but for smaller currents, the more sensitive galvanometer is used. Its sensitivity can be varied by the shunt 24, calibrations being necessary for each value of the shunt resistance. In order to measure current flowing in either direction, the reversing switch 3 is provided, the current flow being positive, i.e., from grid to filament in the tube, when 3 is to the right, and negative with 3 to the left. The

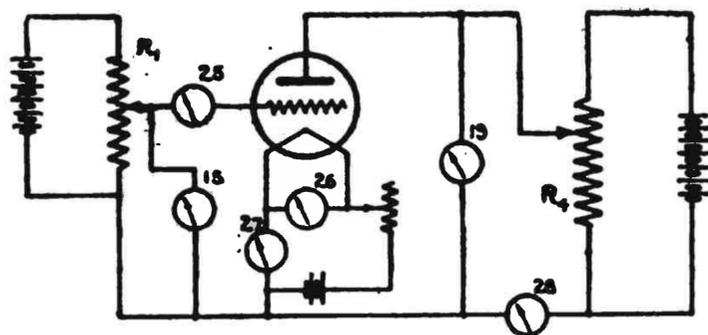


FIG. 3.  
SIMPLIFIED DIAGRAM OF CHARACTERISTIC CURVE SET-UP

grid voltage divider and measuring instruments are shunted by the condenser  $C_1$ , to bypass radio-frequency current when this circuit is used to make the power output measurements described below.

The filament voltage is applied to terminals 16, and connected by switch 30, through the filament ammeter 27, and rheostat  $R_2$  and  $R_3$  to the filament terminals of 17 and 18, the voltage across the filament terminals being indicated by voltmeter 26 when switch 9 is closed. This switch should always be open when adjusting the filament current as the current taken by the voltmeter flows through the ammeter 27 and may cause appreciable error, particularly with tubes using a small filament current.

The plate voltage is connected to terminals 22 and 23. The voltage on 23 should not exceed about 200 volts as it is connected through switch 13 to the voltage divider  $R_4$ , any higher voltage necessary being connected to terminals 22. Since 22 and 23 are in series, connection should be made to both of these in order to complete the plate circuit. Switches 12 and 13 are fused with 0.5 ampere fuse wire.

By changing the slider on  $R_4$ , the plate voltage is varied over a range afforded by the voltage connected to 23, and

(Continued on next page)

(Continued from preceding page)

the total voltage applied to the plate, being the sum of that obtained from the voltage divider and that connected to 22, is measured by the voltmeter 19. By means of switch 11, the voltmeter can be connected directly to the plate (switch 11 to left) so as to measure the actual voltage acting between plate and filament, or (11 to right) to the positive side of the voltage supply to measure the voltage applied to the circuit, excluding the drop across any impedance inserted in the circuit at 20. For ordinary characteristics 11 is thrown to the left and switches 20 and 21 are closed.

The plate current is read on the milliammeter 28, which is in series in the plate circuit and can be short-circuited by the switch 10, when not in use. The capacity  $C_2$  is shunted across the voltage supply and measuring instruments to bypass high-frequency current when this circuit is used for power output measurements.

Measurements for the two most important characteristic curves having grid and plate current plotted against grid voltage, with constant filament current and plate voltage are made simultaneously. With the tube in place, and the proper voltages connected, the filament current is adjusted to its proper value, having switch 9 open while reading the current, the plate voltage adjusted and the grid voltage increased toward the negative (switch 4 to the left) until the plate current has been decreased to zero, reading the grid voltage and current. Now the grid voltage is decreased to zero by steps, at each setting the grid voltage and current and plate current being recorded, then switch 4 is thrown to the right and the voltage increased positively, readings being made as before. The plate voltage is read each time to insure that it remains constant. The filament current will vary according to the amount of electron current flowing in the tube. When a positive grid voltage is applied to the tube, great care should be taken to prevent the high plate current from overheating the tube, by leaving the grid voltage on no longer than necessary to obtain readings. This applies more to power tubes than receiving tubes, since high grid voltages are not necessary for receiving tube characteristics. When the grid voltage has been varied over a range sufficient for the characteristic, a few check points are taken to insure that the tube has remained constant during the run.

It may be found necessary to adjust the plate voltage each time readings are made as there may be an appreciable voltage drop in the plate voltage divider,  $R_4$  caused by the plate current, which changes as the grid voltage is varied.

Tubes should be left with the filament burning and the normal plate voltage applied for 2 to 5 minutes before making measurements.

Other characteristics may be obtained in a like manner, adjusting the voltages or currents it is desired to hold constant first, then varying the remaining ones by steps.

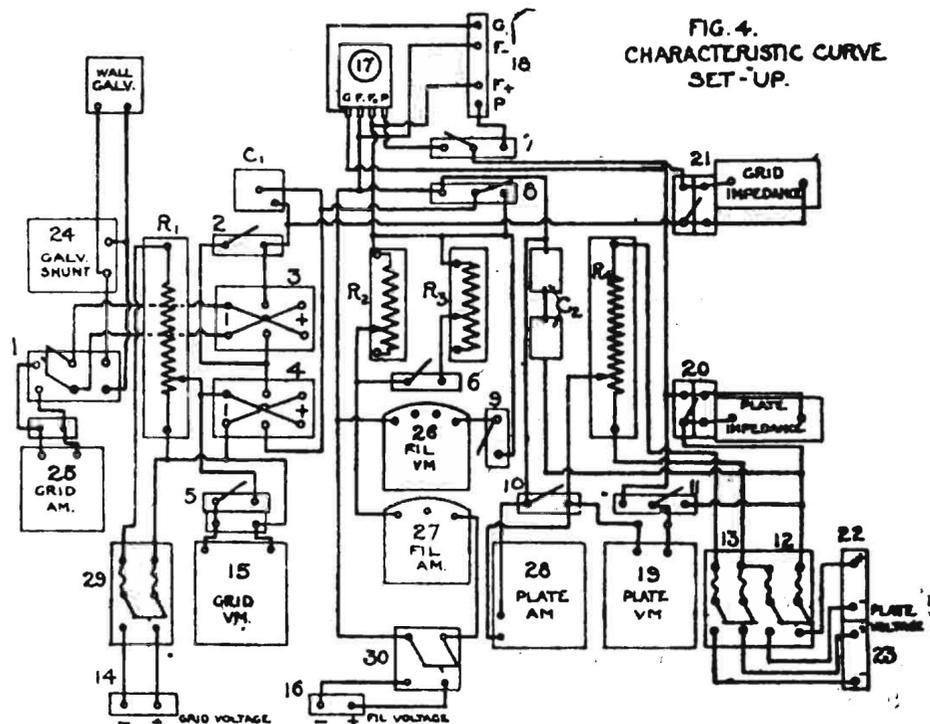
#### (2) Power Output Measurements.

The arrangements shown in Fig. 4 may be used to control and measure the various currents and voltages of the electron tube when it is used to furnish power to a tuned circuit. The power output of a tube under any fixed condition can be measured by the use of this circuit. For the case of an inductively-coupled circuit Fig. 5 shows the arrangement used, the notation being the same as in Fig. 4.

Measurements are made by connecting to the terminals 20, Fig. 4, a suitable radio-frequency oscillatory circuit of known constants. After adjusting the tubes to the desired operating conditions, the radio frequency current is measured, and the power calculated from the circuit resistance and current. Several coils of varying sizes are provided for the grid and plate coupling coils. The plate and grid coils are respectively mounted on the terminal blocks 20 and 21. If an inductively-coupled circuit such as the "Meissner Circuit" is used (see Bureau of Standards Circular 74, p. 210, Principles Underlying Radio Communication, p. 493) the coil for the tuned circuit is so constructed that the grid and plate coils fit into it and the coils are so

arranged that the mutual inductance between any two of them may be varied.

The tuned circuit containing a hot-wire ammeter is connected to the coils, the tube voltages adjusted to the desired value and the alternating current  $I$  recorded. The radio-frequency resistance  $R$ , is measured by means of the re-



sistance-variation method\* at the frequency at which the circuit is used. The power output is, in watts:

$$P_o = I^2 R.$$

From the d. c. plate input voltage  $E_b$ , measured by voltmeter 19, and current  $I_p$  measured by milliammeter 28, the power input is in watts.

$$P = E_b I_p \text{ watts}$$

and the efficiency, disregarding the grid and filament power is

$$\frac{P_o}{P} = \frac{I^2 R}{E_b I_p}$$

Unless changes are made in the set-up connections a series plate voltage supply must be used. The capacity  $C_2$  is connected across the plate power supply circuits, and

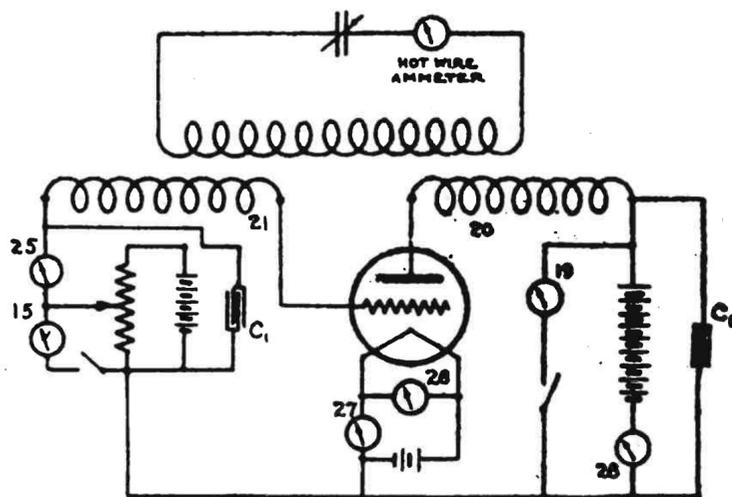


FIG. 5.  
SIMPLIFIED DIAGRAM OF CIRCUIT FOR MEASUREMENT OF POWER  
OUTPUT OF ELECTRON TUBES.

serves as a bypass for radio-frequency currents when the power measurement is made. The coupling coils and output coils provided are so constructed as to allow their use in direct coupled, semi-direct coupled or inductively coupled, output circuit.

\*Bureau of Standards Circular 74, page 180.

(While this article is complete in itself, it will be followed by others on the same subject, and equally important. The first article in this series appeared in these pages last week.)

# Radio and the Woman

*By Crystal D. Tector*

**T**HE Japanese cook of a very influential lady in our town recently met our maid when going to market, and Mary reported something as follows: "Sure ma'am, but Kito sez th' madam nearly threw him out the house the other night becuz he strung the clothes up on the wireless that her husband put up, and wants to know if you know any nice lady in the city that needs a cook and don't have a wireless." I certainly have lots of friends, but when a cook draws the line at being employed by a person who possesses a radio set, I think that he is going too far. I don't believe that my friends would think of showing their faces in public unless their ears were red from wearing "the muffs."

\* \* \*

**A** FRIEND of ours dropped in the other day and after we had a cup of tea, we naturally started in to talk "radio." She was very much interested, but couldn't understand "what all those little do-funny little diinkys are twisted for." Then I knew I was in for it, because there is nothing that I dislike more than explaining the theory of tuning to a novice, because they always say, "Oh! I see, then this is that and that is this," or words to that effect, and then I have to go all over it again and explain that this is not that but that that is that, and this is this. Am I right?

**G**IRLS, you ought to have been with F. H. and myself the other evening. We had the grandest ride in a radio equipped automobile. We went touring all over the city listening to the big broadcasting stations. Finally, the chauffeur was told to drive down to West Street, the location of WEAJ, and when we drew near, the volume of signals was so loud it absolutely was painful to your ears. I can imagine how loud the signals must be received by any one living near that station.

\* \* \*

**T**HE Orphan Asylum gave a party to the kiddies the other day and, of course, it had to be complete and up-to-date. So some of the foremost radio fans of our "metropolis" (according to F. H.) donated their sets and helped make the party a great success for the kiddies. I donated my (I should say our, because if F. H. sees this he will ask me since when "did you ever own a power amplifier") power amplifier and loud speaker and my next-door neighbor donated her husband's radio-frequency receiving set, and so between the whole lot of us the kiddies had a "radio fest." I never thought that a child could be so happy but those little dears just radiated happiness. If it weren't for the fact that the house couldn't hold them why I'd adopt every single soul of them.

## WHEN YOU CAN HEAR THESE BROADCASTING STATIONS

(Evening Programs Only)

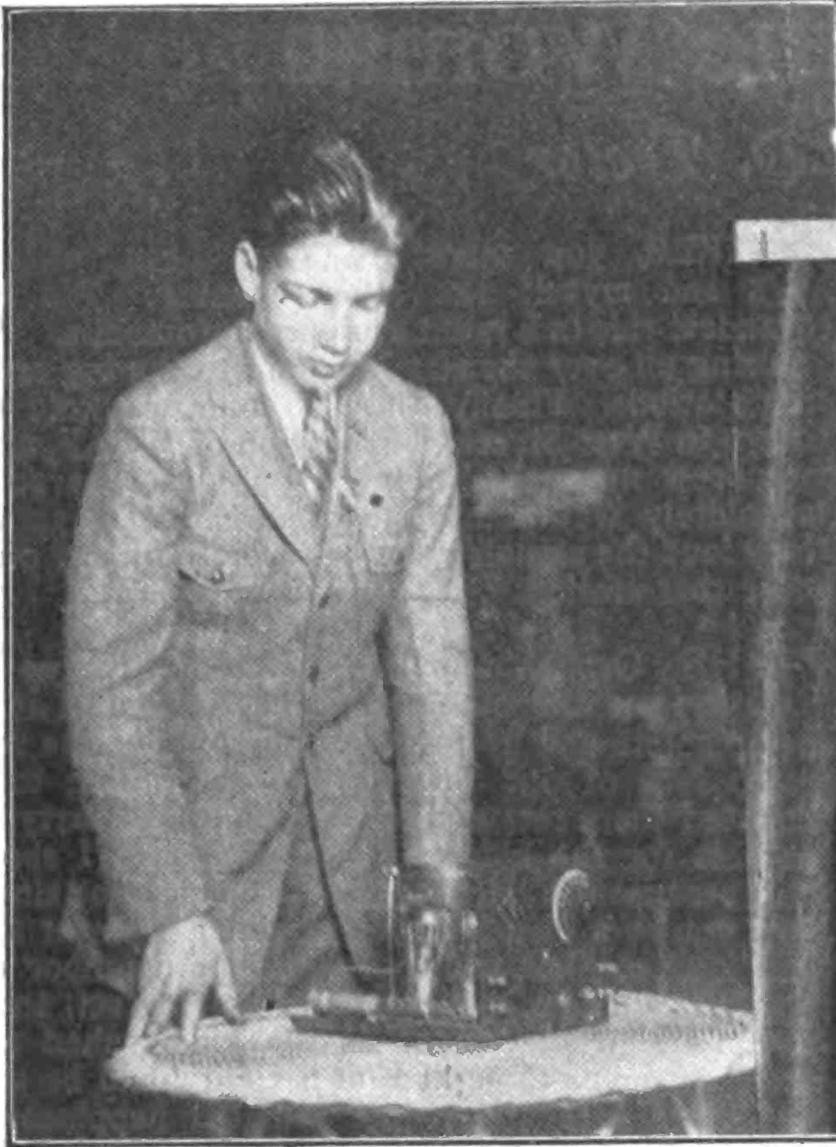
Call	W-L	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Atlanta, Ga. .... WSB	400	10:45- 1:00	10:45- 1:00	10:45- 1:00	10:45- 1:00	10:45- 1:00	10:45- 1:00
Atlanta, Ga. .... WGM	400	10:30-11:30	10:30-11:30	10:30-11:30	10:30-11:30	10:30-11:30	10:30-11:30
Arlington, Va. .... NAA	710	6:45- 8:00	7:45- 8:40	8:00- 9:40	6:45- 8:40	8:00- 9:40	.....
Boston, Mass. .... WNAC	360	.....	7:00- 8:30	9:30-11:00	7:00- 8:30	8:00- 9:30	9:30-11:00
Buffalo, N. Y. .... WGR	360	7:30-10:00	7:30- 8:00	7:30-10:00	7:30- 8:00	7:30-10:00	.....
Chicago, Ill. .... KYW	400	9:00-10:30	9:00-10:30	9:00-10:30	9:00-10:30	9:00-10:30	9:00-10:30
Chicago, Ill. .... WMAQ	360	7:00- 9:15	7:00- 9:15	7:00- 9:15	7:00- 9:15	7:00- 9:15	7:00- 9:15
Chicago, Ill. .... WDAP	360	.....	11:00- 2:00	.....	11:00- 2:00	.....	11:15- 3:00
Cincinnati, O. .... WLW	360	8:00-10:00	10:00-12:00	8:00-10:00	10:00-12:00	.....	.....
Dallas, Tex. .... WFAA	400	6:30- 8:30	6:30-11:00	.....	6:30-11:00	6:30- 8:30	6:30-11:00
Davenport, Ia. .... WOC	400	8:00	.....	8:00-10:00	8:30	8:00	8:00-10:30
Denver, Colo. .... KLZ	360	7:30	7:30	7:30	7:30	7:30	7:30
Dearborn, Mich. .... WWI	360	.....	.....	10:00-11:00	.....	.....	.....
Detroit, Mich. .... WCX	400	6:00- 7:30	6:00- 7:30	6:00- 7:30	6:00- 7:30	6:00- 7:30	6:00- 7:30
Detroit, Mich. .... WWJ	360	7:30- 9:30	7:30- 9:30	7:30- 9:30	7:30- 9:30	7:30- 9:30	7:30- 9:30
Havana, Cuba .... PWX	400	.....	.....	8:00- 9:30	.....	.....	8:00-11:30
Indianapolis, Ind. .... WLK	360	.....	8:30-10:00	.....	8:30-10:00	.....	.....
Kansas City, Mo. .... WDAF	400	8:00-10:00	.....	8:00-10:00	.....	8:00-10:00	.....
Kansas City, Mo. .... WHB	360	.....	8:00-10:00	.....	8:00-10:00	.....	8:00-10:00
Louisville, Ky. .... WHAS	360	.....	8:30-10:00	8:30-10:00	8:30-10:00	8:30-10:00	8:30-10:00
Lockport, N. Y. .... WMAK	360	9:15-10:00	9:15-10:00	.....	9:15-10:00	.....	.....
Los Angeles, Calif.†... KHJ	400	10:00	10:00	10:00	10:00	10:00	10:00
London, Eng. .... ZLO	369	*	.....	.....	.....	.....	.....
Medford Hillside .... WGI	360	5:00- 7:00	5:00-10:00	5:00- 8:30	5:00-11:00	5:00-11:00	5:30- 9:30
Minneapolis, Minn. .... WLAGL	400	10:00-12:30	.....	.....	10:10- 1:00	.....	8:30-11:00
Newark, N. J. .... WJZ	360	7:00-10:15	7:00-10:15	7:00-10:15	7:00-10:00	7:00-10:00	8:30-10:30
Pittsburgh, Pa. .... KDKA	360	6:15-10:00	6:00-10:00	6:15-10:00	6:00-10:00	6:15-10:00	6:00-10:00
Philadelphia, Pa. .... WFI	400	6:30- 7:00	6:30- 7:00	8:00-11:00	6:30- 7:00	10:00-12:00	8:30-10:00
Philadelphia, Pa. .... WOO	400	7:30-10:00	9:55-10:10	9:55-10:10	7:30-10:30	9:55-10:10	9:55-10:10
Schenectady, N. Y. .... WGY	400	7:45-10:00	7:45-10:00	.....	7:45-10:00	.....	.....
St. Louis, Mo. .... KSD	400	9:00-12:30	9:00-11:00	9:00-11:00	.....	9:00-11:00	9:00-11:00
St. Louis, Mo. .... WCK	360	7:45- 9:00	.....	7:45- 9:00	.....	7:45- 9:00	.....
St. Louis, Mo. .... WMAY	360	**	8:00	.....	.....	.....	.....
Springfield, Mass. .... WBZ	422	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00	7:30- 9:00
Toronto, Can. .... CFCA	400	8:00- 9:00	8:00- 9:00	8:00- 9:00	8:00- 9:00	8:00- 9:00	8:00- 9:00
Troy, N. Y. .... WHAZ	360	8:00- 9:30	.....	8:00-10:00	.....	.....	.....

\* Time not listed.

\*\* Sunday—12:00-1:00 and 9:00-10:00 P. M. † Pacific Time.

Note—Type set in bold face is Central Standard Time. Light face type is Eastern Standard Time.

# High Lights of the Second Radio District Convention Pictorially Presented



(C. Photonews)  
K. Hiler, of Ridgewood, N. J., and his 19-watt transmitter which has been heard 2,000 miles east of New York City.



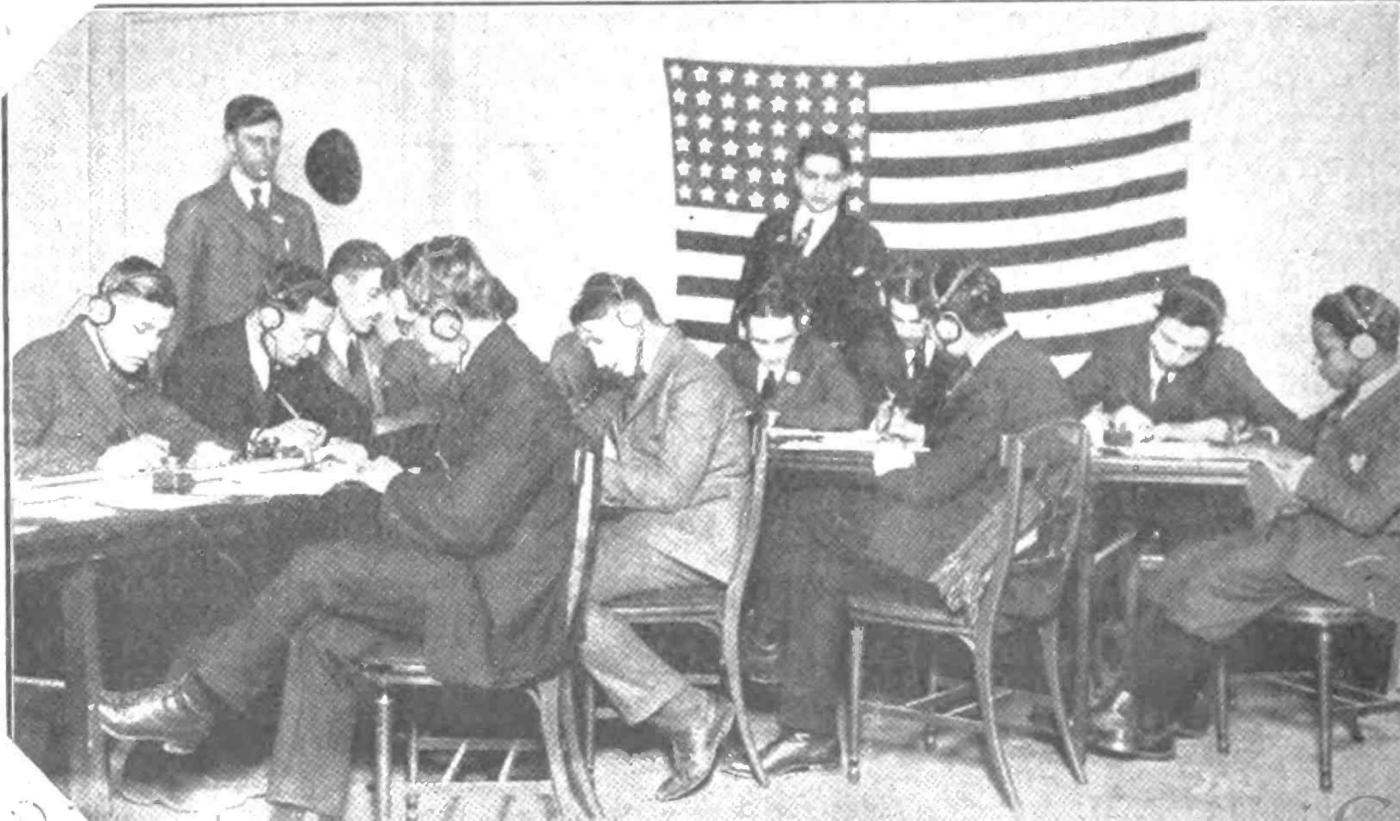
(C. Underwood and Underwood)  
Rosalie Deneve, of New York, listening in on the huge Paragon set at the Second Annual Convention.

**T**HE THIRD ANNUAL CONVENTION of the Second Radio District, held at the Hotel Pennsylvania, New York City, on March 1, 2 and 3, was the most successful up to date. From the standpoint of attendance the meeting overtopped those of former years, the attendance passing the 10,000 mark. At the banquet, held on the evening of the last day, the attendance was about 1,000. The speech of Mr. Droste, chairman of the Second District Convention, regarding the attitude of the amateurs and the broadcasters, and how their troubles were amicably settled was a feature of the banquet. Prominent amateurs were then called upon, and told to "Let the folks see what you look like." Some of those called upon were 2BK, 2OM, 2UA and his OW, who sometimes "pounds

the brass" at his station; 2BRB, 2BUL, 1CNI, 3XM, 9AWN and several other well known big-timers. A speech by Hiram Percy Maxim, the "big gun" of the American Radio Relay League, followed.

The next address on the program was by Radio Inspector Arthur Batchelor, who is a figure well known to all the eastern amateurs and very well known to several in particular. A little comedy was then staged. A young man who was supposed to represent CQ was turned loose and started in to run around in circles, much the same as the original CQ hounds do today. He was caught and brought before Judge Public Opinion who sentenced him to bread and water for life. F. B. OM.!

The next feature was Margaret Meerle, the Follies



# 10th Annual Convention, New York City Radio World Readers



(C. Photonews)  
Operator of transmitter of ZAGC, station of R. Neusch, New York City. It is of the 100 watt type, and has been heard in Switzerland during the recent tests.

(C. Photonews)  
200 watt transmitter of Station 2BHY, owned by Chas. M. Srobroff, New York City. This was one of the club exhibits.

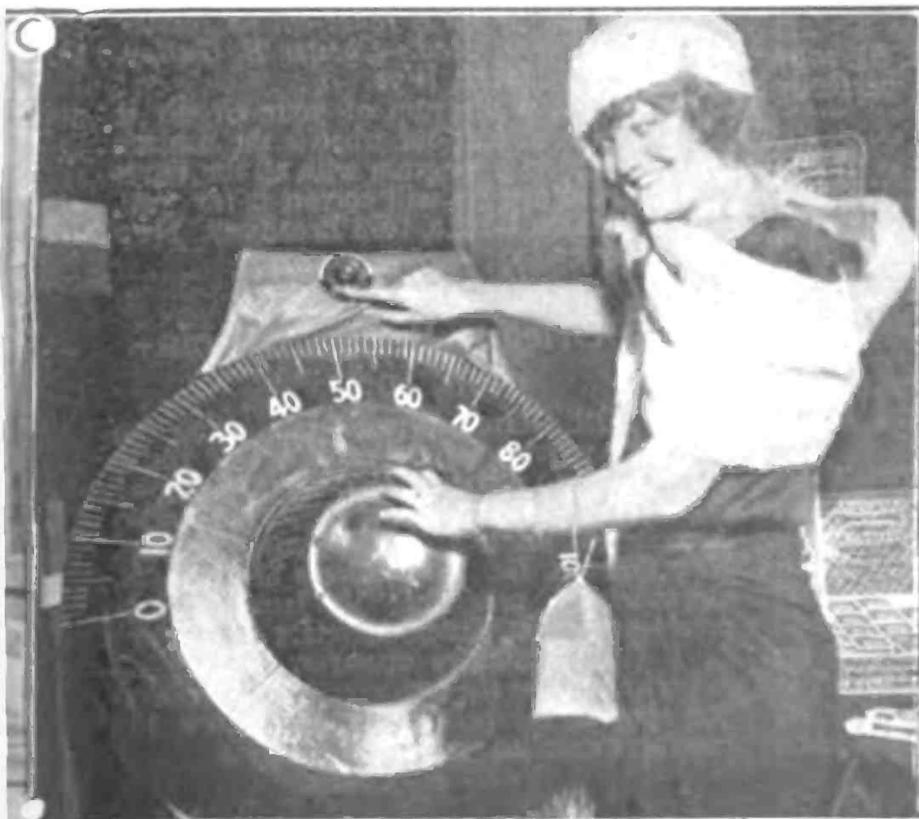
beauty, singing inside the monstrous Adams-Morgan Paragon set, which by the way was one of the features of the show. Mr. George Clark, of the Radio Corporation, next gave a humorous talk which caused the assemblage to roar with laughter. Numerous other men spoke and told stories, among whom were Kenneth B. Warner, wearing his two gallon plug hat; "Paragon" Paul Godley and Wm. F. Crosby.

This convention proved conclusively that more than ever is the interest in amateur radio increasing. In fact, it is growing to such an extent that it is simply impossible to estimate how things will stand next year at this time. The interest is not alone confined to the younger people, but the older ones are taking up the interest from a transmitting point and delight in telling

how fast they can "clean their hooks of all messages."

Some of the big features of the show were the transmitter of A. H. Grebe & Co. It was a 500-watt transmitter of the latest type and was specially licensed for three days, a provisional license being granted and the set inspected before the opening of the convention. Another of the big features was the immense set designed after the famous Paragon, and magnified several times. It was so large that it resembled an immense casket, decorated like a set. It sure did look handsome. Even if it would nearly fill a room, many an amateur would give his boots to own it.

On the whole the entire affair was an immense success, and the banquet was everything that was promised. The folks just had one "good old-fashioned time."



(C. Fotograms)  
Mrs. Dorothy Decker, who "pounds brass" at Station ZUA, trying

(C. Fotograms)  
Miss Vaughn De Lenth, the original radio girl, listening in on the new

# Answers to Readers

**K**INDLY publish, or refer me to a back number containing a hook-up of a regenerative receiver with one stage of radio-frequency detector and one stage of audio-frequency, one A battery and necessary B batteries. It is not to incorporate a potentiometer?—A. O. Turnbull, 57 Union Street, Sydney, N. S., Canada.

If you will refer to RADIO WORLD for Feb. 24, 1923, you will find a hook-up such as you need on page 19. The potentiometer shown in that particular hook-up, while not absolutely necessary, is advisable because of the fact that it makes the tuning so much easier, especially on the distance stations. You can eliminate it, if you wish. The one lead from the secondary will then connect on to the minus side of the filament and that will eliminate the condenser. It is not advisable to eliminate it with radio-frequency, because of the reason that you will find it so much harder to get regeneration started through your circuit and you will lose a lot of the selectivity of the circuit.

I enclose samples of yarn. Will they be O. K. to wind G.-R. (Giblin-Remler) coils with? If not, what kind should I use?—Frank L. Pantell, R. 1, Box 57, Muscatine, Iowa.

The samples of yarn are a bit too thick. Preferably 4-ply yarn of the same type will do.

I enclose circuit that I have tried out. I could only get a loud hum when I used it. Can you tell me what is the trouble and how to remedy it?—E. J. Devereaux, Bakersfield, Cal.

The diagram you enclose has two errors. The first is that the antenna is connected in the wrong place. It should be attached to one end of the inductance instead of to the plate of the tube. The second error is that you have left off the ground connection. It should go to the other end of the inductance, preferably with a slider attached to enable you to get variation of inductance to tune the circuit. The circuit will work if you do this.

I am using the set constructed as explained by Ortherus Gordon in RADIO WORLD for Jan. 20, 1923. All that I can get is code and whistling. Can you tell me what is wrong? My antenna is 60 feet long and 36 feet high.—John Sambemini, 11924 Lafayette Avenue, Chicago, Ill.

The fact that you are getting code loud and clear is an indication that the set is working. You simply do not know how to tune it. We advise that you put a condenser in your antenna circuit, with which to tune your primary circuit. Do not burn your bulb too high. This will cause your tube to oscillate too violently and you will get the carrier wave of the station, but the voice will be so muffled that you will not be able to understand it. Reduce the B current. You may have a tube that does not use a lot of B battery and you may be forcing your tube.

You published a hook-up by John Kent in RADIO WORLD for Jan. 27, 1923. Will this set work with WD-11 tubes as detector and amplifier, or will it be necessary to use the U. V. 201 for amplification? Can I use U. V. 201 tubes as amplifiers for this circuit?—Edward G. Steffen, 10855 Divine Avenue, Detroit, Mich.

Yes, this circuit will work with WD-11 as amplifiers. It is not advisable to use the

U. V. 201 tubes as amplifiers with this circuit as it would necessitate your using both dry cells and storage cells for the filament current. As this circuit was devised to get away from the bother of using the storage cell, the advantage would be lost.

1. What is the value of condensers in the circuit published in RADIO WORLD for Feb. 3, 1923, page 14, by Fred J. Rumford, entitled "A New Amplifying Receiver"?

2. How many turns of wire on the coils L, L1 and L2? How are they mounted?

3. Can I use a three-plate variable condenser in this circuit?—R. W. Nass, Sussex, New Jersey.

1. The two condensers C and C1 in this circuit are of the following values: C is .0005 and C1 is .0005.

2. The two outside coils, shown as L1 and L3 in the diagram, are pancake coils, wound spiral-wise on a piece of stiff cardboard or thin fibre and are 50 turns of No. 22 SSC wire. The inner coil (L2) is wound in the same fashion and is 75 turns of the same size wire. They are mounted in such a way that the two outside ones can be swung book fashion, and the inner one is mounted so as to be able to swing vertically up and down between them.

3. A three-plate condenser can be used by shunting it across the condenser you use in the secondary, thus making the secondary condenser a vernier.

Kindly give me some information as to a receiver that will permit me to receive from 2,500 to 3,500 miles?—O. H. Orr, Foley, Ala.

We refer you to RADIO WORLD for Jan. 10, 1923, where Mr. Thompson has given some very good reflex circuits. It is possible to do wonderful work with these circuits, but it is impossible to guarantee the range of any receiver to such distances, as much depends on the transmitting station and also on the manipulation of the receiver.

Will 45 volts on the plate of the tube (WD-11) be sufficient in connection with the Flewelling circuit? The set in question is to be used on an indoor loop.—F. N. Cash, 39 Union Street, Norwich, Conn.

In this circuit you can get better results if 45 or even 60 volts are used as a plate voltage. The WD-11 will stand 60 volts without breaking down, so it is perfectly safe.

1. I am using a Westinghouse R. C. receiver with the Power loud speaker. Is this radio-frequency? If not how can I add it to my set?

2. Can I connect a condenser in the antenna circuit, and if so will I get any better results?

3. How would the transformers (radio-frequency) be connected?—J. Frank Douthitt.

1. You are not using radio-frequency. It can be added if you wish to entirely dismantle your present set. This is not advisable as the sets in question have been calculated for the best work, and it would entail endless work for yourself to add radio-frequency. We advise building a set such as shown in "Answers to Readers" in RADIO WORLD for Feb. 24, 1923. This set is the regenerative circuit, with both radio and audio-frequency.

2. A condenser can be connected in the antenna circuit but we fail to see where any

additional results can be gained by this unless your antenna is too long to allow you to receive short waves. In this case the condenser will allow you to get the lower wave stations.

3. They are connected much the same as the audio-frequency, with the possible exception that an extra tap may be taken off the secondary side which is done in some cases where reflex circuits are used.

Can you give me an efficient hook-up for the following apparatus: 1. A. K. variometer, 43-plate condenser, tube (WD-11), rheostat, grid leak and condenser, A batteries, B batteries and phones? I have a set now with these parts but cannot get out-of-town stations.—G. V. Heath, 2116 P Street, N.W., Washington, D. C.

We refer you to the diagram published in RADIO WORLD for March 10, 1923, in answer to a question on page 18, by Mr. Hausing. The seven-plate condenser in this circuit is not absolutely necessary, being merely a refinement that will tend to give finer control of the regenerative qualities of the receiver. It can be dispensed with if necessary. The rotor of the vario-coupler is used in this circuit as a tickler to produce regeneration and is shown by the coil on the right.

I have built the receiver shown in RADIO WORLD for Jan. 20, 1923, and described by Mr. Ortherus Gordon. Although I have followed the instructions to the letter I cannot get anything. One peculiar thing is observed. I cannot light my tube when the grid condenser is in the circuit, but when I remove the condenser and connect the wires, I can light the filament. Will you kindly explain this?—Elijah Collins, N. Y. Mills, Oneida County, N. Y.

You evidently have made some mistake. This circuit has been tried and proved a remarkable success. The fact that you cannot light your filament without removing your condenser proves that you have not hooked up the set right. We suggest that you re-wire the set, following the diagram exactly, and using a socket made for the WD-11 tube instead of the regular socket with an adapter such as you are using.

I have detector and two-stage set. I cannot get anything on the first stage, and cannot hold anything on the second stage. If I attach the ground wire I cannot even hear anything, but when the ground is left off I get everything from New York to Mexico and from Canada to the Gulf, but I cannot hold it. I hear it but it fades out no sooner than I have it in good.—Chester B. Gulley, Box 336, Salt Creek, Wyo.

Not having a diagram of your circuit it is impossible to find out what is the matter with it. Send in a diagram with all the parts used marked and we will correct it for you. Address RADIO WORLD, 1493 Broadway, New York City.

## New Orleans Radio Association, Inc.

EDITOR, RADIO WORLD: Referring to your request for the name of our radio club, I beg to advise that the name of our organization is the New Orleans Radio Association, Inc., 2322 Melpomene street, New Orleans, La. The officers are: W. S. Oppenheimer, president; V. Jensen, vice-president; H. E. Faller, secretary-treasurer; L. J. Gallo, publicity manager.

I wish to take the opportunity of advising you that at the present time we have 135 members enrolled in our organization.

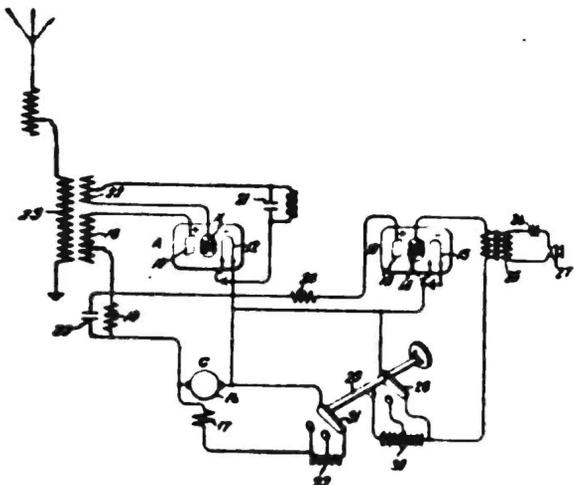
Yours very truly,  
New Orleans, H. E. FALLER,  
March 10, 1923. Secretary-Treasurer.

# Latest Radio Patents

## Apparatus for Producing a Succession of Electric Waves

No. 1,446,925; Patented Feb. 28, 1923. Patentee: Walter R. G. Baker, Schoenectady, N. Y.

**T**HIS invention relates to the production of electric waves and more particularly to methods and apparatus for producing a succession of waves which may be modified



Baker's Apparatus for Producing a Succession of Electric Waves.

in accordance with impulses produced, for example, at a controlling or signalling station.

Apparatus of this character usually consists of a source of electric power, means for converting the energy of said source into current of an oscillatory character and a transmitter for suitably modifying the character of the oscillations. An amplifier for the initial signalling impulses is often used, and this, as well as the oscillator, may consist of a vacuum discharge device which comprises an anode, cathode and discharge controlling grid. A suitable source of current is connected between the anode and cathode, and the current from this source is modified by changing the potential of the grid in accordance with the impulses which it is desired to transmit. It is proposed to provide a single source of current for the oscillator and amplifier. When, however, an attempt is made to change the potential of this source to change the output of the oscillator, as for example when it is desired to increase the distance over which messages are to be sent, it is found that amplifier which is likewise influenced by the changed potential will not operate as effectively unless a corresponding change is made in the normal potential applied to the grid. My present invention provides for the simultaneous changing of the potential of the common source above referred to and of the potential applied to the amplifier grid.

between the anode or plate circuit and the oscillating circuit.

## Wave Meter with Cathode Tube

No. 1,446,425; Patented Feb. 28, 1923. Patentee: August Leib, Berlin, Germany.

**W**AVE meters provided with a cathode tube are well known and it has heretofore been proposed to provide such meters with a back-coupling whereby the wave meter operates as a sender, and the tunings are determined by means of the telephone in a receiver at maximum receiving tone strength. Under certain circumstances this arrangement has the drawback that the wave meter, which operates without damp-

The arrangement may be particularly simplified if the magnets of the buzzer are wound with suitable thin wire and the interrupter connected in the anode circuit in such a manner that it is operated by the anode current as a self-interrupter.

## Indicator for Deviation of Sender from a Desired Frequency

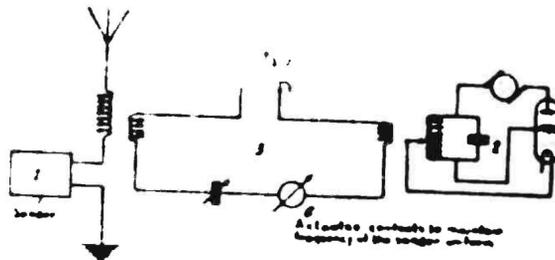
No. 1,446,433; Patented Feb. 28, 1923. Patentee: Walter Schaffer, Berlin, Germany

**I**F two senders operate jointly at the same frequency on an oscillating circuit, a phase displacement of 180° occurs between them. The weaker of the two senders is usually forced into or held in a 180° phase displacement by the more powerful sender. If the wave individual to the weaker sender is now slightly detuned with respect to the more powerful sender, the frequency of the oscillating wave does not vary but apparently only the phase displacement of the two senders with respect to each other is changed. Consequently, a measuring instrument provided in a circuit coupled with the two senders will register the variation. If, on the other hand, there is a variation in the wave of the more powerful sender, that is, the working sender, then this will have a corresponding effect on the auxiliary sender, the phase displacement being varied at the same time. The resulting variation in the current may then be used as a measure for the changes occurring in the wave, and the change in the output of the circuit may be used for correcting the occurring frequency variation.

My invention makes use of these occurrences for automatically indicating or correcting the deviation of a sender from the wave of the desired frequency. The illustration herewith is a diagrammatic representation of a circuit arrangement embodying the invention, and the reference numeral

1 designates an undamped working sender of any well known type, 2 is a cathode tube auxiliary sender, and 3 is a tuned or untuned circuit coupled with 1 and 2 in which the measuring instrument 6 is provided. It makes no difference whether the measuring or instrument circuit 3 is periodic or aperiodic. It is even possible to actuate the auxiliary sender without the use of such circuit.

The momentary deviation from the frequency within the phase range may be acoustically determined, a very loose coupling being used. The use of a loose coupling makes possible the employment of



Schaffer's Indicator for Deviation of Sender from a Desired Frequency.

a mechanically operating measuring instrument provided with a scale gaged in a static manner in order to make possible the direct reading of the wave deviations.

In order to make possible the reading of both positive and negative variations in the wave of the working sender, the instrument 6 is preferably so adjusted that it gives the same indication irrespective whether one or both senders actuate the instrument circuit.

An increase in the reading of the instrument indicates an increase in the wave length, and a shortening in the movement of the instrument a shortening of the wave length.

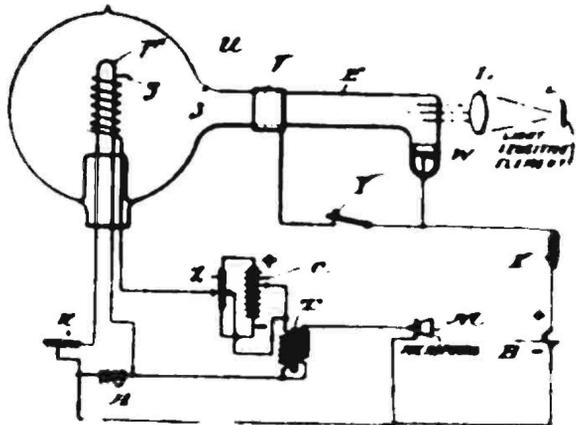
The sensitiveness of the measuring arrangement may be increased or decreased within the desired limits by increasing or decreasing the looseness of the coupling.

In order to make possible the use of the arrangement for the purpose of automatically correcting variations in the wave frequencies within predetermined limits, the indicating instrument itself or in its stead a relay arrangement is used for the purpose of actuating certain contacts provided for this purpose.

## Light-Controlling Means

No. 1,446,247; Patented Feb. 28, 1923. Patentee: Leo De Forest, New York City.

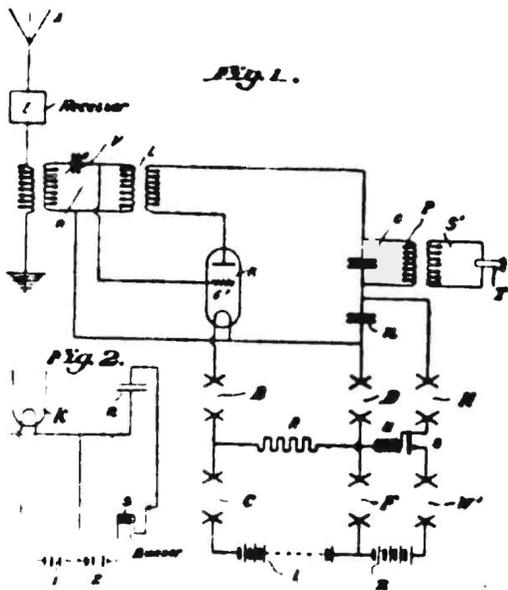
**T**HIS invention relates to means for controlling light by and in accordance with sound waves or other type of signals.



De Forest's Means for Controlling Light.

The object of the invention is to provide means which are simple and highly efficient for obtaining exceedingly large light fluctuations by and in accordance with sound waves or other type of signals.

A further object of the invention is to provide a device which may act as a source of light, and which is extremely sensitive to sound waves, or, in other words, the light from which will vary greatly in accordance with relatively small current variations in the circuits connected therewith.



Leib's Wave Meter with Cathode Tube.

ing, that is, so as to produce a continuous wave, does not give a tone but must be made audible in the receiver by means of a second superimposed sender or by other suitable tone producing means.

The invention consists in transforming a normal oscillating circuit, which is back-coupled to an audion tube, into a sounding sender by very simple means. The means employed consists in an electromagnetic buzzer which is connected in the circuit be-

# New Records of The DX Nite Owls

## Gets Unusual Results

From Norman T. Shideler, Bloomington, Ind.

I HAVE been experimenting with wireless for more than two years, and in that time have made a number of receiving sets which have worked satisfactorily; but in the last few weeks I have constructed a set which gives unusual results, and which I think will be of interest to other radio fans.

My set consists of a 23-plate condenser, a home-made vario-coupler coil, a 5-plate variable condenser, a WD-11 tube, and the other things which are necessary in all tube sets. My coil is  $4\frac{3}{8}$  inches in diameter and is wound with 109 turns of No. 26 D CC wire. The first 25 turns are untapped, then a tap is taken off at every twelfth turn, making eight taps in all. The tickler coil is wound with 50 turns of the same wire, and on a three-inch tube. My hook-up, using the above instruments, is shown in the diagram, together with the layout of the panel.

The 23-plate variable condenser is used in the aerial circuit. The 5-plate condenser may be used either as shown in the drawing or across the tickler (shown by the dotted line). It works well in either place. In using this condenser I am able to get finer adjustment, and it also seems to add to the regeneration. I also use a phone condenser, but it is not absolutely necessary, as the tube does not require so much current when the condenser is used. The amount of B battery current needed depends

THE Editor of RADIO WORLD will be pleased to receive sketches of hook-ups drawn carefully in black ink or heavy pencil from the "DX Nite Owls" who send in records with a view to publishing them.

Send hook-ups of your sets, provided they contain something unusual. Send, also, the names of the various makes of apparatus you are using.

Make your letters brief and informative. Write on one side of the paper only.

The letters and hook-ups will be published in the earliest possible numbers of RADIO WORLD.

speaker. The set has a wave length of from 200 to 1,000 meters. I hope that this may be of use to some of the radio fans.

## Uses an Humble Crystal Set

From Bill Keating, Minneapolis, Minn.

HERE'S another little DX record for a humble crystal set. On a night not long ago I picked up the following long-distance stations, which I heard clearly: WOC, Davenport, Ia., 275 miles; WHAS, Louisville, Ky., 600 miles; WCX, Detroit, Mich., 550 miles; WGY, Schenectady, N. Y., 1,000 miles; KDKA, East Pittsburgh, Pa.; 800 miles; WDAF, Kansas City, Mo., 475 miles; KSD, St. Louis, Mo., 500 miles; WLW, Cincinnati, O., 600 miles, and, last, but far from least, WOAI, San Antonio, Texas, 1,200 miles, which, I believe, is a record for distance with a crystal. The

## Has Heard 150 Stations

From Leon A. Mears, Minneapolis, Minn.

I SEEM to have had exceedingly good results on my three-circuit set, using two steps of amplification. Most of my material is Atwater-Kent or Michigan, and I assembled the set.

I have heard 150 stations and a mileage of 15,170 miles in one evening. The stations heard on this evening were: CFAC, KDKA, KFAF, KFDL, KSD, KYW, WCAE, WCAS, WCX, WDAF, WDAF, WFAA, WGM, WGY, WHA, WHAZ, WSZ, WLAG, WLW, WMC, WOC, WSB, WWS.

The farthest stations received are: PWX, Cuba; KWH, Los Angeles; KGI, Berkeley, Cal.; KEO and KDN, San Francisco. All the stations come in clear.

## On a One-Tube Set

From William Hansen, Astoria, Long Island

I WOULD like to submit my receiving record for a one-tube set, using a 43-plate variable condenser, vario-coupler and two variometers and Brandes phones. The following stations were received loud and clear:

WHAS, WHAI, WJZ, WDAF, WOR, WHN, KDKA, WBAN, WGY, KSD, NOF, WAAE, WBS, WAAM, WDAP, WJT, WMAC, WBAX, WSB, WOC, WGM, WBAY, WWJ, WGI, WHK, WIP, WRP, WJAX, WEAP, WJAS, KYW.

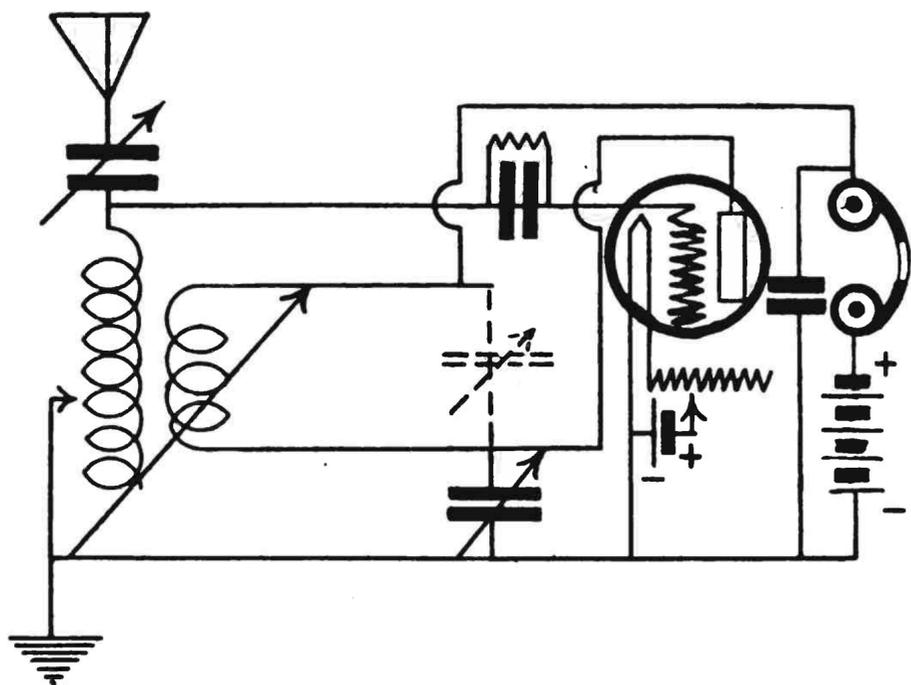


Fig. 1. Hook-up used by Mr. Shideler

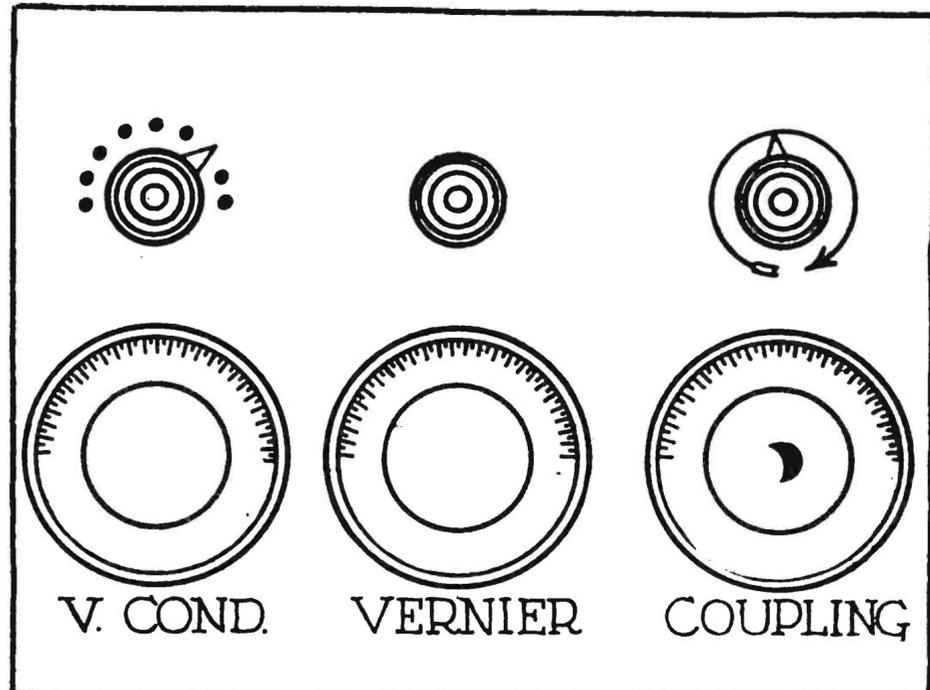


Fig. 2. Layout of Apparatus, as arranged by Mr. Shideler

entirely on the tube. I have found that it varies from  $13\frac{1}{2}$  to 25 volts.

I have had unusual results with this set. Following are the stations I have heard: KDKA, KHJ, KSD, KYW, PWX, WAAC, WAAF, WAAP, WBAP, WBZ, WCAE, WCX, WDAP, WDAF, WFAA, WDAF, WDAJ, WFAV, WGI, WGM, WGY, WHK, WHAZ, WIP, WJAF, WHAS, WHB, WJAP, WJAX, WLAG, WLAL, WLW, WMAF, WMAK, WMAQ, WMAT, WMC, WOC, WOR, WOS, WPA, WQAA, WRAO, WSB, WSY, WWJ, WDAV, WMAC, WLK, WBT, WGF, WCK, WGR, WHAB, AVZ, WOAN, NAA, CFCA, CJCG.

Under ordinary conditions I can pick up any of the above stations. The larger stations, such as WWJ, WGY and KDKA, come in so loud that I can use a loud

other stations I get regularly, but that is the only time I have got San Antonio. They came in very distinctly.

The above stations were picked up while I was testing one of my sets, and the remarkable part about it is that they were all tuned in within less than ninety minutes between the hours of 7:30 and 9.

Several other fans using sets like mine have had equally good results.

## California Records

From Norman West, Lawndale, Cal.

WITH a detector tube only I think I have some records as far as they go:

WBAP, Fort Worth, Texas; WOC, KYW, KSD, WOE, WEAB, WNAC, WQAA, WDAF, KGU, WSY, KFC, WOS, WBAV, WOR, SPG, 9CXP, 8MK.

WDAT, KOP, WBT, WLK, WOS, WOO, WGR, WMAT, WFI, WMAW, IRI, ILL.

I have also received about 50 amateurs. I don't think my record is bad for a home-made set.

## Looks Good to Us

From Nite Hawke, Oshkosh, Wis.

I READ about your new game of radio golf in the Feb. 3 issue. Here is my score, done with a Grebe CR-9. Starting at 7 p. m. I heard 21 stations till I stopped at 9 p. m. The total distance covered was 11,800 miles, or an hourly average of a little more than 5,900 miles. I did not stay up to hear the far western stations, such as KHJ, KYG, KDYS, and KDZR, which I usually hear. This is some DX record, is it not? All the stations were more than 200 miles away.

(Continued on page 21)

## DX Nite Owls

(Continued from page 20)

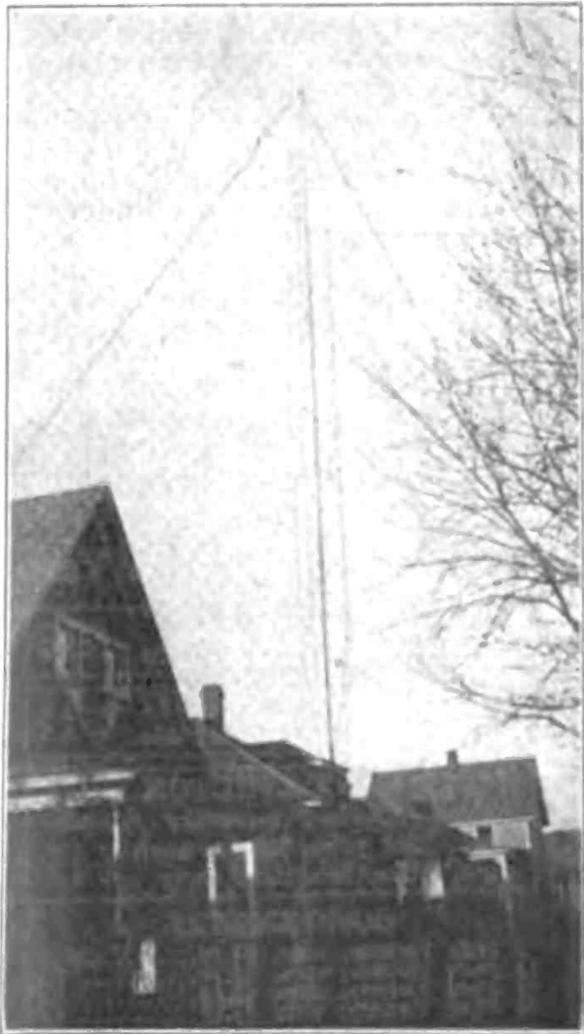
### A High Aerial Is a Help

From L. Cochran, Colorado Springs, Col.

HAVING been an interested reader of your DX records as published in RADIO WORLD I submit one from Colorado Springs—"the city of sunshine, at the foot of Pike's Peak."

Using a standard hook-up, detector and two step, honeycomb coils, aerial 150 feet long, of an average height of a little over 50 feet, the following stations have been received since last September:

AS6, 6XB, 6XY, DN4, DD5, KDC, KDKA, KDN, KDPT, KDYL, KDYS, KDZQ, KFAD, KFAF, KFAN, KFAY,



One of Mr. Cochran's 73-Foot Poles.

KFBB, KFBC, KFBK, KFCL, KFBV, KFC, KFCK, KFDB, KFI, KGG, KHD, KHJ, KJS, KLZ, KMJ, KNJ, KOA, KCB, KOP, KFDL, KPO, KOY, KSD, KUO, KUS, KUY, KWH, KXD, KYJ, KYW, KZN.

WAAB, WAAC, WAAH, WAAK, WAAL, WAAP, WAAQ, WAAW, WAAZ, WBAP, WBF, WBL, WBZ, WCAL, WCAV, WCAZ, WCK, WCM, WCX, WDAF, WDAH, WDAJ, WDAO, WDAP, WDAW, WDAY, WDV, WEAB, WEAH, WEAH, WDAZ, WEAY, WEY, WFAA, WFAC, WFAH, WFAS, WFAT, WFAV, WFO, WGAB, WGF, WGY, WHA, WHAS, WHAZ, WHB, WIAR, WIAS, WJAD, WJAM, WJAN, WKA, WKAL, WKN, WKY, WLAG, WLAJ, WLAL, WLW, WMAB, WMAD, WMAG, WMAH, WMAJ, WMAT, WMAY, WMH, WNAD, WMC, WOAA, WOAI, WOC, WOH, WOI, WOK, WOQ, WOR, WOS, WPA, WPAC, WPAM, WPE, WQAQ, WRM, WRR, WSB, WOAZ, WSY, WYJ.

CFCA, CFCN, CHBC, CHCA, CHCQ, CIGG, CKCK.

This list comprises 144 stations located in 35 different states and four provinces of Canada, and figures a total of 110,000 miles. All the states represented are west of the Mississippi River with the exception of Nevada.

On a recent night I distinctly listened to

the test programs broadcast from KHJ, Los Angeles, and WOR, Newark, N. J. This test was started by KHJ at 11 o'clock p. m., Pacific Time, and was answered thirty minutes later by WOR at Newark. This was at 12 midnight here, and even at that hour several stations could be heard—for instance, the Drake Hotel, Chicago. The Kansas City "night hawks" were on just a few minutes before KHJ started, and Stamford, Texas, was on during the test.

This record is not the best one in Colorado Springs, as several of the fans have records that include Havana, Cuba, a station I have never been able to pick up.

I am enclosing a picture of one of my aerial poles. This pole is 73 feet to the top, and is made from old iron pipe, put up by one man without other help than block and tackle. The pipe was telescoped before raising, so that, at the time it was erected by the eave of the house, it was only 24 feet in length; then the inner or first joint was hoisted by a "gin pole," bolted to the second joint, and so on, like lengthening a telescope.

The radio engineers have reported that Colorado Springs is handicapped in reception owing to a high magnetic field which practically surrounds the location, and we find that reception varies, especially from the north and east; but from the south the stations seem to come in pretty regularly.

### Determining Longitude by Radio

From E. D. Ball, Spartanburg, S. C.

NOT long ago I determined my longitude by use of the time signal from Arlington via Pittsburgh. This may be of interest to some of the radio fans.

The star Pegasi was used. The star's time of transit was computed in local time. The mean time watch was used to get the standard time of the star's transit. The correction to watch was taken by the wireless time signal via Pittsburgh from Arlington at 10 P. M.

The watch face reading of star's transit was..... 10 h. 3 m. 22 s.  
The correction to watch was 10 seconds fast... —10 s.

The standard eastern time of transit was.... 10 h. 3 m. 12 s.  
The computed local time was ..... 9 h. 35 m. 41 s.

The difference is the longitude from 75th meridian ..... 27 m. 31 s.

Five hours added gives the longitude west from Greenwich, which is 5 hours, 27 minutes, 31 seconds west.

This checks less than a second of the same taken by Western Union wire. Having a small astronomical observatory enabled me to do this, in connection with my wireless set.

### Weather Sometimes Interferes

From John R. Knott, Iowa City, Iowa

I HAVE been a radio fan for almost one year now, and sure do like to experiment. I am using a WD-11 tube. The greatest distance I ever heard over was Los Angeles, 2,000 miles away. I get WOC, WHB, KDKA, WGF, and many others. If the weather is just right I can get WGY fine. WHAA, a local station, is a very hard station to tune out. I can usually tune them out unless the weather is exceptionally bad. I obtain best results on the 12-volt tap of my "B" battery. As I do not have a 6-volt tube I do not know how 12 volts would work on one.

(Continued on page 24)



This Combination Completes any RADIO RECEIVING SET



TO own a good receiving set without Magnavox equipment, is like having your house properly wired and then using only small, feeble candle-power lamps in the sockets!

Whether placed in the average living room or large dance hall, Magnavox Radio floods the desired area with clear, resonant music or speech—its volume perfectly controlled from the Magnavox Power Amplifier constructed specially for it.

Combination R-3 Reproducer and 2 stage Power Amplifier (as illustrated).

R-2 Magnavox Reproducer with 18-inch horn: the utmost in amplifying power, for store demonstration, large audiences, dance halls, etc.

R-3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc.

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer. 2 stage 3 stage

Magnavox Products can be had of good dealers everywhere

The Magnavox Co., Oakland, California  
New York: 370 Seventh Avenue

Write for booklet illustrating and describing the

MAGNAVOX Radio The Power Amplifier and Reproducer Supreme

Advertising Rates: Display, \$5.00 per inch, \$150.00 per page.

# Radio Merchandising

Classified Quick-Action Advertising, 5 cents per word.

Telephone Bryant 4796

## New Radio Firms

(The new firms and corporations mentioned in these columns can be reached directly or by communicating with the attorneys, whose addresses are given when ever possible.)

Domestic Supply Company, Dept. 28, The Broadway Market, 19th street and Broadway, Oakland, Cal., household goods and electrical appliances and supplies.

Electric Novelty Shop, 4th and Market streets, Logansport, Ind. H. Levy, proprietor.

American Electric Sales Co., 632 Baronne street, New Orleans, La.

Nicholas Bros., 123 South Winter street, Adrian, Mich., are adding radio supplies to their business.

Kinley Radio Co., 33 Elmhurst avenue, Detroit, Mich.

United Electric Stores Corp., New Market, N. J. Samuel Eisemann and others.

Seattle Lighting Fixture Co., 617 Fourth avenue, Seattle, Wash., is adding radio supplies to the business.

D. X. Radio Corp., New York City, \$5,000; W. and M. Scadron, H. Jaolons. (Attorney, L. Scadron, 149 Broadway.)

Burrows Magnetic Equipment Corp., develop patents, \$90,000; C. O. Asamus, T. Irving Potter, East Orange, N. J.; Harrison H. Pierce, New York. (Julian Walker, Wilmington, Del.)

Municipal Products & Electric Co., Buffalo, N. Y., \$15,000; A. A. Aaron, C. Dautch, H. A. Kulowski. (Attorneys, Aaron & Dautch, Buffalo.)

Elliott Electric Supply Co., New York City, increased capital from \$5,000 to \$100,000.

Will-Fred Electric Manufacturing Corp., Queens, \$20,000; W. O. and B. A. Feldman, E. F. Calnes. (Attorneys, Mann & Buxbaum, 886 Broadway, Brooklyn, N. Y.)

Merrick Electric Co., Queens, \$10,000; T. L. McKeown, E. E. Breiling. (Attorney, T. Breiling, Hollis, Long Island.)

Super Radio Corp., Wilmington, Del., supplies, \$1,000,000. (Corporation Service Co.)

Marks Radio & Electric Co., New York City, \$5,000; L. Marks, B. Wertheir. (Attorney, H. C. Adams, 220 Broadway.)

Long Island Electric Service Corp., Queens, make wireless apparatus, \$9,000; B. Lapoint, J. V. Miller, W. W. Caulfield. (Attorney, W. E. Kennedy, 47 Cedar St., New York City.)

Radio Exchange, New York City, \$6,000; L. Feldman, B. Gleichman, F. Golding. (Attorney, M. L. Kane, 50 Court St., Brooklyn, N. Y.)

O'Connell Electric Co., Rochester, N. Y., increase of capital from \$10,000 to \$50,000.

Maceur Electrical Supply & Radio Co., Manhattan, \$5,000; W. Hurza, J. McQueen. (Attorney, H. Schapiro, 261 Broadway, New York.)

## How Radio Helps Shorthand Students

EVERY day brings to light another use for radio broadcasting. It is now revealed that students of shorthand and typewriting are picking up addresses out of the ether to increase their speed at the typewriter or in writing shorthand symbols of the speaker's words. Those who have had to rely upon the patience of a member of the family or a friend to read to them while they dashed down the dots, dashes and curves can appreciate the advantage of radio dictation.

## Radio Stocks

(Quotations as of March 7, 1923, furnished by Frank T. Stanton & Co., 35 Broad Street, New York City, Specialists in Wireless Securities.)

Stock	Bid	Asked
Am. Marconi Stamped...	5c	7c
Am. Marconi Unstamped	5	7
American Tel. & Tel...	124½	125
Canadian Marconi.....	2½	3¼
De Forest Radio.....	7	10
English Marconi com....	11	15
English Marconi pfd....	11½	15½
Federal Tel. Calif.....	6	6½
General Electric.....	185	186
Hennessey Radio Pub...	9	11
Manhattan Elec. Supply.	55½	56
Marconi Int. Marine....	9	10
Mackay Co. com.....	116	117
Radio Corp. com.....	4	4¼
Radio Corp. pfd.....	3½	3¾
Spanish Marconi.....	1	3
Western Union.....	115	116
Westinghouse E. & M...	64½	64¾

## Satirizes International Radio

A FACETIOUS correspondent writes this letter to the New York Times:

"The attention of American reformers should be directed to the wave of moral turpitude into which the English have either drifted or plunged during the last week. Children in the British Isles are being kept up until 3 A. M., London time, to hear bedtime stories by radio, after which their elders begin orgies of song and dance that continue without cessation until 7:50 A. M. Beyond the probable deleterious effects on the English, it is difficult to estimate the number of cases of shattered nerves sustained by American radio amateurs in trying to hear the London revelry on this fantastic schedule."

## Wireless Shares Boom

Following the announcement by Premier Bonar Law that licenses will be issued to the Marconi's Wireless Telegraph Company, Ltd. (English Marconi), to operate a large central station by which they can keep in constant communication with the world, similar to the Radio Corporation's station on Long Island, shares of all the companies have been in great demand. Radio Corporation common sold on March 6, from \$3¾ to \$4¼, the preferred up to \$3½, English Marconi to \$16 and Canadian Marconi \$3¼. As this demand broadens out, De Forest and other companies will come in for higher prices.

## Coming Events

PERMANENT RADIO FAIR FOR BUYERS, Hotel Imperial, New York City. Open from September, 1922, to May, 1923.

ANNUAL HOME AND CITY BEAUTIFUL EXPOSITION, featuring radio exhibits. Atlantic City, N. J., June 16 to September 8, 1923.

ILLINOIS STATE ELECTRIC ASSOCIATION, Chicago, March 16 and 17; R. V. Prather, secretary, Mine Workers' Building, Springfield, Ohio.

## A Tip on the Flewelling Circuit

Many people have constructed the famous Flewelling Circuit, and have attempted to put a couple of steps of audio frequency amplification on it and have found that it was impossible, or that the control was so hard that they gave it up as a bad idea.

Now, if they had put a variable grid leak across the primary of first audio frequency transformer and varied that, much the same as the one in the grid circuit, they would have found that the signals cleared up and came in with a bang. A grid leak variable from one-half to five megohms will suit the purpose, and will help a lot.

## WILLARD

WILLARD RADIO COMPANY

Dept. R.W.

291 Broadway New York

REINARTZ CIRCUIT  
Every part complete. \$10

FLEWELLING CIRCUIT  
Every part complete. \$11

TUNING & DETECTOR UNIT  
2-Step Audio-Frequency Amplifier. List price \$35 for each unit. Combination only.. \$45

### CONDENSERS

3 Plate Variable; value, \$1.75.....\$1.95  
13 Plate Variable; value, \$2.50..... 1.20  
23 Plate Variable; value, \$3.50..... 1.35  
43 Plate Variable; value \$4.50..... 1.85

13 Plate VERNIER; value, \$5.50.....\$3.75  
23 Plate VERNIER; value, \$6.00..... 4.00  
43 Plate VERNIER; value, \$6.50..... 4.25

V. T. SOCKETS—Nickel brass sleeve, composition base; value, \$1.00; special at \$0.50

Ball Bearing Inductance switch; value, 75c; special at ..... .30

FILAMENT RHEOSTAT—Condensite base; value, \$1.10; special at ..... .70

FILAMENT RHEOSTAT with 2½" dial; value, \$1.50; special at..... .85

Potentiometer with knob; value \$1.75; special at ..... 1.00

Potentiometer with 2½" dial; value, \$2.15; special at ..... 1.15

BEST QUALITY JACKS. Single circuit; value, 65c; special at ..... .30  
Double circuit; value, 90c; special at..... .45

VARIOCOUPLER—Colson condensite and Litz Wire wound secondary; value, \$4.50; special ..... 3.25

THREE-INCH DIALS—Unbreakable—best resisting composition—high finish; special .30

TWO-INCH DIALS—Same design—for rheostate and potentiometer; special..... .25

EXTRA SPECIAL—Telephone 3000 Ohms Headsets; \$9.00 value; reduced to..... \$5.50

RAYMOND VERNIER RHEOSTATS—Value, \$1.50; special ..... .95

REINARTZ COILS—Value, \$2.50 ..... 1.75

ALUMINUM LOUD-SPEAKING HORN—Nickel Plated; List \$8.00..... 3.75

AUDIO-FREQUENCY TRANSFORMER—For use with W.D.-11 Tubes; List \$4.50. 2.75

Every article advertised above is guaranteed both by the manufacturer and by us—Mail orders filled immediately—transportation PREPAID on all orders of \$5.00 or over east of the Mississippi River. All others include postage.

### Relative Advantages of Single Circuit and Double Circuit Tuners

RIOR to the introduction of radio broadcasting, the ordinary type of radio receiver used by the amateur was of the double-circuit or three-circuit type. Because of these instruments it was not difficult for them to use these tuners and they took pride in their skill of operation. However, when broadcasting was initiated, the need for a simple tuner device that could be used by the layman was considered necessary and a single-circuit tuner was developed. On account of the simplicity of this tuner and in view of the great number of broadcasting stations operating at the present time, confusion resulted concerning the efficiency of this tuner. Interference of one broadcasting station is the cause of trouble in the use of the single circuit tuner. The interference sometimes encountered in radio broadcasting reception is primarily a problem of broadcasting transmission. It can be eliminated by the enactment of suitable government legislation that will enable wave-lengths other than 360 and 400 meters to be assigned to broadcasting stations. No receiving tuner, whether it be of the single or double circuit type, will prevent two broadcasting transmitting stations operating on the same wave length from setting up interference in the receiving set, unless the signals of one station are of sufficient intensity to drown out those of the other station. Two broadcasting stations operating on nearly the same wave lengths will produce an audible note or "whistle" in the receiving apparatus, which no tuner of either the single or double circuit type will eliminate. The cure for this problem is the assignment of wave lengths to the transmitting stations of sufficient separation so as not to produce an audible note. The single circuit tuner will enable the listener to differentiate between two local broadcasting stations by erecting an antenna over 15 feet high and 15 to 20 feet in length. It has been conclusively demonstrated that a low antenna is more selective than a high antenna. The selectivity on a low antenna can be increased by an additional series condenser between antenna and tuner.

Selectivity in regenerative receiving sets is primarily a function of the amount of regeneration. Two local broadcasting stations on different wave lengths will often interfere with one another on either the single or double circuit receiver, but this is due to the overwhelming power of the transmitter which causes the apparatus to function by back excitation and respond even when not accurately tuned to the transmitter. It has been demonstrated beyond all cavil that interference set up by two local stations can be eliminated on the single circuit receiver by an antenna, as described above. The ordinary regenerative set with the double circuit tuner gives from 20 to 50 per cent reduction in signal audibility over the single circuit with the same number of tubes. In other words, stronger signals will be obtained, in long distance reception, from a single circuit than from a double circuit set.

#### The Advantages of Two Antennas

For those who have interest in long distance reception, as well as local reception, who experience difficulty in obtaining necessary shielding with the low antenna owing to being shielded by buildings, etc., it is sometimes advisable to erect two single wire antennas, one for long distance reception—each may be of any wave length up to 150 feet—and the other for local reception—each is the small one previously described. The small antenna enables one to differentiate between local signals, while the larger antenna can be used for long distance work when the local stations have discontinued. Many users of broadcasting sets are now

installing two antennae—a long one for long distance reception after the local stations have closed down, and a small one, or an indoor aerial, for local reception. The indoor aerial may consist of 10 to 25 feet of lamp cord concealed behind the picture moulding, or a piece of No. 28 wire stretched across the corners of the room. Listeners located up to 15 or 20 miles from a broadcasting station can often obtain all the signal audibility necessary for local work by concealing the antenna under the carpet of the living room or the library of the home.

The foregoing are technical points which will stand the closest analysis. Speaking purely from the commercial phases of the matter, the single circuit tuner is, without qualification, the most suitable for the novice, that is, for the user unskilled in the art; for generally, the multiplicity of knobs involved in the operation of the double circuit tuner places them beyond the stage of practicability for the non-technical public. Single circuit tuners were designed primarily with the idea of providing simplified operation, and as such, they enable the novice to obtain results which can only be secured from the double circuit tuner when the user possesses an intimate knowledge of the technicalities of the art.

Comparing collectively the advantages of the two types of tuners, it is clear that the single circuit tuner is by far the more useful to the average member of the family, as it enables him with a minimum number of adjustments to pick up far distant or local broadcasting stations. Usually the distant station can be found on the single circuit tuner several minutes before it can be located on a double circuit tuner, to say nothing of the increased audibility which the single circuit set provides.

For long distance reception, it is preferable in every case to install an outdoor antenna in a free open space keeping the lead-in away from the building and bringing it as directly to the receiving apparatus as possible. The antenna is preferably kept at the maximum distance from the trolley car lines, power lines, trees, buildings, etc., whereupon a marked increase in selectivity and in signal strength will be obtained.

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This adapter is constructed of molded composition. It eliminates metallic and distorted sounds. Guaranteed to be satisfactory or money refunded.

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Industrial Sales Engineering Co.  
 671 Broad Street, Newark, N. J.  
 Phone, Market 9023

**DX Nite Owls**

(Continued from page 21)

**A War Veteran Reports**

From Albert R. Champlin, 12 Maple Ave., Westerly, R. I.

AS I have not seen any records listed from Rhode Island lately I thought you might desire to publish my late tests. I am a commercial operator, having served through the World War as a radio man, and had some interesting experiences. I have a detector and one-stage, using 50 feet of phosphor bronze wire strung around the baseboard of my room. I have received the following stations remarkably clear: WGY, KDKA, WEA, WNAC, WBZ, WGI, WWJ, 1,000 miles; WOT, WHAI, 1,200 miles; KYW, 1,000 miles; WOR, WAAM, WJZ, WIP, WHAG, WJAR.

Besides I have copied several CWS and amateur sparks. On 600 meters sparks have been copied as far south as NAT, New Orleans. I think this is good for inside antenna.

**Receives on Detector Only**

From Lang Spell, Bonifay, Fla.

I HAVE been reading RADIO WORLD for quite a while, and thought I would send my DX work in. I am using the single-circuit hook-up which was published

in RADIO WORLD of January 27 and find it a fine one.

The greatest distance I received was about 2,200 miles—KGW, Portland, Ore. KHJ comes in regular. Others are: KFI, KFAF, WAAL, KYW, WDAP, WJAZ, WLK, WCI, WOC, WHAN, WHAS, WIAR, WBAM, WDAN, WWI, WCX, WWJ, WOS, WDAF, WHB, KSD, WJZ, WOR, WEA, WGY, WHAZ, WBT, WLW, WJAX, WBAJ, WKAK, WKY, WLAL, WFI, WIP, WOO, KDKA, WHAF, WMC, WMAM, WFAA, WDAH, WBAP, WHAB, WEAY, WKAL, WOAI, WJAD, WAAK, WSB, WGM, WDAJ, WHOA, and WSY. These I did not get: Auburn, Ala.; Greenville, S. C.; Knoxville, Tenn., and one in Cuba I couldn't get, call or town. This is my 1½ months' record, being a total of 65 stations in 25 states and Cuba. All these were received on detector only.

**A Good Hour's Work**

From Gene Ullsmyer, Rock Island, Ill.

I HAVE a record of 7,500 miles in one hour. This is only the second time I have attempted to time my mileage. I get all my stations regularly but one. That is Troy, N. Y. I have two friends who listened in who will answer for my mileage. I have a three-bulb set.

**He Likes Nite Owls Records**

From Maurice T. Dabel, Buffalo, N. Y.

HAVE been reading with interest the "DX Nite Owls" records in RADIO WORLD, particularly regarding crystal detection. Mr. Keating's record is particularly good. Here is my contribution, using a crystal set and no amplification: KDKA, KOP, NCP, WBAY, WBZ, WCK, WDAP, WIP, WJZ, WOR, WEA, WEAI, WBU, WGY, WHAS, WHAZ, WIAR, WJX, and WOC. Farthest air line distance, St. Louis, 760 miles.

If you want details of my set will be pleased to furnish same. Time, experimenting, patience, a good piece of galena and good results can be had. Had ten of the above out-of-town stations in one evening.

**Rapid Fire Work**

From J. G. Bradley, Justin, Tex.

I SEND herewith my DX record for a recent night. I speeded up the old flivver some.

Total time worked, three hours, fifteen minutes. Mileage, 19,330. Average, 5,944 M.P.H.

KFFQ, 6:45 p. m.; WGY, 6:50; WHA, 7:04; WMAK, 7:10; WMAU, 7:15; WHAS, 7:30; KDKA, 7:35; WHB, 8:00; WSB, 8:02; WMC, 8:10; KSD, 8:20; WOC, 8:30; WLK, 8:40.

Closed down until 9:45 p. m. WJD, 9:50; WMAQ, 10:00; WDAP, 10:07; WJAN, 10:10; KFI, 10:15; WLW, 10:22; WGF, 10:23; WOAI, 10:24; WLAL, 10:30; WCX, 10:43; KPO, 10:44. Signed off, 10:45 p. m.

I did not count eight stations closer in—three each at Waco and Dallas, and two at Fort Worth, Texas. Some of these were on the air all the time from 6 p. m. until 10:45 p. m.

**A Home-Made Record**

From William M. Jackson, Wilson, Okla.

I HAVE been reading the DX records in RADIO WORLD for some time and would like to submit mine. I have a three-circuit tuner, detector and two-stage ampuner, which I built myself. My aerial is a single wire, 115 feet long, 20 feet high on one end and 25 feet on the other. On a recent night I received the following stations:

WDAP, WDAF, WOC, KDKA, WBAP, WMC, WCX, WLW, WGY, WOS, KLZ, WFAA, WSY, KFAF, WOI, KSD, WLAG, WSB, KGW, KFDL and KFI.

This makes 21 stations in 15 states. My longest distance is KGW, Portland, Ore. I have got 26 states so far, but expect to get more.

**WALCON**

**Radio Frequency Transformers**

Brings in distant stations on a loop—perfect reproduction. No distortion. Awarded Certificate of Excellence by N. Y. Eva. Mail.

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WALCON Transformers are tested and guaranteed. Particularly adapted for use with W.D.-11 tubes.

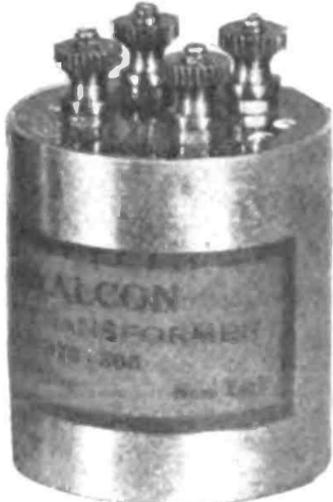
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Price, \$4.00. We pay postage.

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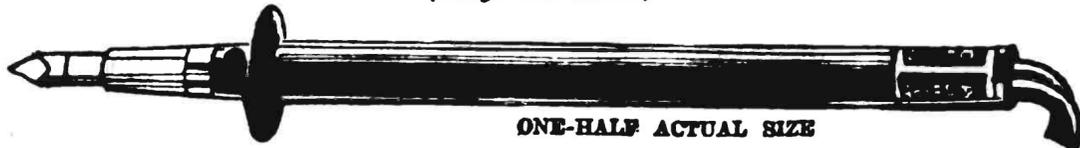


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## Grain Prices Broadcast From Chicago Every Half Hour

THE latest method of broadcasting grain price quotations by radio from Chicago is an important service to the farmer, and is thus described by the *New York Times*: It is 9:15 in the morning. The spacious trading floor of the Board of Trade is astir. Traders are changing from street coats to light jackets before entering the pits. Messengers are scurrying about, hands crammed with order blanks.

On the stroke of 9:30 a gong sounds. Overnight orders to buy and sell grain and produce are rapidly executed. Buyers, representing the consumer, seek the lowest price. Sellers, representing the producer, seek the highest price. The figure at which these two forces meet represents world values.

Over at one side of the trading floor is a man in a glass cage. He is in direct communication with a powerful radio-sending station. The opening prices are registered. Without the delay of a second these are transmitted to the radio-sender at the station on top of a large Chicago hotel.

Far out in the grain belt, hundreds of miles from the sending station, is Jed Smith, a farmer. He wants to know whether the time is opportune to ship his grain. He steps to his little radio-receiving set, tunes in to the 360-meter wave length, and what he hears runs about as follows:

"WDAP speaking. . . . Opening prices on the Chicago Board of Trade. . . . May wheat . . . one twenty-three and a quarter. . . . July wheat . . . one fifteen and a half . . ."

Then follow other quotations on grains and provisions, with important market news comment. At half-hour periods from the opening of the market until the close at 1:15 the quotations are broadcast, and thus made available to a legion of farmers and distributors. It is a milestone in marketing progress.

Hardly had the radio become practical when its value in the dissemination of price quotation was recognized at the center of world grain trade. A test period of broadcasting was opened. In a short time hundreds of letters and telegrams came pouring into the Board of Trade from scores of cities, towns and villages commending the service. They came not only from farmers, but country elevators, shippers, banks, business houses and educational institutions that use the quotations in class work.

Advices showed that, in Illinois alone, almost 500 towns and villages were using the quotations. Hundreds of farmers not in easy communication with towns obtained small radio-receiving sets for home use. Reports from other states told a story of similar interest.

It was then that the Board of Trade determined upon a permanent, continuous broadcasting service, and recently the Board purchased outright the big radio-sending station WDAP, on the Drake Hotel.

"The imagination falters in measuring the full significance of radio," commented Henry A. Rumsey, Chairman of the Board of Trade Radio Committee. "Forces of no less promise have written strange history. In the grain and produce market alone wonders will be accomplished. It will not be long until the farmer in the field follows the course of his daily market as closely as the merchant on the trading floor. And that is precisely what the Board of Trade wants. It has spent a fortune in an effort to give the farmer first-hand information on the ever-shifting world supply and demand. The grain trade is determined to aid the farmer in this end and in every other manner commensurate with sound economics."

"It is our intention," said Robert Mc-

station, "to give the entire radio public the official prices and other valuable information in connection with all commodities handled through this channel, thus serving the public from the farmer to the consumer. We hope to broaden our acquaintance and to demonstrate our contention that the Chicago Board of Trade is an open book that 'he who runs may read.'

"The complete ownership and operation of the station will bring to our association, as well as to the public, no financial return. But it will work to the mutual advantage of the members and their world-wide clientele. It is indeed a step forward in our endeavor to acquaint the public in the grain business and also with the operations of the world's greatest grain exchange and the largest international enterprise in the Middle West."

The extent of the territory covered by the radio grain market service has not as yet been fully determined. Those in charge say, however, that a comparatively small radio set is capable of receiving these reports in any state in the Union.

Two thousand five hundred price quotations on wheat, corn, oats, rye, barley, pork, lard and ribs are issued from the Chicago Board of Trade on every business day. As Chicago is the largest grain exchange in the world the quotations are of vital interest to every one concerned with the production or distribution of these commodities and to persons in scores of related industries.

The radio has placed at the disposal of the farmer all salient features of this machinery of crop information and marketing. It has virtually placed him on a footing with the most enlightened merchant in the world grain and provision markets. The magic is his. He merely stretches phantom fingers in the air and pulls it down.

## Radiophone on Ford Truck

A Ford ton truck equipped with a radiophone was one of the novelties entertaining visitors at the Brooklyn, N. Y., Automobile Show. Stanley Payne of the Payne Motor Company, Brooklyn, is responsible for the idea. The installation had its trial on a trip from Brooklyn to the New York Ford headquarters, and worked without a hitch. On Fifth avenue several traffic officers detained the outfit a moment to enjoy programs.

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150 to 600 Meters  
No outside connecting hardware used—reducing capacity losses. Rugged—Solid. Size 4 3/4" x 4 3/4" x 3".  
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By M. B. SLEEPER

Fully Illustrated. Price 75 Cents

IN addition to the listening to ships and broadcasting stations on short wave lengths there is a peculiar fascination about listening to the high-power telegraph stations of England, France, Germany, Russia and Italy as well as those located in the Pacific Ocean and the Oriental Countries. It is much easier to do this than most people imagine. The sending is very slow, a feature of assistance to the beginner in telegraphy. Several types of receiving sets for this task are described. Detectors, amplifiers, oscillators, etc., for long distance reception are also described. Suggestions for the operation of relays by the signals and the reproduction of them on a phonograph are given. In addition there is some valuable data on home made wavemeters for testing and experimenting.

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A simple pressure of the buttons instantly connects or disconnects the receivers. It is not necessary to disassemble the Bestone Spring Grip Plug for any reason. Just insert the cord tips—no more work, worry, or possibility of a poor connection.

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**FREE** A HYDROMETER (Battery Tester) with **FREE**  
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## FIRST PRIZE—

\$250.00 Radio Set Free—Six Tube Radio-Audio Frequency Set

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To advertise our business we will give the above prizes to the three persons sending us a list of five or more names of Radio fans and who compose the best slogan or phrase of words we can use for our advertising matter. We are interested in sending our catalogue and price lists to Radio fans.

If you are interested in Radio and in its future possibilities don't overlook this opportunity to get acquainted with us, secure low prices on your purchases and an opportunity to win one of the above prizes free of charge.

In the event of two or more persons submitting the slogan judged the best, second best, or third best, each will receive the full amount of the prize tied for. All entries must be received by us not later than *March 31, 1923.*

## Our Peanut Tube Does the Work of WD-11

For Detector and Amplifying uses. Can be used on 1½ volt dry cells or regular 6 volt A Batteries. Fits standard V.T. socket. Uses about 1/10 ampere, on two 1½ volt dry batteries. Price of tube, \$2.50, includes adapter.

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## THIS WEEK'S SPECIALS

1,000 HEADSETS, \$6.00 Value..... \$2.99 each

Biggest Radio Bargain Ever Offered—Order Promptly

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Freshman Grid Leak and Condenser for  
Flewelling Circuit ..... " 1.00, " .75

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Atwater Kent ..... " 5.00, " 3.75  
Acme ..... " 5.00, " 3.75  
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Space being limited, we are obliged to omit other money-saving items. Write for quotations or ask for our latest Price Sheet Catalog.

# National Radio Products Corporation

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**VARIOMETERS .....\$3.00**

Better than moulded, 150 to 600  
 Wave Length. Unconditionally Guaranteed.  
**VARIOCOUPERS, 14 taps, 14 sol-**  
**dered leads. Bakelite. Good for \$2.50**  
 all hook-ups.

A. M. F. RADIO COMPANY  
 30 EAST 23RD STREET, NEW YORK CITY  
 Send money order, including postage.

**STANDARD MERCHANDISE  
 AT CUT RATE PRICES**

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Framingham Plain Rheostats.....	1.75	1.65
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Kleener Vernier Rheostats.....	1.50	.95
Kleener Vernier with Dial.....	1.50	1.35
8 Volt Detector Tube.....	4.00	2.25
6 Volt Amplifier Tube.....	4.50	2.75
Freshman Variable Grid Leak.....	1.00	.70

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**BULB SET  
 \$12.45**

Outfit includes 1 1/2 Volt Tube—Fischer Variocoupler—14 taps—4 stops—23 Plate Variable Condenser—2 Knobs and Dials—Rheostat—Socket—Grid Leak Condenser—Dry Cell—22 1/2 Volt Plate Battery—8 Binding Posts—Also Drilled Panel—Easy to Assemble.

With Federal Double Head Phones ..... **\$17.40**

Mahogany Finish Cabinet for this Set ..... **\$2.45**

Wholesale and Retail. Mail orders filled same day, upon receipt of Money Order, including Postage.

123 Nassau St., N. Y. City

**Great Britain's Wireless Plans  
 Announced by Premier**

REPLYING to a question in the House of Commons on March 5 Premier Bonar Law said:

"In view of the developments in the science of wireless telegraphy and the other circumstances which have arisen since the late government decided upon a policy of a state-operated wireless chain, it is not considered necessary any longer to exclude private enterprise from participation in wireless telegraphy within the Empire.

"The government has therefore decided to issue licenses for the construction of wireless stations in this country for communication with the dominions, colonies and foreign countries, subject to the conditions necessary to secure British control and for suitable arrangements for handling the traffic.

"At the same time the government has decided that it is necessary in the interests of national security that there should be a wireless station in this country capable of communicating with the dominions, and owned and operated by private enterprise. A station of this kind will therefore be erected as early as possible, and it will be available for commercial traffic as well as for service messages."

**Secretary Hoover Calls Another  
 Radio Conference**

SECRETARY HOOVER, of the Department of Commerce, has called a radio conference for March 20 to clear the air of the present chaos, due to conflict from broadcasting stations all over the country. The conference call reads in part:

"The Department of Commerce has sent out invitations for a reassembly of the radio conference held a year ago, together with some additional members. The conference held last year was for the purpose of considering legislation necessary in order to reduce the amount of interference in radio broadcasting. The legislation having failed to pass Congress, it is felt desirable to investigate what administrative measures may properly be taken temporarily to lessen the amount of interference in broadcasting.

"Since the last conference the number of broadcasting stations has increased from 60 to 581, and it is estimated that somewhere between 1,500,000 and 2,500,000 receiving stations are now in use. The amount of interference has increased greatly and threatens to destroy the growth of the art."

**Radio Pioneer Injured in Army  
 Plane Crash**

A HUGE Martin bomber airplane, belonging to the Army, and known as A-26, crashed in a vacant lot in East New York, N. Y., on March 4. Lieut. Stanley Smith was killed and Major Follette Bradley, the pilot, was seriously injured but probably will recover. Major Bradley is credited with having sent the first radio message from an airplane in November, 1912.

**NATIONAL RADIO SERVICE CO.**

140 West 32nd Street  
 New York, N. Y.

**GENERAL RADIO CO.  
 APPARATUS**

W. D. 11 Amplifying Unit. \$7.50  
 U. V. 201 Amplifying Unit. 8.00  
 .001 Variable Condenser. 5.00  
 .001 Vernier Condenser. 5.50  
 .0005 Variable Condenser. 3.25  
 .0005 Vernier Condenser. 3.75

**HARD RUBBER PANELS**

Grade A

7 x 10...\$ .90 7 x 18...\$1.45  
 7 x 21... 1.70 7 x 24... 1.90  
 10 x 12...\$1.40

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 ACCESSORIES**

23 Plate Precision Condensers.....	\$1.10
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Two-Coil Mounts Deforest License.....	2.25
D. L. 50 Honeycomb Coil.....	1.45
D. L. 75 Honeycomb Coil.....	1.45
Variable Grid Leak only.....	.20
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W.D. 11 Tube Socket.....	.20
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**YOU DX HAMS!**

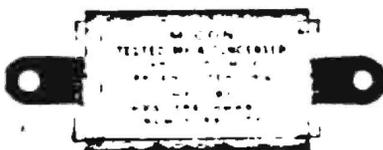
Have you seen the book up with complete panel layout in full size and all constructional details in RADIO WORLD No. 43, dated Jan 30?  
 This book up actually goes out and draws the distance in, and lays it at your table.  
 All that is necessary is to lay the full-page diagram of the panel on your own panel and drill and mark your holes. Simple, isn't it?  
 If you haven't this copy, send 15 cents to Radio World, 1473 Broadway, New York, N. Y., and you will be mailed you. Or start your subscription with that number.

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**For the New Flewelling "Super" Circuit**

**VARIABLE  
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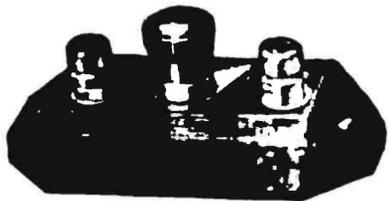
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FROM YOUR DEALER OR  
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 50 WARREN STREET NEW YORK \$1.10

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DEPARTMENT AT 5¢ A WORD

# RADIO WORLD'S QUICK-ACTION CLASSIFIED ADS

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

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

**J. MULBERG, DEALER**—Radio Sets and Supplies. Key West, Florida.

**SUPER-SIMPLICITY CIRCUIT**—1,000 to 1,500 miles on one tube, one control, 150 to 25,000 meters. No rheostat, storage battery, vario coupler, variometer, 3-coil mounting, variable inductance, taps or radio frequency. Nothing to guess about. Complete hook-up and particulars, \$1.00. No checks. Build your own. Save 50% and get better results. **RADIO EXPERIMENTAL LABORATORY**, Box 194A, Berkeley, Calif.

**GUARANTEED VARIOCOUPERS, \$2.25.**—RADIO ASSEMBLY, 1109 Valley St., Joplin, Mo.

**VACUUM TUBE RESULTS WITH A CRYSTAL SET!**—Cover distance with a "PT" ULTRA-SENSITIVE CONTACT in your crystal detector. Beats gold and other ordinary catwhiskers. DOES NOT JAR OUT. Using the "PT," Myrtle Wood heard over 43 broadcasting stations in a thousand mile radius! Other users testify: "Heard new stations on first adjustment. Has all advantages you claim. Receives music so loud it hurts my ears." The "PT" has received 3,300 miles through static. Price only twenty-five cents. "PT" CRYSTAL CONTACT COMPANY, Box 1641, Boston, Mass.

**SOLDER YOUR RADIO CONNECTIONS** with Radsol, the new soldering paste. Price, 20 cents. Dealers write. **DAVIS PROCESS CO.**, 219 Devoe St., Brooklyn, N. Y.

**BUILDERS AND EXPERIMENTERS.** Do you know that the Reflex circuit is one of the most interesting circuits to construct? You can not guess how much fun you are missing if you fail to try out at least one of these circuits. See RADIO WORLD issues of Feb. 24 and March 3. They contain two fine articles by W. S. Thompson, with plenty of new Reflex circuits to experiment with. Don't miss these! 15¢ a copy. **RADIO WORLD**, 1493 Broadway, New York City.

**MAKING MONEY WITH YOUR SMALL CAMERA,** 10c. coin. Wm. Kissel, Box 114, Adrian, Mich.

**FOR SALE**—Paragon Regenerative receiver, R.A.10. Detector, and two-step D.A.2. Both \$110.00. Crosley two tube set, \$25.00. All apparatus new and guaranteed. Write Philip Coblenz, Middletown, Maryland.

**DYNAMO BUILDING FOR AMATEURS**—Or How to Construct a Fifty Watt Dynamo.—By Arthur J. Weed. A practical treatise showing in detail the construction of a small dynamo or motor, the entire machine work of which can be done on a small foot lathe. Dimensioned working drawings are given for each piece of machine work, and each operation is clearly described. This machine, when used as a dynamo, has an output of fifty watts; when used as a motor it will drive a small drill press or lathe. It can be used to drive a sewing machine on any and all ordinary work. The book is illustrated with more than sixty original engravings, showing the actual construction of the different parts. Price, \$1.00. **THE COLUMBIA PRINT**, 1493 Broadway, New York City.

**EXCHANGE JOLLY, INTERESTING LETTERS** through our club. Stamp appreciated. Betty Lee, Inc., 4254 Broadway, New York City

**NEWS AND GOSSIP OF THE STAGE**—Send 10c. for specimen copy of the NEW YORK STAR, the great illustrated theatrical weekly. \$4.00 year, \$2.00 six months, \$1.00 three months. New York Star Co., 1493 Broadway, N. Y.

**WIRING A HOUSE.** By Herbert Pratt. Shows a house already built; tells just how to start about wiring it; where to begin; what wire to use; how to run it according to insurance rules; in fact, just the information you need. Directions apply equally to a shop. Sixth edition. **COLUMBIA PRINT**, 1493 Broadway, N. Y. C. Price, 35 cents.

**FOR SALE**—"Homcharger" battery charger, \$14.00. Frost Fones, \$4.00. Brandes Superior, \$6.00. U. V. 200 Tube, \$3.00. Volt-ammeter, "Pignolet" make, 0.30 amperes, 0-30 volts, 0-3 volts, also Cadmium eRading, mounted in neat case, \$15.00. All goods are new and guaranteed perfect. **ADRIAN SHANLEY**, Aberdeen, So. Dakota.

**HOW TO REPAIR Vacuum Tubes.** Complete literature, \$1.00. Box 103, Station C, Toledo, Ohio.

**TWO** one stage amplifiers, Acme, \$8; Remler, \$7. King Amplifying horn, \$7. Condensers. J. B. Rich, Hobart, New York.

**VARIABLE CONDENSERS** at factory prices. 3 plate, \$1.05; 11 plate, \$1.35; 21 plate, \$1.60; 43 plate, \$2.05. Send cash with order. **GREEN-LEAF**, 34 Merchants' Row, Boston, Mass.

**EXCHANGE LETTERS** with friends everywhere. Pleasant pastime. Information for stamp. Smith, Box 3125, M. Portland, Ore.

**PATENTS PROCURED AND TRADE MARKS REGISTERED**—Advice and terms upon request. Robb, Robb & Hill, 1403 Hanna Bldg., Cleveland, Ohio; 942 McLachlan Bldg., Washington, D. C.

**CASH FOR OLD GOLD, Platinum, Silver, Diamonds, Liberty Bonds, War, Thrift, Unused Postage Stamps, False Teeth, Magneto Points, Jobs, Any Valuables.** Mail in today. Cash sent, return mail. Goods returned in ten days if you're not satisfied. **OHIO SMELTING CO.**, 337 Hippodrome Bldg., Cleveland, Ohio.

**ATTENTION, Amateurs!** Have you seen the RADIO WORLD'S page of hook-ups in the Oct. 21 issue? 15¢ a copy or start your subscription with that Number. Many people are writing in for the hook-ups listed here. **RADIO WORLD**, 1493 Broadway, New York City

**HOW TO BECOME A SUCCESSFUL ELECTRICIAN**—By Prof. T. O'Connor Sloane. An interesting book from cover to cover. Telling in simplest language the surest and easiest way to become a successful electrician. The studies to be followed, methods of work, field of operation and the requirements of the successful electrician are pointed out and fully explained. 202 pages. Illustrated. Nineteenth revised edition. Cloth. Price, \$1.50. **The Columbia Print**, 1493 Broadway, New York City.

**IF YOU ARE A REGULAR RADIO fan** and like to hear the stations in the four corners of the United States come in with a bang, then you will want the Flewelling Circuit. If you do, send 15¢ for RADIO WORLD, issue of Feb. 27, which contains complete description and directions for the manipulation of the circuit. **RADIO WORLD**, 1493 Broadway, New York.

**A COURSE IN MECHANICAL DRAWING**—By Louis Rouillion. The author has written a most practical book on the subject of Mechanical Drafting. It fully explains the art of Drawing, Lettering and Dimensioning. It is, by far, the most practical book ever published on this subject, for use in day and evening schools, and more especially adapted for the teacher and for self instruction. Fifteenth edition, revised and enlarged. Fully illustrated. Oblong. **COLUMBIA PRINT**, 1493 Broadway, N. Y. C. Price, \$1.50.

**STANDARD ELECTRICAL DICTIONARY**—By Prof. T. O'Connor Sloane. Just issued an entirely new edition brought up to date and greatly enlarged—as a reference book this work is beyond comparison, as it contains over 700 pages, nearly 500 illustrations, and definitions of about 6,000 distinct words, terms and phrases. The definitions are terse and concise and include every term used in electrical science. 767 pages, 477 illustrations. (See page 18 for fuller description.) Price, \$5.00. **The Columbia Print**, 1493 Broadway, New York City.

**MODEL MAKING**—By Raymond Francis Yates. A new book for the mechanic and model maker. This is the first book of its kind to be published in this country, and all those interested in model engineering should have a copy. The first eight chapters are devoted to such subjects as Silver Soldering, Heat Treatment of Steel, Lathe Work, Pattern Making, Grinding, etc. The remaining twenty-four chapters describe the construction of various models such as rapid fire naval guns, speed boats, model steam engines, turbines, etc. 400 pages. 301 illustrations. Price, \$3.00. **The Columbia Print**, 1493 Broadway, New York City.

**RADIO-APPLAUSE Post Cards.** Encourage broadcasting by such acknowledgment. 2 dozen, 25c, postpaid. D. J. SPANGLER, Elkhart, Ind.

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**BATTERIES**—Edison Storage "B" Battery Elements, 5c per pair; 18 will make one 22.5 volt Battery. **GILMAN'S BATTERY SHOP**, Chelsea Sq., Chelsea, Mass.

**RADIOPHONO Adapter**—Your Edison, Brunswick Victrola or other talking machine has the finest acoustic properties possible. Radiophono Adapter enables you to use it as a loud speaker. Patent (Pend.) Molded Construction. Sent on money back guarantee. At your dealers or direct from us. \$2.00 post prepaid. **Industrial Sales Engineering Co.**, 671 Broad St., Newark, N. J.

**OLD MONEY WANTED**—\$2.00 to \$500.00 EACH paid for hundreds of Old and Odd Coins. Keep all old money. Send 10 cents for New Illustrated Coin Value Book, 4x6. You may have valuable coins. Get posted. We pay CASH. **Clarke Coin Company**, Ave. 83, Le Roy, N. Y.

**AGENTS**—Are you interested in radio? If so drop us a card. We have a proposition no live agent should turn down. Meets the needs of 90 per cent. of the public. **THE WILKENDA CO.**, 500 Fifth Avenue, New York City. Dept. R.W.

**AMATEURS—LOOK!** Send in 15 cents to RADIO WORLD for issue of January 20 containing panel layout, hookup and full explanatory data on the construction of a D-X receiver, which simply lays the long distance on your table. Or start your sub. with that issue. **RADIO WORLD**, 1493 Broadway, New York City.

**DO YOU WANT TO SAVE MONEY** in making your set? Send for the Jan. 27 issue of RADIO WORLD, containing a full-page drawing of how to make filament control rheostats, as well as an easily understandable text, which makes the construction easy. 15¢ a copy, or start your subscription with this issue. **RADIO WORLD**, 1493 Broadway, New York.

**RAND-McNALLY RADIO MAP OF UNITED STATES**—Is 28 x 30 inches in size. The locations of broadcasting stations are shown by distinctive symbols. The call letters of each station are given, also the wave lengths of each. The Radio Districts with numbers are shown in red and the Radio Relay Divisions are in blue. Time zones are included. Alphabetical lists of stations and alphabetical lists of call letters are in the margins. Convenient pocket form with cover. Price, 35c. **The Columbia Print**, 1493 Broadway, New York City.

**TWENTIETH CENTURY BOOK OF RECIPES, FORMULAS AND PROCESSES**—Edited by Gardner D. Hiscox. This book of 800 pages is the most complete book of recipes ever published, giving thousands of recipes for the manufacture of valuable articles for every-day use. Hints, helps, practical ideas and secret processes are revealed within its pages. It covers every branch of the useful arts and tells thousands of ways of making money and is just the book everyone should have at his command. The pages are filled with matters of intense interest and immeasurable practical value to the photographer, the perfumer, the painter, the manufacturer of glues, pastes, cements and mucilages, the physician, the druggist, the electrician, the dentist, the engineer, the foundryman, the machinist, the potter, the tanner, the confectioner, the chiropodist, the manufacturer of chemical novelties and toilet preparations, the dyer, the electroplater, the enameler, the engraver, the glass worker, the gold-beater, the watchmaker, the jeweler, the ink manufacturer, the optician, the farmer, the dairyman, the paper maker, the metal worker, the soap maker and the technologist in general. A book to which you may turn with confidence that you will find what you are looking for. A mine of information up-to-date in every respect. Contains an immense number of formulas that everyone ought to have that are not found in any other work. New edition. 807 octavo pages. Cloth binding. Price, \$4.00. **The Columbia Print**, 1493 Broadway, New York City.

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High dielectric resistance.  
 6"x24" ..... \$1.00  
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All Wave Coupler, with free diagram.....\$4.00  
 Honey Comb Coil—D L No. 50..... 1.50  
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 6-Way Phone Connector ..... .75  
 45 Volt B Batteries ..... 1.75  
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**Nathaniel Baldwin**  
**Headsets**

Type C Complete

Special Price \$11.75

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with each pair of phones — a \$5.00 Shaltone Loud Speaker.

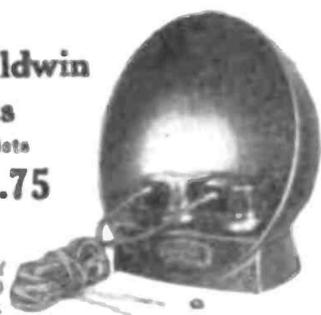
Phones can be used as head set or on speaker. Combination makes a wonderful loud speaker.

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1493 BROADWAY NEW YORK CITY

LETTER TO THE EDITOR

Radio World's Assistance Demonstrated

EDITOR, RADIO WORLD: Many of your readers may be dismayed by the choice of so many different hook-ups and the extravagant claims of their partisans. To these I want to call attention to the simple and efficient WD-11 set described in your issue of January 20, 1923, by Ortherus Gordon.

I studied this article carefully, bought the various items required, and, after one day's work, with a total expense of \$18.63, exclusive of phones and aerial, was bringing in stations over a thousand miles away. These include, in the East, Schenectady, Troy, Newark, and Charlotte, N. C.; in the South, Atlanta, Birmingham, New Orleans, Dallas and Fort Worth; in the West, Denver, Salt Lake City, Great Falls, Mont., and in the North, Minneapolis, Milwaukee and Chicago.

Since adding one step of audio amplification I have received very plainly over fifty distant stations. The significance of this is apparent when you consider that the almost constant operation of the two powerful local stations prevents listening in when the majority of concerts are being broadcast.

To Mr. Gordon's explicit instructions let me add the importance of a proper aerial. The labor of winding the two coils can be saved by buying them already prepared at a very slight expense. The simplicity of tuning this set and its selectivity are two important virtues.

March 1, 1923. E. STANLEY FIELD, JR.  
 821 E. 42d St., Kansas City, Mo.

New Technical Director for WGY

HARRY SADENWATER, one of the heroes of the air service of the United States Navy, has been placed in charge of the technical operation of the broadcasting stations of the General Electric Company, including WGY at Schenectady, N. Y., and the projected station at San Francisco, Cal. Two years before he entered the ranks of the Radio Engineering Department of the General Electric Company Mr. Sadenwater was a lieutenant in the United States Navy, and was one of the few out of hundreds of volunteers selected for the hazardous flight of the NC flying boats, NC-1, NC-2 and NC-4, across the Atlantic, from Newfoundland to Portugal.

Lieutenant Sadenwater was radio officer on the NC-1, commanded by Lieutenant-Commander P. N. L. Bellinger. The NC-4, it will be recalled, was the only one of the three boats successfully to make the crossing. The NC-1, which carried Lieutenant Sadenwater, encountered heavy fog. Navigation was made so difficult that the big flying boat was brought down to float on the sea until the fog lifted. Instead of the calm sea expected the boat ran into rough water, and in a very short time the NC-1 was so badly rammed by the waves that it was impossible to ride off the water, and every minute added to the damage. Lieutenant Sadenwater sent out SOS calls until the batteries became exhausted. A Greek freighter finally sighted the NC-1, and picked up her crew, which was landed safely at Horta Bayal in the Azores. Lieutenant Sadenwater, with other members of the crew, was made a Knight of the Military Order of the Tower and Sword by the president of Portugal.

Pacific Coast Radio Exposition

A RADIO and electrical exposition will be held at San Francisco from April 3 to 8 inclusive. A home-made set contest for amateurs will be a feature of the show

**RADIO TUBES REPAIRED**

"Guaranteed Equal to New"

FOUR DAY SERVICE

6 V. Detectors, \$2.50; Amplifiers, \$2.75;  
 5 Watt Power Tubes, \$4.00  
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770 Broad Street Newark, N. J., U. S. A.

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 LIBERTYVILLE, ILLINOIS

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 CRYSTAL RECTIFIER

MULTIPOINT

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A Synthetic CRYSTAL DETECTOR sensitive over its entire surface

Eliminates all detector troubles. Extraordinary clearness and volume. Endorsed by radio experts and press. Sold in sealed packages only. Join the ever-increasing Rusonite fans.

Price, postpaid, mounted 50c  
 Sensitiveness guaranteed

**RUSONITE CATWHISKER**

14-Karat Gold Multiple contact.

Supersensitive..... 25c

Order from your dealer or direct from us  
 Resonite Products Corp., 21 Park Row, N. Y.

**STUYVESANT**  
**Radio Corporation**

15 E. 14TH STREET, NEW YORK CITY  
 Bet. 5th Ave. and Union Square

Price List	HEAD SETS	Our Price
\$12.00	Robbins Original Double	\$9.00
6.00	Robbins Original Single	4.75
5.00	Robbins Superior	3.75
5.00	Robbins 2200 Ohm	3.25
5.00	Robbins 2200 Ohm	3.75
5.00	Robbins Tone	3.75

**CUT RATE SPECIALS**

13 Plate Ten Lenser	\$2.10
23 Plate Ten Lenser	1.50
Double Jacks	.60
Single Jacks	.35
Thermion Transformers	3.50
Aerial Transformers	1.50
Radio Tube Boxes	1.00
Metals	37.50
Acme Transformers	4.10
M. and R. Plates	.60
Sylvania Fish	.40
Sylvania Fish Double	.70
Sylvania Fish Triple	1.10
Sylvania W. D. 11	.35

Full Line of All

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**RADIO PANELS**  
 Cut exactly to size and shipped within 12 hours.  
 1/4 inch thick, 1 1/2 per square inch, 3/16 inch,  
 1/8 per square inch. Made of the highest grade  
 black fibre. This material possesses high dielectric  
 strength, is inexpensive, unbreakable, easy to work  
 and takes a nice finish. Special offer, 6x6 1/4, 50c; 6x  
 12 1/4, \$1.00. Postage paid.  
**WILEY PANEL CO.**  
 2323 So. Central Park Ave., Chicago, Ill.

**Rexite Synthetic Crystals**  
 Sensitive over the entire surface.  
 Price, including special catwhisker, 50c.  
 Dealers—Write for unusual proposition.  
**THE AIREX COMPANY**  
 237 Centre Street New York

**CRYSTAL FANS**  
 Are you satisfied with your crystal,  
 or do you want better results?  
**MOLYBDIC GALENA**  
 A new detector just discovered is  
 sensitive even when ground to dust.  
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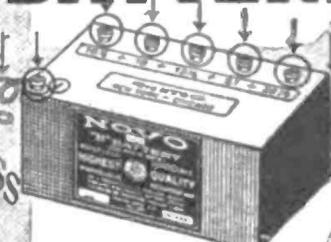
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 FROM PUBLICATION OFFICE,  
 1493 BROADWAY, NEW YORK, N. Y.  
 BY HENNESSY RADIO PUBLICATIONS  
 CORPORATION  
 ROLAND BURKE HENNESSY,  
 President and Editor  
 M. B. HENNESSY, Vice-President  
 FRED S. CLARK, Secretary and Manager  
 1493 BROADWAY, NEW YORK, N. Y.  
 Managing Editor Stephen L. Coles  
 Technical Editor Robert L. Dougherty  
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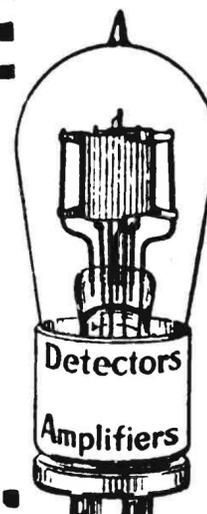
Is "Amateur" a Misnomer?  
**A** VERY literal Englishman recently re-  
 marked to a man who was very much  
 interested in radio, and had been for the  
 past eight or ten years: "I really do not see  
 why they call them 'amateurs.' From what  
 I have noticed and heard, they seem to be  
 as well equipped if not better than most of  
 the operators on board the ships. Not only  
 that, but I have had the opportunity to see  
 them actually handle messages, and the re-  
 markable precision and accuracy with which  
 it was done actually astounded me."  
 This is a very true conception of the  
 American amateur. In nearly nine cases out  
 of ten the average amateur, that is, the one  
 who has owned a transmitter for the past  
 five years or more, is more of a professional  
 than the professional himself. In most cases  
 amateurs have not the amount of money  
 necessary to buy the expensive apparatus.  
 So they are their own manufacturers and  
 they turn out apparatus that works as  
 well, sometimes better, than the commercial  
 apparatus. This fact was recently brought  
 out in the transatlantic tests. The distances  
 covered on short waves with low power go  
 to show that the amateurs have by means of  
 a purely non-commercial association, that  
 is merely for the benefit of the American  
 amateur at large, developed into a force that  
 is in many cases causing the various com-  
 mercial enterprises to look to their laurels.  
**White's "Varioment" Cement**  
 Make your own coils. Construct variometers, vario-  
 couplers, etc. No distributed capacity. Holds wind-  
 ings securely and permanently.  
**FOR BANK WOUND COILS**—"For this operation  
 of cementing the three turns together shellac will  
 not do."—Radio World, March 10.  
 Send 25c. for sample bottle  
**WHITE RADIO COMPANY**  
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Excellent 43 Plate Condenser .001..... \$1.30  
 Excellent .0003 Variable Condenser..... 1.10  
 Variometers, Baldwin Style, Wood..... 1.50  
 King Amplitude Loud Talkers..... 4.50  
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**CASH WITH ORDER**  
**Radio Engineering Co.**  
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**NU-TYPE ANTENNA**  
 50% more volume, 35% Less Voltage on filament  
 of tubes, which means fewer burnt out tubes  
 and battery recharges.  
**CAN BE BUILT FOR \$2.50**  
 Complete instructions and diagram, \$1.00  
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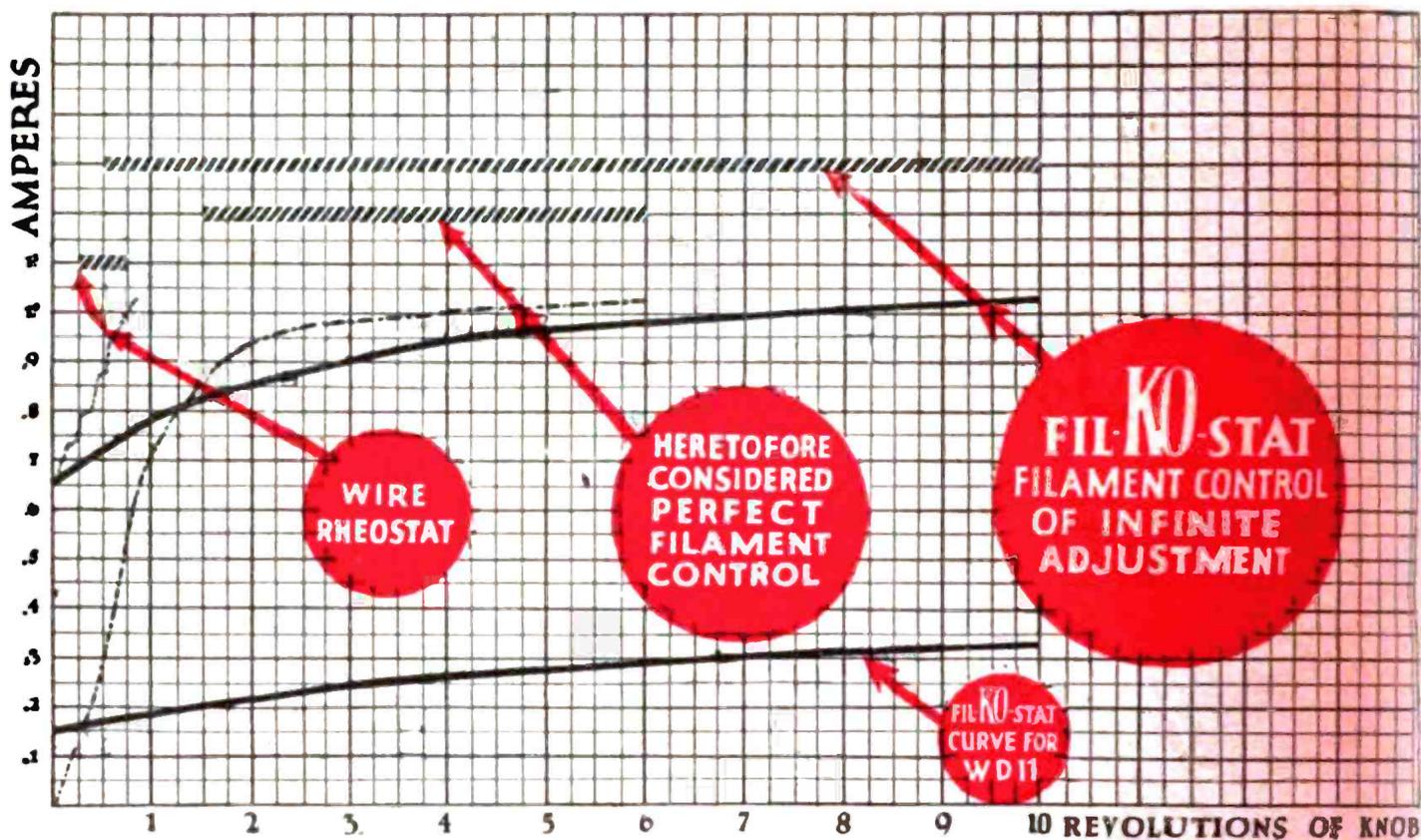
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# Filkostat Proven Best Filament Control

**Comparison of Fine Adjustment Control Range of Filkostat With Rheostats and Other Filament Controls Clearly Indicates Filkostat Superiority, as it Permits Perfect and Gradual Current Increase With Infinite Adjustments.**

**Tests made on Bureau of Standards Instruments**



**I**N the Filkostat, a new filament control just perfected by S. R. Hipple, well known as an inventor of apparatus for the control of electric currents, there is at last presented an instrument which is distinctly designed to utilize the great tuning possibilities of the vacuum tube itself. Radio set builders, amateurs and manufacturers have been looking forward to the advent of just such a device. They have realized that all rheostats and other so-called filament regulators, are merely adaptations of pre-radio day devices, not capable of adjusting the infinitesimal graduations of filament HEAT which adjustments are essential to perfect tuning.

### PERFECT TUBE CONTROL

The Filkostat permits perfect regulation of filament heat. Since the heat emitted varies as the square of the current, fine current regulation becomes extremely necessary to accomplish. This governs the flow of electrons. Proper control of the electronic flow in the tube permits the very finest tuning conceivable. The fine adjustment of the Filkostat starts slightly before the tube begins to function. With other filament controls, what minute adjustment there is, starts when the filament is almost at maximum heat. Between 1800 degrees—

considerable increase in tube life. Furthermore the extreme degree of fineness in increase and decrease of electronic flow by infinitesimal variations, makes the Filkostat control ideal.

The perfection of design including ample internal contact is the cause of this new instrument being non-microphonic, absolutely silent, and free from all noises.

### IDEAL FOR WDI'S AND DX WORK

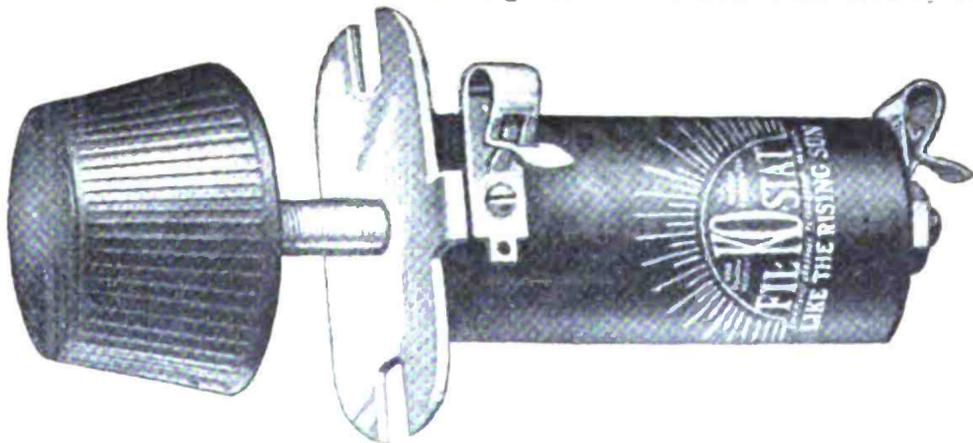
The lower curve on the graph above is eloquent testimony as to the Filkostat's adaptability to any dry cell tube. These tubes using only a fraction of an ampere demand an instrument that is so finely adjusted that this fractional current can be perfectly regulated. This the Filkostat accomplishes.

### OTHER FILKOSTAT FEATURES

The Filkostat has a *definite off*. It is so designed that the filament extinguishes abruptly indicating that the A battery supply is completely disconnected.

At *Full On* the Filkostat resistance is practically zero.

The Filkostat consists of a hollow cylinder containing the special resistance material placed between two large adjustable contacts controlled by turning the knob.



The Filkostat is to all purposes "fool proof." It is compact in form, takes very little space on the panel and so mountable that it can replace any other control without redrilling.

dull red glow—and 2050 degrees—white heat—the Filkostat control is so fine that increases of temperature of *fractions of a degree*, with corresponding variations of electronic flow from the filament to the plate, are obtainable.

### LONGER TUBE LIFE; NO NOISES

The initial inrush of current prevents the crystallization of the filament which so many experts claim occurs when the current is fed too slowly, as is done in other forms of filament controls. This means

THE RESISTANCE ELEMENT is so finely divided that no further division is possible. There are no disks to break or chip.

The RESISTANCE remains CONSTANT at any position eliminating current variations once set. Such variations are not apparent to the person tuning, excepting in "fading out" of stations and noises. But in the laboratory, where such a test as that shown on the above graph can be made by anyone, this feature and all the other points of superiority of the Filkostat are immediately apparent.



## 12 & 4 Reasons Why you should say 'Filkostat' for filament control—

- 1—Not adopted to vacuum tubes adjustment, distinctly designed for it.
- 2—A REAL Filament control, NOT just a rheostat.
- 3—Permits infinite adjustments of filament HEAT.
- 4—Infinitesimal control electronic flow.
- 5—Permits fine tuning needed for DX.
- 6—Control of small current makes it ideal for WD11's.
- 7—Fine adjustment starts where tube BEGINS to function.
- 8—DEFINITE OFF—indicating A battery disconnection.
- 9—At FULL ON Resistance is practically zero.
- 10—No current variations—resistance always constant.
- 11—Resistance element so finely divided further division impossible.
- 12—No disks to break or chip.
- 13—Operation absolutely silent.
- 14—Connection posts with Fahnestock Clips and solder contacts.
- 15—Adjustable mounting—no redrilling of panel.
- 16—GUARANTEED—Unbreakable, Replaced within 1 year if broken.

**\$2** Manufactured and guaranteed to **DX INSTRUMENT CO.** **\$2**  
Harrisburg, Pa.

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Ask to see "Graph" proving Filkostat Superiority  
If Your Dealer has none in stock yet send \$2.00 and his name direct to

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