March 15, 1925
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RADIO PROGRESS

"Always Abreast of the Times"

In This Issue

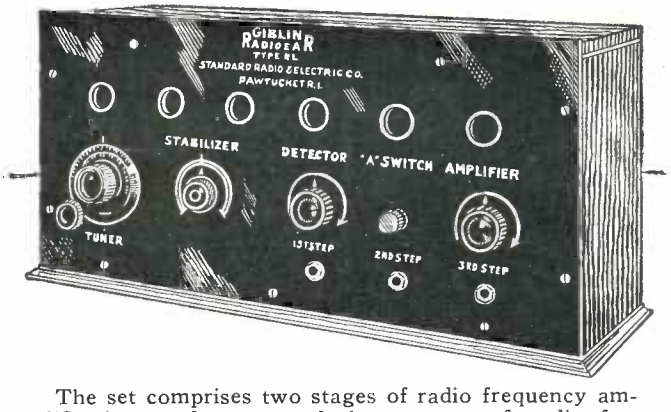
YOU WILL UNDERSTAND THIS MAGAZINE---AND WILL LIKE IT

PUBLISHED TWICE A MONTH

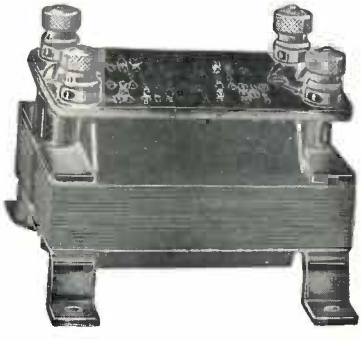
GIBLIN
RADIO APPARATUS

The Giblin Broadcast Receiver

The Giblin Radio Frequency Broadcast Receiver makes it possible to obtain radio entertainment without the necessity of erecting outside antenna wires or using a troublesome ground wire. A small loop aerial placed near the set will pick up signals, which, though they have come long distances, and are weakened by hills, valleys, trees and buildings, will be clear and of great volume. Many families, living in apartments where it is undesirable or impossible to erect antenna wires, can now hear enjoyable, ever-changing programs through the day and evening by "listening-in" with a Giblin Radio Frequency Broadcast Receiver.



The set comprises two stages of radio frequency amplification, a detector and three stages of audio frequency amplification. The parts are mounted on a subbase to which a Bakelite panel is attached. It is enclosed in a handsome solid mahogany cabinet.
Write for descriptive circulars



The Giblin Audio-Frequency Amplifying Transformer
Price $4.50

The Giblin Radio-Frequency Amplifying Transformer
Price $5.00

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STANDARD RADIO & ELECTRIC CO.
PAWTUCKET, RHODE ISLAND

RADIO PROGRESS

HORACE V. S. TAYLOR, EDITOR

Volume 2 Number 1

Contents for

MARCH 15, 1925

RADIO PROGRESS is issued on the 1st and 15th of each month by the Oxford Press at 8 Temple Street, Providence, Rhode Island. John F. O'Hara, Publisher. Yearly subscription in U. S. A., $3.00. Outside U. S. A., $3.50. Single copies, 15 cents. Entered as second-class matter, April 4, 1924, at the Post Office at Providence, R. I., under the Act of March 3, 1879. Address all communications to RADIO PROGRESS, 8 Temple Street (P. O. Box 728), Providence, R. I. Title registered at United States Patent Office.

What Fifteen Cents Will Buy

Our next issue contains a very interesting account of some of the problems of building sets in large quantities. Various freak orders for unusual radios are often received. Rados describes some of these in **"Building Sets by the Thousand".**

Dry cells have been used for a great many years, and when they run out they are pitched on the dump. A new type which can be recharged and yet contains no acid, which might be spilled, is described by Vance in **"A Dry Cell Can be Recharged"**.

A prize contest was recently held to name a most efficient radio set. In spite of that it is called **"The Nameless",** a construction article by Marx gives all the details of laying out and building this unusual hook-up.

Do you know what "Resonance" means? That's what happens when you tune to a special wave. The same thing is occurring every second in your watch. If you want to understand why its ticking is like tuning a radio set, read Taylor's **"Inside Story of Resonance".**

Everyone is troubled these days with squealing from regenerative sets. Various inventors have been working on the problem of reducing or curing these horrible howls. De Forest has just patented a scheme for curing this trouble. Don't fail to see Arnold's description of it, **"De Forest Cures the Squeal".**

Time was when a receiving set that worked was all that one desired. But now a radio must look good as well as have a pleasing tone. Goldsmith discusses this problem in a very interesting article, **"Please the Eye as Well as the Ear".**

A Swiss Watch Playing Football!

Once there was a husky chap who played center on a lively football team. He wanted to know what time it was, so he spent $150.00 for a full-jewelled railroad watch to carry during the scrimmage.

He showed the same kind of poor judgment which some radio fans do when they buy the best low-loss condensers and spend hours winding up coils with no winding form, and then use these extra good units in some ordinary hook-up. Such a combination has so many losses aside from coils and condensers that no improvement is noticed with the best of parts. Just as a $1.00 watch would have been better for our friend, the football player, so ordinary parts would fit the ordinary hook-ups.

The next issue of RADIO PROGRESS contains a construction article giving all the details of a set which is designed in such a way that it can make use of the no-loss qualities of the best equipment you can build or buy. It will pay you to try out this circuit and see how much better results you can get. It uses five tubes. The exact location of each part is shown in detail.

RADIO PROGRESS

"ALWAYS ABREAST OF THE TIMES"

Vol. 2, No. 1 MARCH 15, 1925 15c PER COPY, $3.00 PER YEAR

Sharpen Your Single Circuit Set

You Will Help Your Neighbor and Also do Good to Yourself

By HORACE V. S. TAYLOR

LIKE the explorer who said he didn't mind the North Pole, except for the climate, most things in radio are more or less of a compromise. For instance, by shortening your aerial you can cut down static, but unfortunately, it also reduces the loudness of the signals, which you wish to hear. By adding another tube to a set you can get greater distance, but on the other hand it costs a lot more.

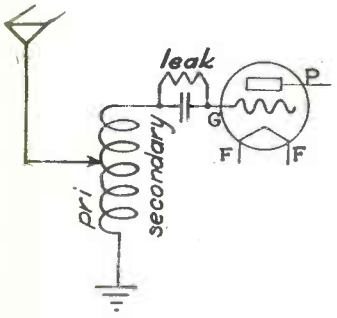


Fig. 1. This is Tuner of Old Single Circuit Set

It is rare to find a change which can be made that gives better results in all directions without having any drawbacks to discourage you. However, there is one such improvement which you can put in your radio which will make the music louder, and also the set more selective, and besides that, your neighbors will arise and call you Blessed, since any squawks which you may accidentally get in your own loud speaker will not be nearly as disturbing to them as before.

A One Lung Automobile

If you read the history of most cars, you will find that way back in ages past the first machines were built with a single cylinder. This often got you there and sometimes brought you back. But it made an awful racket all the time. Such a motor would not be tolerated in these days. There is no more excuse for a single circuit radio than there is for the single cylinder auto.

Perhaps you are not entirely familiar with what is meant by a "single circuit" set. It all depends on what kind of a tuner you have between the aerial and the detector tube. If there is only one coil, which serves as primary and secondary, then your tuner belongs to this outlawed class. Notice in Fig. 1 that the radio waves come in from the aerial and go through the lower part of the tuning coil to the ground. The actual number of turns used in this primary coil depends on the position of the tap switch, which is shown by an arrow. For a slow vibration wave like WEAF, New York, you need a large amount of wire and the contact would be slid up near the top of the coil.

If the speed of vibration of the sending station is high, then the amount of wire in the coil should be reduced by turning the tap switch to include only a small number of turns as the primary. The secondary coil, which is really the same wire as the primary, is connected through the grid condenser and leak to the grid. There should be included in the circuit a variable air condenser on either the primary or secondary side, but this is not shown in our diagram, as it is used only to adjust for the exact wave length, and does not have any reference to whether the tuner is a single circuit or not.

Fig. 2. These Boys Illustrate Bad Effect of Tight Coupling

Stick Closer Than Brothers

The secondary waves oscillate in and out of the grid and so control the operation of the detector tube. But as just mentioned, notice that the primary and secondary coils are one and the same and so the two waves stick so close together, that neither one can vibrate the way it

wants to at its own speed. Because of this, the secondary wave is not nearly as big as it otherwise would be and also it does not respond nearly so well to the adjustment for tuning. That is why you are not able to tune out loud stations very well and pick up softer ones.

If we can have some means of dividing up this work so that there are two separate coils, one for the primary, which is the coil used by the incoming waves in the aerial, and the other the secondary, which works the detector, then each one will be able to oscillate without being hindered by the other, and the result will be that there is a big improvement in the operation of the set.

Like Boys on Swing

To get a better idea of the way this action goes on look at Fig. 2. Here we

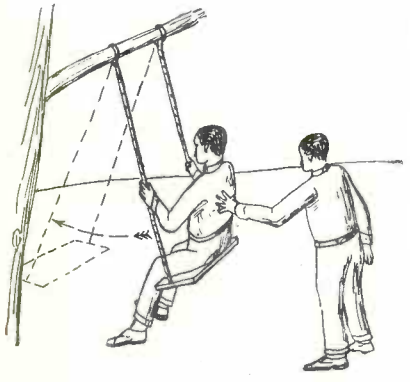


Fig. 3. When Coupling is Loose, Boy Swings Much Higher

have a couple of fellows who are swinging. The one on the ground gives the other one the necessary pushes to keep him going. But instead of letting him swing the ways he wants to, he takes tight hold of the seat of the swing and endeavors to shake the other chap back and forth and so keep him going. You can easily see that this is going to be a lot of work for the fellow on the ground, and furthermore, the swing itself will not oscillate back and forth through a very great distance.

Suppose instead of that the boy on the ground decides to let the other one go a little more by himself. Instead of grasping the seat firmly in both hands and trying to shake it back and forth by main force, he decides that he will give the other a push every now and then. If he times it right he will get the swing going higher and higher until finally it has all the motion which the swinger wants. It is also considerably easier for the one doing the pushing.

Pushing at the Right Time

Of course, in such a case it is necessary for the boy on the ground to notice when the one in the swing needs a push. If he should shut his eyes and strike out blindly, he would not get very far in setting the other in motion. Furthermore, if the swing vibrates back and forth say every four seconds, and he insists in pushing every three seconds, the motion will not be at all smooth, and not much movement will be worked up. In other words, the fellow on the ground (primary) and the one in the swing (secondary) must be tuned to the same speed. In that case, everything will work well and the motion (loudness) will be large.

The same thing applies to our radio set. The single circuit tuner shown in Fig. 1 corresponds to our youngsters when they both insist on using the same coil—that is both take tight hold of the seat. If we can arrange some way so that they can give each other room so to speak and not get in the way as was done in Fig. 3, then it would seem that the radio vibrations should be a lot louder and the set more selective. That is indeed the case.

Breaking Away from Primary

Just how shall we go about making this change so that the secondary can swing back and forth vigorously the way it wants to instead of being tied to its mother's apron strings (primary). A glance at Fig. 4 will show how to do this. The secondary is unchanged. It usually consists of the stator of a variocoupler. The rotor of the coupler is usually in the plate circuit of the detector tube. This is not shown in details of Fig. 4 to avoid confusion. But now glance at the primary. Instead of using the same wire another coil consisting of a few turns is wound on the same form (stator) and this is connected to the aerial through a load coil.

The waves from the aerial now oscillate through the load coil and primary direct to the ground. The magnetism from the primary affects the secondary and the waves which it excites reach the grid just as before. The secondary coil will be tuned by a condenser across its terminals in the usual way. This is shown at greater length in Fig. 5.

Tuning the Primary

It is not really necessary that the load coil be connected in series between the aerial and the primary. Many two circuit sets do not use this piece of apparatus at all. However, it is a distinct advantage to include it in the circuit, because by doing so it is possible to tune the primary to the frequency you wish to pick up rather than have a so-called "untuned" primary, which merely means that the latter coil is tuned to the wrong wave frequency.

In winding these coils use the following data:

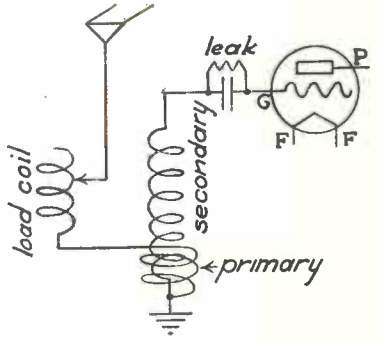


Fig. 4. This Change Adds Distance and Selectivity

The stator of the varicoupler is to be used as the secondary with the top lead running to the grid and the bottom to ground. Over the lower part of the stator winding wrap two turns of good writing paper. On top of the paper wind five to ten turns of wire of about the same size as is already used on the stator. No. 18 to No. 22 dcc (double cotton covered) makes a satisfactory size.

If you wish the greatest selectivity to get rid of strong, local stations, then five turns are enough for this coil. This will not give you as great loudness, however, as if you used ten turns and the latter will be much better for selectivity than your present set, although not quite so good as if you cut it to five. Some fans prefer to wind on five, then make a loop and then five more with a

second loop, then five more, making a total of fifteen. By using a small clip you can attach the aerial wire to one of these three loops after you have found by experiment which one works best in your particular set.

If You Use a Loading Coil

As just explained the loading coil will increase your selectivity still further and also make the reception louder. The only disadvantage is that it introduces one more control on the panel. If you decide to employ this improvement use a three-inch tube or a spider web form to wind the wire on. Forty turns of No. 20 or No. 22 dcc wire will constitute the winding. This should be tapped every five turns, and the taps brought out to the points of a tap switch.

In such a case connect the aerial to the center arm of the switch. Then, by rotating this arm, you can add any number of turns up to forty to the primary in order to tune it to the incoming wave. In case you decide to omit the loading coil then run the aerial wire direct to the primary.

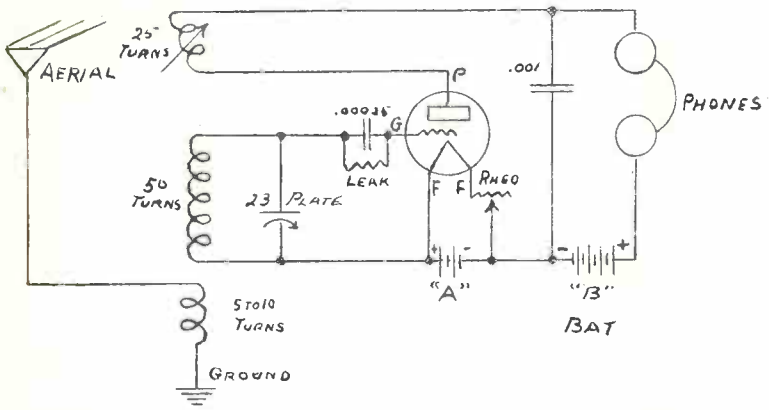


Fig. 5. Complete Hook-up of Set After Improving Selectivity and Loudness

Complete Hook-up of Set

This is shown more clearly in Fig. 5, which gives the complete wiring diagram for this set. Notice that the loading coil is omitted as most fans do not use it. If you once try it, however, we feel sure that you would prefer to continue its use even with the extra adjustment needed to tune the primary.

Another point which is omitted in the diagram for the sake of clearness is a wire running from the A plus to ground. This wire will carry no useful current in the operation of the set, and so may be omitted just as well as far as listening to a station is concerned. But it does have quite an effect in the way of convenience. Without it the batteries and set as a whole are insulated from ground. The capacity, which they naturally possess, because of this insulation, has a slight effect on the tuning, and so when this capacity is changed, the tuning is also shifted a little. By connecting the set to ground, as just described, this capacity is removed from the insulation and so no change is made when the hand is brought up to the tuning dials. In this way the body capacity effect is minimized.

Taking Care of Polarity

In hooking up the set be sure you get the right polarity. The primary winding may be wound in either direction, but the end which is down is connected to ground, while the upper end runs to the aerial, or to the leading coil, if used. The lower end of the secondary, which is the stator of the coupler, is also connected to ground and to the A plus. The upper end reaches the grid through the grid condenser and the leak. The rotor must have the right polarity in order to give regeneration. If this coupler is the ordinary or 90 degrees type, with the dial shaft set at right angles to the stator, (Fig. 6) then the proper polarity will be found by turning the rotor either to the left or right. One way will give regeneration and large increase in volume, while the other has no effect.

If the coupler is the 180 degree model, with the shaft set at an angle to the stator, (Fig. 7) then the rotor can not be turned to give both polarities, and it is, therefore, necessary that the correct terminal be connected to the plate. The easiest way to tell which is which is to connect the rotor as it happens and then turn the tickler up until the two coils are in line. If the polarity is right, you will hear a squeal or roughness as you turn the tuning condenser. If, on the other hand, the polarity is reversed, you will hear nothing at all unless a powerful local station happens to be sending. In that case interchange the two leads of the rotor.

Following the Waves

To see how the vibrations flow through the set, observe Fig 8. The primary circuit oscillates from the aerial to coil to ground. The quick vibrations labelled "P" show the course of this current. Its period or frequency of oscillation varies from 550 kc. (550,000 vibrations per second) for St. Louis, up to 1,200 kc. for some of the high speed stations. The magnetism caused by this current flowing in the primary starts oscillations in the secondary of the same speed. This is shown by vibration "S". This is tuned by the variable condenser which is adjusted so that the set oscillates at

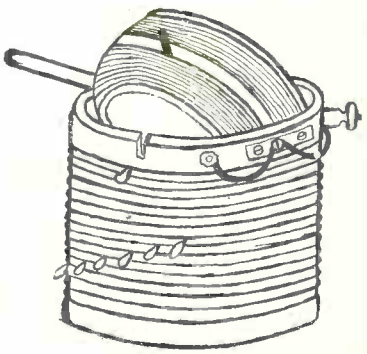


Fig. 6. The 90° Coupler May Have Either Polarity

the particular speed which you wish to pick up. The current is fed to the grid and filament as illustrated.

In the meantime the "A" battery is furnishing direct current through the filament and rheostat as the arrows indicate. The output from the plate con-

Continued on Page 8

Portrait of Popular Performer

Sometimes people complain that a piano sounds like a harp. But it does not resemble the kind of harp playing which has been heard recently through some of the popular broadcasting stations. Miss Anna Pinto is an accomplished harpist and when she tears off a few arpeggios we have to take off our hat to her.

Miss Anna Pinto

SHARPEN SINGLE CIRCUIT

Continued from Page 7

sists of radio frequency and also audio frequency waves in accordance with regular detector action. These waves from the output are shown at "O". They pass through the rotor or tickler and by reacting on the secondary, help the

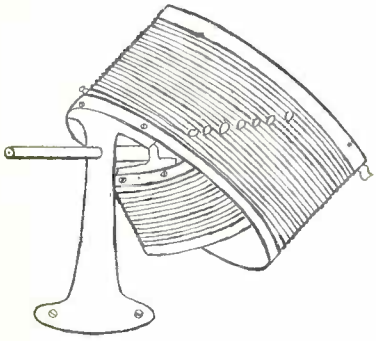


Fig. 7. Rotor Leads of 90°. Coupler Not Interchangeable

latter to keep up its vibration. If the tickler is set at too high a value, it will make the tube oscillate itself in which case music will be poor and your neighbors will be tempted to buy poison for you.

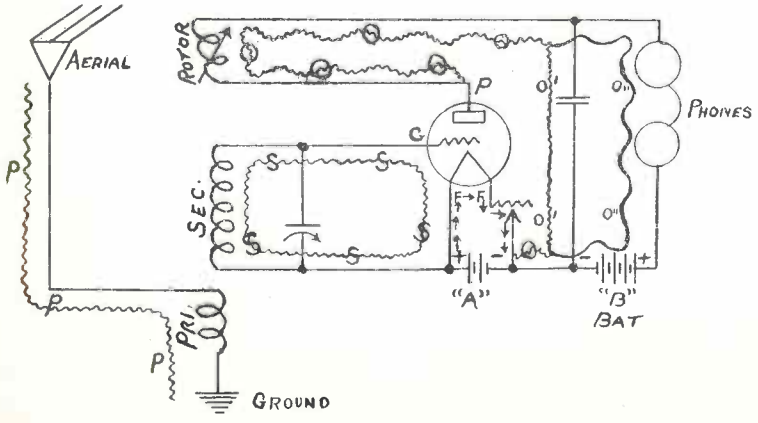


Fig. 8. This is Way the Waves Travel in Going Through the Set

The RF and AF Divide

The radio frequency and audio frequency waves divide when they leave the rotor. The high speed vibrations return to the "A" battery and filament through the by-pass condenser, while the audio frequency can not pass such a small capacity. The latter waves are therefore forced to run through the phones and "B" battery back to the filament.

This action, as just described, is the same in a single circuit tuner as it is in the two circuit, which is described. The big difference between the two lies in the fact that the primary and second-

Continued on Page 30

Using the Radio Telescope

By ALFRED N. GOLDSMITH, B. S. Ph D., Fellow I. R. E., Chief Broadcast Engineer, Radio Corporation of America

IT has often been pointed out that radio waves are an invisible sort of vibration, quite similar to light waves, except at a lower oscillation speed. They travel outward in all directions from the transmitting station just as the rays from a powerful lighthouse reach all quarters of the horizon. For broadcasting purposes this is a great advantage, since it enables the radio waves to cover all the territory around the transmitting station impartially.

Steel Buildings Are Shields

Of course, there are some regions around a broadcasting station which may be partially shielded from the radio waves by great groups of steel buildings, hills containing metallic ore deposits, and the like; but otherwise the waves travel impartially in all directions and are capable of giving equally good service at all points which are at the same distance from the transmitting station. It is this feature which gives radio broadcasting its peculiar advantage for covering an area, as opposed to wire communication, which by its nature, is readily adaptable to the connection of two fixed points on land.

It is possible to transmit radio messages, especially on the higher frequencies (shorter wave lengths) in particular directions, so that they can be received readily only within certain regions or sectors. But this method of sending has not been used up to the present for broadcasting, and it is not known whether it would prove practically useful in this field.

Mixing Up East and West

In view of the way in which radio waves travel in all directions, it is possible for an ordinary receiving set, using a wire antenna, to pick up messages coming from any point of the compass. Every broadcast listener has observed and appreciated the fact that the concerts from cities in all directions can be received equally well on occasion.

He has also noticed that code messages coming say from a spark station in one direction can easily interfere with concerts on a nearby frequency coming from a different direction. If one had available a form of radio set which could receive signals from only one desired direction, instead of being open to reception of messages from all points of the compass, it might be possible to eliminate undesired signals, not by tuning only, but by the use of this directional effect.

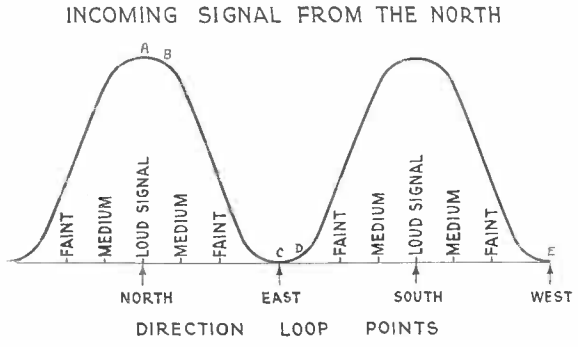


Fig. 1. As Loop is Turned Loudness Var ies as Shown; Loudest at A, Quiet at C.

The Radio Telescope

Such a radio, which would receive messages from a definite direction and fail to respond to programs from some other point, would be a convenient kind of "radio telescope" and would reduce interference a great deal. The simplest form of such a radio telescope is the loop or coil aerial. It consists of a number of turns of wire, generally wound in square or diamond form for convenience, and mounted on a frame which can be readily turned around. The side of the square is from about one foot to as much as five or six feet, but the smaller sizes are far more convenient.

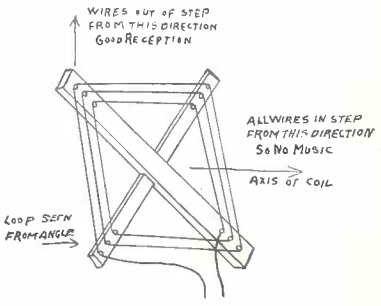


Fig. 2. Sticks of Frame Are Pointers For Direction.

The terminals of the coil are hooked up in place of the "antenna" and "ground" connections, but an ordinary radio set will not be satisfactory for use with such an aerial because the receiver is not sufficiently sensitive. As a matter of fact, the signal strength which can be delivered by a coil is only a small fraction of what can be obtained by an ordinary out door aerial, and the difference must be made up by the use of additional boosting in the form of several steps of radio frequency amplification, since otherwise, strong signals can not be obtained.

Keep Near the Window

The coil aerial set has the great advantage that no antenna wires need be strung, either outdoors or inside. This simplifies installing the set, and enables it to be used almost anywhere. In steel-frame buildings, it is advisable to keep such sets near the windows and not back of steel columns or long sections of wall. Stronger signals are generally obtained in the more open locations.

Coil aerials also are ideal for portable sets, as they may be carried around, with minimum delay and inconvenience in setting up and using them.

In ordinary antenna sets, because of the different sizes of aerials used in various installations, it is not usually possible to mark on the dials the exact settings for every frequency. The operator must log his own dials. With the coil aerial, however, such markings or calibrations are possible. This results in a big increase of convenience in handling the receiver.

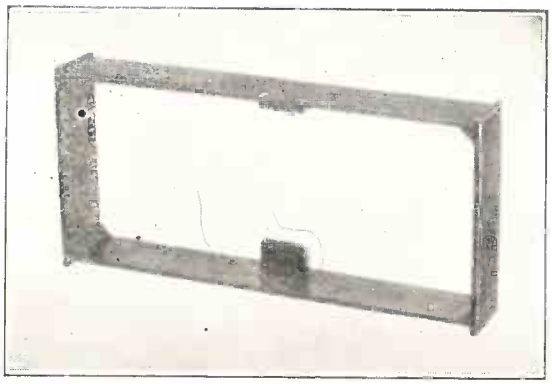


Fig. 3. This Loop is Quite Efficient and Goes in a Small Space

The accompanying drawing, Fig. 1, shows how the loudness of a concert received on a coil aerial changes as the coil is rotated. Let us suppose that the program comes from the north. When the loop points north, the signal is loud, and as the loop is rotated to the east, the loudness dies down until, when the loop points due east, the signal in a well-designed and properly used set of this type has almost or quite disappeared. As the loop is again turned to the south, the music comes back with full strength, to disappear once more when the loop is turned to the west.

What Do You Mean—Points?

When we say that the loop points in a certain direction it is necessary to understand just what is meant. It would naturally seem that if you wind a coil on a long tube that it is the axis or length of the tube which counts in the direction effect. This is not true, however. It is always the single turn of wire which decides. Suppose you take a sheet of paper and draw a picture of a single loop of wire on it. Now if you turn this paper so that it is vertical (as if it were stuck on the wall), and the edge points, say to the north, then waves coming in from either the north or south would be picked up strongest.

When you wind several turns of wire on a loop the principle is the same. If each single turn receives north waves the best, then, of course, the whole coil will do likewise. This is true no matter whether the loop is wound so that all the wires lie in the same plane as shown in Fig. 2 or if they are wound around the sides of a box. In either case the axis of the coil points at right angles to the direction which is picked up best.

Referring again to Fig. 1 notice three interesting facts.

May Not be Straight Line

1. The loop receives the strongest signals when it points (as explained) in the direction of the incoming waves. At times, especially in city locations, this may not be the exact direction of the station which is being received, since the incoming waves may be swung out of a straight line of travel by obstacles or reflection.

2. The loop receives little or not at all when it points at right angles to the direction of the waves.

3. It is possible to tell only the line of direction of the incoming waves from the loop position, but not the actual point of the compass. Thus, one can tell in the case just described that the signals are coming from the north *or* the south, but one cannot tell which of these it is. Generally this does no harm.

Two Ways for Silence

Accordingly, the simplest way to get a station loudest, as a matter of practical operation, after having picked it up, is to swing the loop until the desired signal disappears, and then to swing it exactly at right angles to the disappearing position. This will be found a little more definite and positive than the more obvious method of pointing the coil by trial in the direction giving the strongest signal. In order to get rid of an undesired station, the loop is merely swung until the unwanted signal disappears. If the interference comes from a very different direction, this method will work well; but if the desired and undesired waves arrive from nearly the same direction, or nearly opposite, this method of reducing interference will not be so very effective. Of course, normal tuning is also used to get rid of the undesired station.

A Gear to Turn It

The coil system of loop receivers may be either external to the set itself, or it may be enclosed in the cabinet of the set. A type of rotating loop of high efficiency which may be used for external operation with a sensitive set (and which is also permanently included within the cabinet of Radiola Super-VIII.) is shown in the accompanying photograph, Fig. 3. This loop is readily rotated by hand manipulation when placed outside the set, or is rotated by a geared control and knob on the operating panel when it is enclosed in the Radiola Super-VIII receiver cabinet.

An internal loop, fixed in position, is included within the cabinet of Radiola Super-Heterodyne, and this is a smaller rectangular loop. It requires no manipulation. Occasionally the entire set may be shifted slightly to pick up some particular station which happens to be in an unfavorable direction in its usual position. Generally this is hardly necessary.

Cutting Out Locals of Same Wave

Another interesting point in connection with loop receivers is that it has been found possible by actual trial to listen to stations many hundreds of miles away, operating on practically the same frequency or wave length as a powerful local broadcasting station, by utilizing the difference of direction

Continued on Page 21

An Ideal Radio Announcer

Should He Spring a Joke or Attend Strictly to Business?

An Interview from S. H. HAWKINS

DO brown eyes fit a studio better than blue? Perhaps you think there is no connection, but a great many fans (presumably fair ones) write to find out the color of their pet announcer's eyes. As a matter of fact it is only recently that this important official of broadcasting has come in to his share of public interest.

At the present time there is considerable talk about the ideal voice for broadcasting. The Radio Voice Technique Committee, an organization which lately discussed the "Ideal Radio Announcer," recently held its second meeting in the studios of station WJZ, New York City. Seven points of vital importance to the art of radio announcing were discussed by the committee, and several popular announcers from the Eastern part of the United States were compared.

At this meeting an attempt was made to rate well-known announcers of the East according to the standards set at the previous session. The following questions were also discussed: "Plugging the Air," "Extempore vs. Written Announcements," "Rhetoric of the Radio Announcement," "A Specialized Radio Vocabulary," "Trade-marking the Announcement," "Audience Salutation," and "Radio Humor."

Do You Break Dates?

Everyone has had the experience of waiting around for some one who has apparently forgotten to keep a date. When it is a musician or anyone who thinks he has an "artistic temperament" who is being expected it seems that he is apt to arrive late or not at all. This does not help very much when a vast audience of perhaps a million fans is waiting breathless for the next number.

In such an emergency a wise director will have something up his sleeve. Perhaps a singer held in reserve or a good pianist or maybe the announcer himself can go on the air with a song or a poem. Filling in such a hole in studio language is called "plugging the air." In discussing this, it was unanimously decided that all so-called plugging is commendable; that there should be no prolonged gaps in the program allowed by any station. It was added, however, that the cause of any delay should be frankly stated by the announcer, no attempt being made to fool the audience into the belief that the pause was intentional and not unavoidable. The committee decided that each announcer should be prepared with material to take care of any unforeseen gaps which might occur; such numbers should consist of entertainment matter which would be in harmony with the spirit of the program.

PHYLLIS SACIA

This is the Crosley-Dolly Varden Radio Beauty for 1925.

She won the honor in the second annual WLW Beauty Contest.

Her home is in Galesville, Wisconsin. Votes were received from the radio audience throughout the country.

Writing Out One's Speeches

In regard to the second question, it was unanimously decided that announcements in every case must be written, except in unavoidable instances where an unforeseen announcement must be made on the spur of the moment.

The consideration of the third question brought forth the decision that announcements should consist of short sentences rather than long ones, and that the sentences should be of simple construction as opposed to complex structures.

The fourth question aroused considerable discussion. It was finally advocated by the committee that radio speakers should employ a vocabulary containing words which are transmitted easily and well by radio. Such sounds as "ch," "sh," "ss," "tt," "ff," etc., should be avoided as much as possible in the announcing vocabulary. The committee found no objection to "Trade-Marking" an announcement; i.e., the use of special station mannerisms.

Don't Get Too Familiar

The meeting favored the use of a formal salution by the announcers. Such words as "folks," "friends," "people," or other familiarities they thought should not be used.

The committee was unanimous in the agreement that the announcer who at-

tempts to be a humorist as well as an announcer is a "pest."

The necessary characteristics of the Ideal Radio Announcer (IRA) were found to be seven in number, and the nature of each was determined by the following seven tests: (1) Average Rate Test; (2) Rate Variation Test; (3) Average Pitch; (4) Pitch Variation; (5) Emphasis Variation; (6) Formality; (7) Distinctness. The digest of the decisions of the committee members on each test establishes the nature of the Ideal Radio Announcer, as follows:

How Fast Do You Talk?

He should speak at an average rate of approximately 175 words per minute, but while keeping to this average, he should introduce into his announcements marked changes in the speed of talking.

He should have a voice of low middle range, but should vary the pitch of his voice considerably to avoid a monotone.

IRA should use marked stress variations, or change of emphasis. He should speak in a formal, but friendly, manner, adapting his style to the general content of the program. His voice should have moderate distinctness.

The committee's decision as to the relative importance of these various characteristics contains some unexpected features. Rate of delivery is most important, stress variations are second, distinctness is third, average pitch is fourth, pitch variations fifth, changes in rate pace sixth, and degree of formality is least important of all.

IRA Has No Personality

The committee explains further that IRA lacks one most vital factor, which they are unable to give him; namely, Personality. The committee presents the Ideal Radio Announcer to the entire directing profession as a correct and perfect being; but to each announcer it must remain to imbue him with the spark of Personality. It is the earnest hope of the committee that radio directors throughout the country will be able to utilize these findings to advantage, eliminating those technical faults which are at present detracting from their "Radio Personalities."

In rating a small number of representative announcers of Eastern stations, the committee was very careful to keep in mind the fact that *personality* was not considered, and that judgment was made entirely upon how close each announcer kept to the standards previously set by the committee. The total number of credits possible for one was 100. The rating for the leading thirteen Eastern announcers follows:

Find Your Favorite

Announcer	Station	Rating
Glover	WJZ	66
McNamee	WEAF	62
Barnet	WOR	56
Brokenshire	WJZ	56
Haupt	WEAF	54
Page	WEAF	52
"Roxy"		50
C. W.	WIP	48
Cross	WJZ	48
Reid	WJZ	44
Neff	WAHG	42
Breck	WOR	38
"N. T. G."	WHN	30

It is significant that even the highest announcer on this list failed to approach, by a wide margin, the committee's "Ideal Radio Announcer."

Was It a Row with Roxy?

Many of our readers however, may not entirely agree with the committee's standards. For instance, recently the officials of the American Telegraph and Telephone Company of WEAF, New York, had a disagreement with Roxy over the way that popular announcer conducted his Sunday Evening Concerts. For one week he was very subdued and as business-like and dry as a list of prohibition raids.

However, this was followed by such a storm of un-applause cards that the next week Roxy was as jaunty as ever, and both sides of the controversy explained that if they had done anything they were sorry for they were glad of it, or words to that effect. So it is quite possible that you would give this list a different order of rating from the way it appears above.

Very likely you are not familiar with all these names anyway since it is the style for announcers to give call letters instead of their names. Sometimes these letters are their own initials and sometimes they apparently have no connection at all. Many fans do not think very highly of this custom.

Style Changed at WJZ

Listeners to stations WJZ and WJY of New York City have not lately heard the familiar "AON" announcing—or "AJN," "ALN," or "ATN" as the case may be. For the first time since WJZ opened as the first broadcasting station east of the Alleghenies in 1922, the announcers are identifying themselves by their own names.

The change in policy, which took effect on the first of March, is the result of the increased attention to the art of announcing. From now on, a good man will win public approval under his own name, and a poor one will receive the blame as himself rather than as a group of three letters. "AJN" has become Milton J. Cross." "ALN" is now "J. Lewis Reid." "AON" addresses the radio audience as "Norman E. Brokenshire." "ATN" is Herbert B. Glover.

Where A-N Came From

The history of the famous "A-N" announcing family is an interesting one. When WJZ first opened in Newark the question arose as to how the announcer should identify himself. To avoid any misapprehension by the audience that the announcer was a performer, the use of initials was decided upon. The "A" stood for "Announcer;" the middle and distinguishing initial was the first letter of the announcer's last name; and the "N" stood for "Newark." Thus Thomas H. Cowan, WJZ's first announcer, became "ACN" to the radio audience. When Milton J. Cross was engaged, he became "AJN," the middle initial being used to avoid conflict with "ACN's" call. Miss Bertha Brainard, now assistant to the manager, became "ABN" when on the air.

Then WJZ moved to New York, in the spring of 1923, and the final "N" of the announcers' calls stood for New York. WJY was opened up, and the staff of announcers was enlarged. Robert D. Newton, now assistant to the manager, became "ARN," since "ANN" and "ADN" are not clearly understandable to the listeners. J. Lewis Reid was the next addition to the "A-N" family, and since Newton held the "ARN" call he became "ALN."

Initials Were Hard to Fit

Norman E. Brokenshire and Herbert B. Glover met with difficulties when trying to fit their initials between the "A" and the "N." "ABN" was Miss Brain-

Continued on Page 30.

Weeding Out Bad Tubes

When You Suspect a Tube is Bad, Test It Like This

An Interview by J. D. R. FREED

ALL trouble men in radio know that at times the customer will complain about the operation of a set and as a matter of fact the only thing that proves to be wrong, is a worn out tube. At other times a tube is bad, but not necessarily from old age.

That is why it is safe to give the following advice:

When something goes wrong with your set, if it is one of standard make and built by a big, responsible company, do not blame the receiver itself until you have tested the tubes you are using. Frequently, even in the case of brand new tubes, one or more out of a set of five or six will prove to be weak. The fact that the tube lights up does not prove anything. A tube may be absolutely dead as far as the power to amplify is concerned, and yet the filament will remain lighted.

Why it is Easy to be Fooled

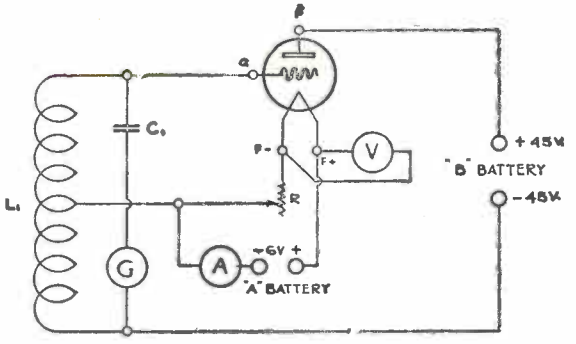
Of course, if a tube is dropped on a hard enough pavement, it will shatter the glass. It does not require special tests to prove that such a tube is damaged. If the shock is not quite so great, then the filament may break, although the glass does not crack. Such a tube will not light and the only remedy is to throw it in the ash barrel. But a much commoner cause for trouble is that while the filament is intact and will glow when the "A" battery is connected, it still will not pass enough plate current to work the phones. Also, it may not have a vacuum sufficiently good to allow it to oscillate, and so it will be of no use as a detector.

Take the average set of four or five tubes in any one receiver. If you will test them, you will find that they probably vary in efficiency. One may be 100% good, and another only 50% efficient. This is particularly true of tubes which have been in use for several months.

Brothers, But Not Alike

Users of radio receivers who have vacuum tubes in operation from six months to a year, frequently wonder why their sets do not work as well as they did before. The answer lies most frequently in the fact that vacuum tubes wear out,—that is, that the filament remains lighted but the tube has lost its power of amplification. Frequently in the case of brand new tubes, one or more out of a set of five will be found to amplify, but only a small degree. It will be more difficult in an ordinary run to find five tubes, although brand new, which are all equally up to the standard of efficiency.

In 99 cases out of 100, the complaints about standard makes of radio receivers are due to faulty vacuum tubes. It needs only one bad tube out of a set, to cause the tremendous loss in efficiency. The average consumer does not



TUBE TESTER (FOR UV-201A AND C-301A)

L_1 = 50 TURNS #22 D.C.C. WIRE WOUND ON 1¼" DIA. TUBE TAPPED AT MIDDLE.
C_1 = FIXED CONDENSER = .0001F MFDS (MAY CONSIST OF TWO .00025 MFDS. CONDENSERS IN SERIES (THIS VALUE IS NOT CRITICAL)
R = 30-OHM RHEOSTAT.
G = WESTON THERMO-GALVANOMETER · MODEL 425 · RANGE 115 MA
A = WESTON D.C. AMMETER · MODEL 301 · RANGE 0-1 AMP.
V = WESTON D.C. VOLTMETER · MODEL 301 · RANGE 0-7 VOLTS.
"A" BATTERY = 6 VOLTS STORAGE BATTERY OR 4 DRY CELLS IN SERIES.
"B" BATTERY = 45 VOLTS

INSTRUCTIONS FOR OPERATION

1. TURN THE RHEOSTAT TO THE OFF POSITION.
2. INSERT TUBE.
3. TURN UP THE RHEOSTAT TILL THE VOLTMETER READS 5 VOLTS. THE AMMETER SHOULD NOW READ 0.25 AMP. THE THERMO-GALVANOMETER SHOULD REGISTER FROM 30 TO 40, DEPENDING ON THE EXACT CONSTANTS OF THE CONDENSER AND COIL USED. A NUMBER OF TUBES WHICH ARE KNOWN TO BE GOOD SHOULD BE PUT IN THE TUBE TESTER AND THE GALVANOMETER DEFLECTION NOTED. ALL OTHER TUBES UNDER TEST SHOULD, IF SATISFACTORY, COME UP TO THIS AVERAGE VALUE. ANY TUBE GIVING AN OUTPUT APPRECIABLY UNDER THIS VALUE SHOULD BE REJECTED.

NOTE 1. IT IS ABSOLUTELY ESSENTIAL THAT "B" BATTERY VOLTAGE BE 45 VOLTS AND NOT LESS
" 2. COIL SHOULD BE COATED WITH CLEAR SPAR VARNISH OR OTHER SIMILAR COMPOUND AFTER WINDING
" 3. ALL CONNECTIONS SHOULD BE MADE WITH ROSIN-CORE SOLDER.

know that vacuum tubes should be tested every three months or at least every six months. Unfortunately most dealers do not have instruments for the testing of vacuum tubes. It often happens that a perfectly good radio set is blamed for the difficulty. The average story runs as follows:

"My tubes light up but my set isn't working right."

Tonic for a Such Tube

It is freqeuntly possible to restore the tubes to a greater efficiency by disconnecting the "B" batteries and allowing the tube to run for several hours with the filament lighted, but with the "B" batteries completely disconnected from the receiver. The heat of the filament permits the chemical element inside the filament itself, to accumulate again on the surface of the fine incandescent wire, without the actual flow of current from the filament to the plate. Thus, the tube may be considerably improved.

A hook-up for testing tubes is shown in Fig. 1. This makes use of a socket to hold the tubes, a coil for feeding the grid and plate, a rheostat for controlling the filament, and the necessary meters.

Laying Out the Parts

A convenient way to lay out the different instruments appears in Fig. 2. The three meters occupy the main part of the panel, as they are the instruments which are read. At the left appears the ammeter, which measures the current flowing through the filament. The voltmeter is in the center. This indicates the pressure which is impressed across the filament terminals of the tube. This pressure is, of course, controlled by the rheostat. The latter should be adjusted until the voltmeter reads the correct amount for the particular kind of tube being tested. That is, the UV-200 and UV-201A require five volts on the filament, while the UV-199 takes three volts. Both WD tubes (11 and 12) are adjusted to 1.1 volts.

After this pressure has been adjusted correctly, the ammeter is next observed. The UV-200 absorbs one ampere. The UV-201A, WD-11 and WD-12, each operate on one-quarter of an ampere. The UV-199 takes the smallest amount of all. One-sixteenth of an ampere is enough to bring its filament up to full brightness. Some of the so-called "Boot-leg" tubes on the market work pretty well as far as operation in the set goes, but use a very much larger current than has just been indicated. Of course, such tubes introduce a heavy drain on the "A" battery.

Continued on Page 21

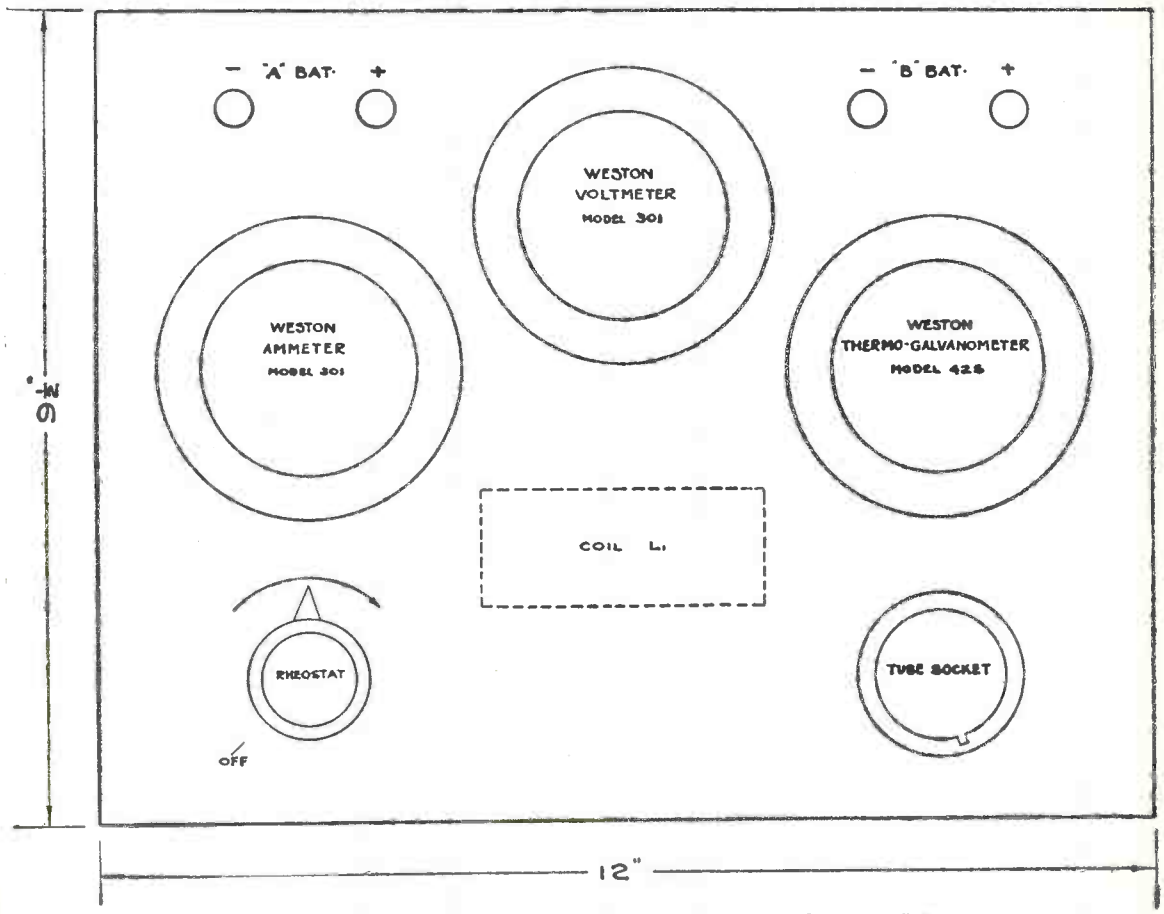


Fig. 2. Layout for Three Meters, Socket, and Rheostat, Volt and Ammeter Test Filament; Galvanometer, Plate and Grid

Installing Your Lead-in

It Looks Simple but a Good Lead-in Improves Your Set

By RICHARD K. MORTON

"LOOK at that aerial," you exclaim to a friend as you drive along the street. If it is particularly high, or long, or well insulated it immediately attracts your attention. You know that a good aerial is needed, to get the best results. But do you ever stop to think of the lead-in which connects it to your set.

Defective lead-in wires are a common weakness in receiving-set operation. But a broadcast signal is only as good as the lead-in wire will conduct it in. Height and length of the aerial may be right, but an unsoldered and corrosion coated lead-in will greatly reduce the effectiveness of the set. It is a good idea to have the aerial, if possible, adjusted with pulleys, so that it may frequently be lowered.

Don't Shin Up Twice

Many fans install their wire on the top of a tall pole of the edge of the peak of the gable. It is rather risky work to reach the supports. When first put up there is the thrill of knowing you will shortly be able to pull in Cuba (perhaps). But once the set is running, there is no further thrill in shinning up the pole to take the aerial down to clean it. So by all means install a pulley (galvanized to prevent rust) and a piece of clothes line—then you will find it an easy matter to take care of the wire. This will allow you to remove the black coating on the copper with some preparation, such as kerosene.

Those who use porcelain cleats as aerial insulators, should use two, at each end of each wire. This gives you a factor of safety, since if one of the insulators should happen to crack and so absorb water, such a short circuit would not put your line out of business.

Your Landlord May Object

A porcelain tube is often used to conduct the lead-in wire under the window sash to the set. The window is shut down on the tube which leaves a small crack. This is quite satisfactory in the summer time, but will hardly do for the winter, unless you get your coal free of charge. Of course, a hole may be drilled through the sash to accommodate the tube, but this will need to be about 13-16 in. diameter, which is big enough to disfigure the sash. A better way is to wrap it with a thin rubber coating (from automobile tire, etc.) or with tire tape. It makes a great difference if the bare lead-in wire touches the house or the sill, (especially in wet weather) or runs for a long distance along a wall, which it may touch in spots.

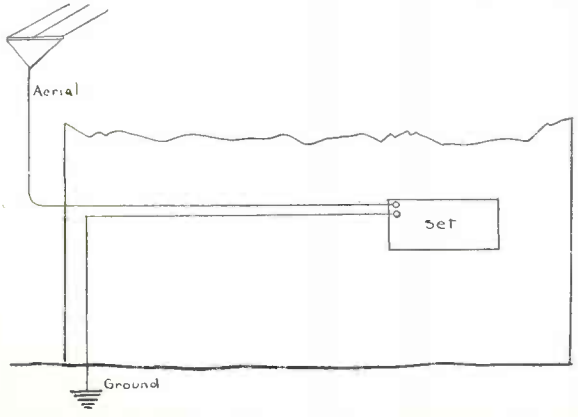


Fig. 1. The Lead-in is Put Too Near the Ground Wire.

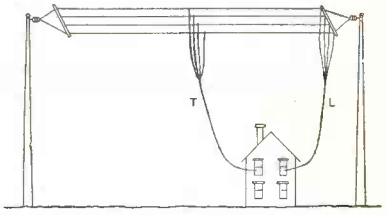


Fig. 2. This Becomes Either a T Aerial or an L Aerial, Depending on Lead-in

Another point to look out for, is not to allow the lead-in to come too close to the ground wire. Many a set is installed as shown in Fig. 1, with these two wires very close together. In that case they act like the plates of a condenser and considerable of the energy is conducted by capacity action direct to ground without ever running through the set. Sometimes we see cases where these two wires are even run through the same hole in the wall, and naturally a good deal of the music is wasted. The lead-in should be separated at least a few inches from the ground, except where absolutely necessary as for instance at the lightning arrester.

How can one fix good ground and aerial wires, when one lives, say on the third floor of a five-flat tenement house? Permission to have the aerial on the roof may usually be obtained; then attach a lead-in wire, which comes down to your floor, keeping about a foot away

from the outside wall. Make a little shelter for a good lightning arrester, to guard it from the weather. A wooden box from the grocery store can be used. However, the fire insurance rules allow a lightning arrester to be installed inside the house near where the wires come through, provided no curtains or other inflammable material are close to it.

In such a house there are usually cold water pipes running down through the wall in some corner. By carefully lifting up a floor board in this corner, a grounding clamp may be often there attached to the pipe. A porcelain tube may be fixed in a small hole which can be easily plugged. The Underwriters prefer, however, that the ground wire be attached to the cold water pipe just where it comes from the street into the cellar. This will usually be right at the water meter.

Fig. 3. Be Sure to Fasten Lead-in in Center of Flat Top—Not as Shown

How to Reduce Static

Study the length and position of the lead-in as carefully as the aerial, which partially regulates proper direction for best signal, the wave lengths you can get, and how much static you will pick up. Add together the length of wire in your aerial, lead-in and ground. This should not exceed 175 feet under any circumstances and with the modern sensitive set it is better to let this length be as small as 100 or 125 feet. The longer systems are harder to tune to high frequency (kilocycle) waves and furthermore they pick up a lot more static and interference.

Here it should be noted that the position of the lead-in determines the style or name of aerial. Fig. 2 shows an aerial with two lead-ins. Of course, both should never be used at the same time. When the center connection is made, it is called a T aerial, while the end wires bring it to the L style. Either of these is good, whichever works out better with your particular location. Although four wires are shown, such as would be used in sending, a single strand or at most two (if quite short) are sufficient.

Lead in Right in Center

In building a T aerial be sure that the lead-in is taken off exactly in the middle of the flat top as Fig. 2 shows. If you do as revealed in Fig 3, and attach the T connection nearer one end than the other, you will prevent sharp tuning on your set. The short end will try to vibrate at a higher kilocycle frequency than the longer part. As a result you will find great difficulty in separating stations which may interfere with each other.

If you have a loud local station, and wish to be able to tune it out as much as possible to get distant programs, then it is an advantage to locate your lead-in so that the aerial points straight at the local station. This may seem extraordinary, but it is a fact that the free end of the flat top points *away* from the direction of best reception. Using the L aerial in Fig. 2, waves coming from the right would be heard loudest and a station at the left would be toned down more than from any other direction. However, do not look for anything like complete silence from that point of the compass, since the ratio between best and poorest directions is usually around 2 to 1.

Swaying Causes Fading

Have the lead-in of one piece, if possible. Do not allow any kinks and turns in the wire. Keep both fairly taut. If they are too loose they will swing considerably in the wind and this will change their capacity to ground, and so alter the wave length as they swing. As a result a station will seem to fade in and out in tune with the swaying of the wire.

If your aerial contains more than one wire (which is not necessary), connect lead-in strands to each by carefully winding or splicing, and then soldering. Bring these wires together into one lead-in, and solder this very carefully, so as to form a perfect V. This is shown in Fig. 4.

As to the material for the lead-in, it is now becoming customary to use the same wire as that of the aerial itself. This is logical, since the same current flows through them both, and there is no advantage in using a larger size for one than the other. Many builders use a single length and this saves a joint where the two come together.

Lead-in Its Own Aerial

In conclusion, it is well to point out that the lead-in plays a considerable part in collecting the radio waves as may be shown by this experiment. Disconnect the flat top and then after retuning your set, you will find that the programs are usually more than half as loud as they were before. It is necessary to retune, since the shortened length will change the position of your dials. Since the lead-in plays such an important part in collecting the waves, it is worth giving more than a passing thought.

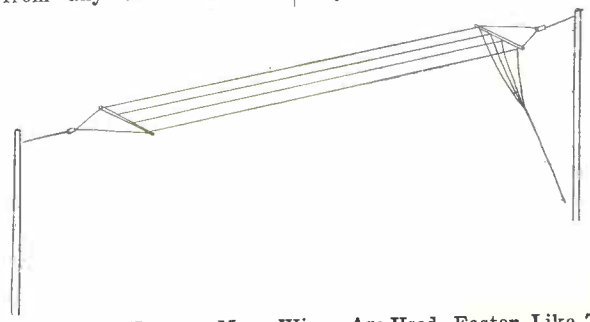


Fig. 4. When Two or More Wires Are Used, Fasten Like This

Shooting Waves Like Bullets

Scrambled Signals Fool The New York Operators

By E. F. W. ALEXANDERSON, Chief Consulting Engineer,
Radio Corporation of America

TALKING across an ocean—this has always been the force that developed and kept up great civilizations. Ten centuries ago the great Commonwealth of the Mediterranean Sea was held together by speedy ships communicating with Rome as a center. In these days commonwealths on the two sides of the Atlantic Ocean have been held together by the telegraph cable systems between London and the United States.

New York Will be the Center

The scene is now shifting, and New York is fast becoming the financial and commercial center of the world. New York has now a well developed new system of communication reaching all parts of the globe by radio. It is the growth of this world net work of radio which I wish to bring to your attention. The Radio Corporation of America started operation in 1920, but its system has already outgrown the experimental stage and become a public service on a large scale.

It fires the imagination. It is difficult to convey by mere words this appeal to the imagination,—the appeal which the development and operation of this world wide spider web of communication has had to those engaged in it. We had to develop transmitting stations and antenna systems, high frequency alternators with current speed control, high speed modulation of the antenna current, high frequency insulation withstanding voltages higher than those used in any power lines, etc. Atmospheric disturbances have been conquered by an antenna system capable of receiving all the different signals from all parts of the world, concentrating the operation of the whole system in one large room in New York.

The aims of the engineers responsible for this system are largely the same as those operating a railroad: reliability, service and speed. Such service is already being given. But this does not mean that the development of radio has come to a standstill, any more than we have a right to say that steam locomotive improvement is over. It does mean this, however, that one of those pauses has been reached in radio communication which occurs in any engineering development; namely, that the technique has, after a strenuous effort caught up with the commercial requirement, and so is having a breathing spell, getting ready for new efforts.

This stage was reached by the steam engine on ship board before it was replaced by the steam turbine. Such a point has also been reached in electric power engineering. This is the period when the technical achievements of the past are capitalized and put into practice. Technical development work is always done with a money loss at first. If engineering did not have these breathing spells it could not keep going, because in the first place, the money supply would fail, and in the second place, the engineers would be tied down with small details and so would not have time for the fundamental research which paves the way for the next advance.

Low Speed Waves Understood

When we try to anticipate the next big improvement, we must first take account of what new facts we have learned in the last few years. Radio communication of 1925 uses low frequency waves. The way these long waves travel has been thoroughly explored, and we know how much radiated energy is needed for communication over any distances day or night. We know how to build radio transmitters, and receiving systems, and we have learned how to control the effect of static under almost all conditions.

The slowly vibrating (long) wave follows the surface of the earth and is subject to laws of attenuation (or reduction in loudness) which are by this time well understood. See Fig. 1. In the broadcast range of frequencies, on the other hand, there is considerably more irregularity. Signals sometimes go through and sometimes not, depending upon conditions which are not under our control. Occasionally tremendous distances are covered with very low power, and then our friends call us liars.

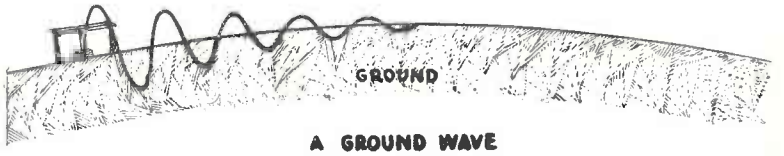


Fig. 1. Slow Vibrations (Long Wave Lengths) Follow the Earth's Surface

During the last year a number of long distance circuits have been introduced using waves above 3,000 kc. (100 meters.) Such circuits are now in operation between New York and Europe, New York and South America, and San Francisco and Hawaii. Adopting fast (short) waves for communication

over long distances is contrary to the earlier well established experience in which it has been found that the longer the distance, the slower should be the vibration for giving reliable service. There are many indications that in the high speed field we have effects of wave transmission quite different from those we used before. This new branch of knowledge is being explored, and promises to open up new, unexpected fields in radio.

New Tracks Through Space

The fast vibrations do not follow the surface of the earth. We have learned to launch the wave like a high angle gun fire into space in such a way that it travels in the upper atmosphere and comes back to earth a great distance away, (Fig. 2.) By travelling on this upper track, the waves are not subject to the ordinary laws of absorption. So long as we are working with earth bound waves (Fig. 1) we must use slow ones for long distances, because the earth absorption of such vibrations is comparatively small. When, on the other hand, we use high angle radiation with fast oscillations we have a different form of wave travel. These new tracks in the ether are being explored by regular research work, as well as by commercial messages.

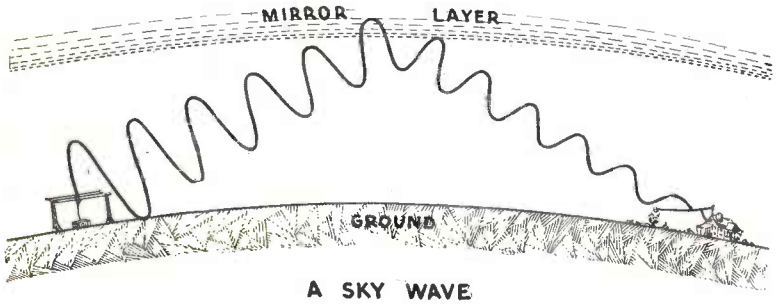


Fig. 2. High K.C. Waves Do Not Waste Themselves in the Ground

It took many years before we understood the earth bound waves so that we can now count on reliable communication, summer and winter. The curved space radiation with high speed waves will undoubtedly open up new and important fields of radio. We are using it already to some extent in business traffic, but it will probably be a good many years before this is as well understood as the slow oscillations are.

1,000 Times the Talks

The fast vibrations (short waves) not only open up new paths, but give us a tremendous number of different wave channels which do not interfere. The following facts will make this clear. Almost all the trans-oceanic telegraph stations in the world are crowded into a band 10,000 cycles wide. This "space" in the ether is now full up to its capacity; but the high speed field above 3000 kc. includes up to ten million cycles (10,000 kc.); there is room for 1000 times as many messages as all the long wave stations put together. To carry 1000 times as many messages would seem fantastic, but attempts to state our hopes of the future in terms of the cold facts of today always lead to what seem like wild dreams.

Two years ago Mr. Owen D. Young, Chairman of the Board of Directors of the Radio Corporation and of the General Electric Company, and co-author, of the famous Dawes Plan, stated his idea of what radio ought to do. He wished to press a key and—zip—a whole page of a newspaper would be flashed across the ocean. Acting upon this lead, we went ahead to see what could be done and in less than two years we had demonstrated picture transmission across the ocean. Of course, there is a far cry between sending a picture, and flashing a whole newspaper, but the art is rapidly moving in that direction.

An inspiring thought must always be many years ahead of the event. As an illustration of this, I wish to mention an important advance in radio which was thought of long ago, but has just now been realized. In 1912, I visited the laboratory of Mr. John Hays Hammond, Jr., to make tests of two A. C. generators of 100,000 cycles (3,000 meters) which he had bought, and we had some very inspiring conversations. Among other things we discussed the modulation of the antenna current, trans-atlantic telegraphy and broadcasting, control of airplanes and submarines. Mr. Hammond outlined his idea of taking a variety of messages and scrambling them together, feeding them to one transmitter and then sending them forth by radio as a composite message. At the receiving end they would be unscrambled into separate messages again.

Now after twelve years, we find a paper presented to the Institute of Radio Engineers by Beverage, Hansell and Dean, which tells just how this is done and explains the theory of the apparatus and its operation.

A Ten Mile Antenna

This is what happened in the meantime. The fight against air disturbances and static has led us to build on Long Island, a central receiving station with an antenna system consisting of two aerials, ten miles long, joined by a transmission line. Think of it—ten miles. This seems like a large equipment, but its cost is insignificant compared with the service it renders. This antenna idea is known as the Beverage-Rice system, and it eliminates practically all static, and picks up on one aerial all the signals from all the stations in Europe. These messages are then automatically separated in more than a dozen receiving sets and sent by wire lines to the operating room in New York.

There is only one kind of disturbance which this system does not eliminate, and that is a thunder storm near by the station right on the line from which the signals come. To insure service even during the lightning, a similar large antenna system was built at Belfast, Maine, which would naturally be immune to a thunder storm on Long Island, whereas a station in Long Island would not be worried by a thunder storm in Maine. But the problem was, how to get the signals down from Maine to Long Island.

Continued on Page 22.

Broadcasting the Victor Artists

Biggest Event in Radio World Is Sent out Every Two Weeks

By VANCE

WHAT is it that sells radio sets these days? Dealers say that the Victor artists concerts are having a very powerful effect in helping them sell radio sets.

While there is no doubt that a great many people, particularly the young folks, like dance music, still most of them already have sets. It is the conservative music lovers, who are perhaps a wee bit tired of jazz that have felt that there is not much of interest to them floating around the air at night.

There is Not Any Better

When the American Telegraph and Telephone Company announced that their New York Station, WEAF, was going to broadcast the concerts by some of the best musicians and singers in the world, it naturally woke up the ones who like opera and high class music. For a good many years the Metropolitan Singers have had contracts with the various phonograph companies and so they could not sing for the broadcasting station without special permission.

Now it happens that the Victor Company, being one of the oldest in the field, had made contracts with quite a large number of the best talent in the country. So when they decided to release these artists to perform for a big chain of sending stations, of course it made all the fans sit up and take notice. Everyone's expectations were raised to a high pitch, and fortunately no one has been disappointed. Many people used to blame on the broadcasting itself the poor tones which often came through their loud speakers.

Of course, if you have a set which is out of adjustment, or a loud speaker which has a cold in its chest, then even the golden tones of a McCormick will sound like silver or brass. But if your set is a good one and everything in adjustment, there will be just as much difference between one of these top notch singers and an ordinary performance as heard on the radio, as you would find if you met the singers face to face.

Rudy Wiedoeft

Waiting for Nine O'clock

It is 8:59 o'clock on a Thursday night. Hundreds of telephone operators all over the country, with eager fingers clutch-

Fig. 2. One of the Popular Victor Ensembles—The International Novelty Orchestra

ing a plug, tensely watch the minute hand of the timepiece.

The clock ticks 9—the operators push their plugs home—and the golden voice of Dal Monte is heard in 10,000,000 homes over the radio.

This almost miraculous technical perfection in the transmission of the Victor broadcast programs gives but an inkling of the tremendous task and the infinite care and preparation necessary to reproduce these concerts simultaneously through fourteen separate stations.

In a small sound-proof room in the broadcasting station of the American Tel. and Tel. Company at 195 Broadway, New York, the famous artists have given the best of their music into the little black microphone. Alda, McCormack, Bori, De Luca, Chemet, De Gogorza and many others have for the first time broadcast their art to an invisible audience—as awe-inspiring an experience as the making of their first record.

Making the First Records

Back in the olden days when the phonograph was first invented, records could not be turned out by the thousands from a single master as they are done now. You will probably remember that the first record ever made was produced by Thomas Edison on a cylinder with a piece of tin foil wrapped around it. The tin foil received the scratches made by the needle, and when run again through the instrument gave back the information that "Mary had a little lamb." The next step was to record the music on a wax surface. But there was no way of making more than a single copy of the artist's voice.

How tiresome it must have been for the first performers. You, maybe have got weary of hearing a piece like "Bananas" reproduced over and over again, but suppose you had to sing this time after time as a steady performance from nine in the morning until five at night? Yet this was the way the original records were made.

Machine Sings to Itself

The next step was to use one machine to repeat to another. By connecting the two horns together a master record could tell its story over and over one at a time to fifty secondary records. These were then sold. Of course, some of the delicate shading of the music was lost in this second recording and for that reason many people were willing to buy the master records even at a considerable advance in price over the repeats.

The present method of making records is to have the music repeated by the performer several times. Then the best record of the lot has a metal coating electrically plated on it in something the same way in which silver plating is done. This metal form is then used as a mould and the impressions are made from it by pouring the moulten material and then allowing it to harden as it grows cold.

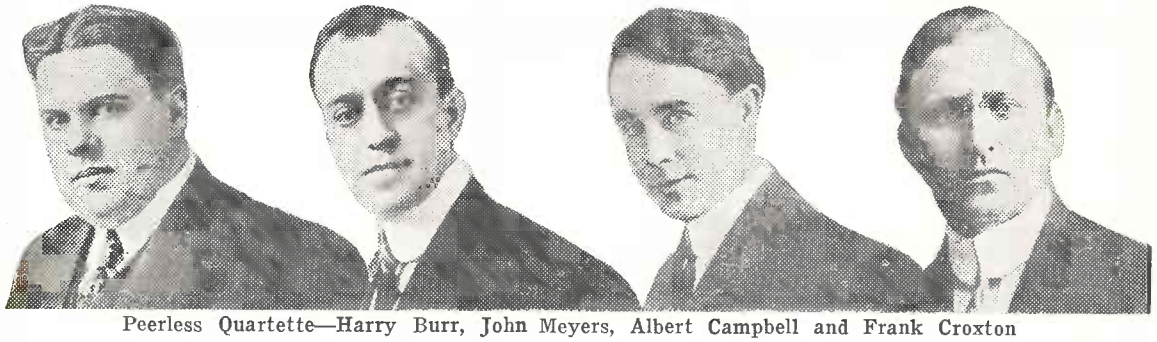
In making such a record these Victor artists realized they were preserving their genius, to be listened to by millions, over many years. In singing into the microphone they knew their voice was being carried to millions instantly; and though the applause, as reckoned in almost 200,000 letters received to date by the Victor Talking Machine Company, is the greatest ever given in the history of the world for any performance, the lack of immediate response was uncanny. The solitude of the artists, while broadcasting—the absence of a audience—was so unusual as to be most disconcerting. As De Luca said after his experience, "This time I was so nervous, oh, so nervous! I tremble still. It is not like the stage. There you feel a little hoarseness perhaps. Very well, you walk about, you make gestures, you turn your back. Soon it is all right, and no one has noticed. But here you cannot make gestures.

"After my song I stand there, waiting. But I hear nothing. I still wait. Nothing. Then I think, no applause, they do not like me. Terrible! But next time I shall be all right. I shall know them."

Madame Dal Monte said: "It was like a dream—just a dream—to think of all those people listening."

14 Stations—2200 Miles

Twenty-two hundred and fifty miles of telephone wires are connected, four-



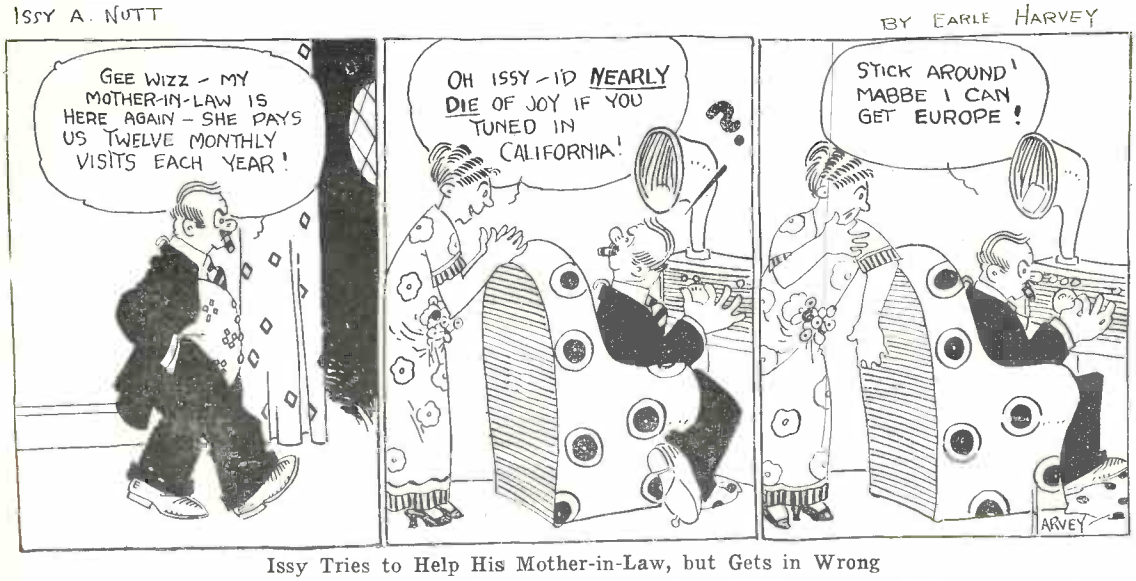
Peerless Quartette—Harry Burr, John Meyers, Albert Campbell and Frank Croxton

teen stations are hooked up by direct telephone wires from Station WEAF for the Victor concerts. The concert travels to each of the other thirteen stations over these telephone wires. Here it is recaught, relayed and rebroadcast so that instantly the concert is heard by millions.

It is estimated that more than 8,000,000 people listened to the first Victor broadcast concert on January 1, when John McCormack and Bori sang. Since then six more stations have been added and the listeners-in are more than 10,000,000.

It is an amazing fact that a person standing thirty feet from De Luca when he is broadcasting does not hear him as quickly as a farmer tucked off in a corner of the Dakotas, thousands of miles from New York. This is hardly

Continued on Page 22.



Issy Tries to Help His Mother-in-Law, but Gets in Wrong

THE RADIO TELESCOPE

Continued from Page 10

only. We thus realize not only "tuning selectivity" of the ordinary kind, but also "directional selectivity."

A few rather curious and interesting effects will be found in the use of such receivers. In the interior rooms of steel-frame buildings, it will sometimes be found that all signals seem to come from about the same point. The reception is fairly good, but the directions of all signals are the same. This is because the reception is chiefly from the magnetic fields of currents induced by the travelling waves either in the steel of the building or in the electric wiring system of the building.

One Boosts the Other

A nearby wire antenna of considerable length will increase the signal strength on a coil receiver when both are tuned to the same frequency. If the long aerial has a regenerative set connected to it, with the tickler or feed back control brought well up the scale, it will very greatly increase the strength of the signals on the coil receiver because regeneration actually strengthens the local field of the incoming radio waves.

Sometimes at night, and particularly in certain country locations, signals from stations roughly a hundred miles away, fade markedly, and vary rapidly in intensity. When using an ordinary long wire antenna receiver, nothing can be done about the fading effect. With the coil receiver, however, it will sometimes be found that when such a signal fades rapidly, swinging the coil approximately ninety degrees to a new position at right angles to the original direction will bring the signal back again. When this works it is a very useful way of following the fading effects of an incoming program, since it has the advantage that it enables you to hold the signal at a critical moment, for example when some important statement is being broadcast or the station call letters are being given.

In view of its portability, directional selectivity, and general interest and convenience of installation, the coil aerial receiver or radio telescope is sure to be widely used in modern sets, and to have a real sphere of usefulness.

WEEDING OUT BAD TUBES

Continued from Page 14

Reading the Galvanometer

The galvanometer, which is here suggested as a Western Model 425, is connected in series with condenser C1. This latter has a value of .00012, mfd. This size is not usually carried in stock by most radio dealers, but may be obtained by connecting two .00025 mfd. in series. Such a connection cuts the capacity down to half.

This galvanometer works on very high frequency oscillations and indicates the amount of current that is passing through the tube. No direct current goes through this instrument since the condenser C1 is in circuit with it. A condenser allows an alternating current to pass but not direct current.

The correct value which galvanometer G should show cannot be told in this article as so much depends on the coil and condenser. The thing to do is try out several tubes and see how they compare. If the readings are practically alike on all of them, there is no doubt but they are first class. But if one or two drop considerably below the others then it shows that they are defective and should not be used. In testing UV-201A tubes the reading of this meter will usually lie between 30 and 40, but more regard should be paid to the deflection of the needle when a good tube is inserted and this may be considered standard.

Cutting Down the Cost

The most expensive parts of this outfit are the three meters. Anyone operating a radio store or doing very much repair work should include them in spite of the cost. But if you have only your own set to test and so wish to reduce the price as much as possible the volt meter and ammeter may be omitted. In such a case adjust the rheostat until it

Continued on Page 22.

Fone Fun For Fans

Point Proven

"You say you come from Detroit," said the doctor; "that's where they make automobiles, isn't it?"

"Sure," replied the patient with some resentment; "we make other things in Detroit, too."

"Yes, I know," retorted the doctor; "I've ridden in 'em."—Store Chat.

Avoiding Difficulties

The junior partner was interviewing a pretty girl who had applied for a position. The senior partner came in, and, after inspecting the vision, called the other member of the firm aside and whispered, "I'd hire her."

"I have."

"Can she take dictation?"

"We'll find that out later," said the junior partner. "I didn't want any obstacles to crop up."—Louisville Courier-Journal.

The Trust Buster

Tommy (at cigar store)—"Please, father wants to know if it's true there's a tobacco trust?"

Clerk—"Quite true."

Tommy—"Well, father would like to be trusted for two ounces, please.—London Mail.

A Crowd Expected

A young man with a pretty but notoriously flirtatious fiancee wrote to a supposed rival. "I've been told that you have been seen kissing my girl. Come to my office at 11 on Friday. I want to have this matter out." The rival answered, "I've received a copy of your circular letter and will be present at the mass meeting."—Argonaut, San Francisco.

The Flavor Lasts

Grocer's Clerk—Should I order some more fresh eggs?

Grocer—No. We have enough fresh eggs in the cellar to last us a couple of months.—The Progressive Grocer.

Wakeful Feature

Mother—Is daddy asleep?

Betty—Yes, mother—all except his nose.—London Humorist.

No Backing Out Now

She—If wishes came true, what would be your first?

He—I would wish—Ah, if only I dared tell you.

She—Go on, go on. What do you think I brought up wishing for?—Jack-o'lantern.

A Professional

A campaigner was constantly interrupted by a man in the crowd, who kept shouting out, "Liar!" After about the twentieth repetition, the speaker paused and fixed his eyes on his tormentor. "If the gentleman who persists in interrupting," he said, "will be good enough to tell us his name instead of merely shouting out his calling, I am sure we shall all be pleased to make his acquaintance."—Christian Register.

SHOOTING WAVES LIKE BULLETS

Continued from Page 18.

Twelve Words at Once

The authors of this recent paper show how by much painstaking work and many ingenious new inventions this has been done, so realizing Hammond's dreams of a dozen years ago. The messages from Europe are picked out of the ether in Maine, scrambled together and sent out by a single transmitter. This composite signal is then received on Long Island and unscrambled into a dozen words at the same time, which are fed into receiving sets where they go through the usual process of detection and transmission to New York. The signals so reproduced are exact duplicates of the original messages, word for word, so that the operators in New York do not know whether they have received the original signals, or the scrambled and unscrambled dots and dashes via Belfast, Maine.

BROADCASTING THE VICTOR ARTISTS

Continued from Page 20.

believable, but is scientifically true. That's because electric impulses which carry the artist's voice through the air travel with the speed of light—186,000 miles per second. Ordinary sounds travel only 1090 feet per second. So that it takes but one-forty-sixth of a second for the first note of a song to reach San Francisco from New York. A person on the West Coast, therefore, would hear the first note of a selection over the radio sooner than a person standing twenty-five feet from the artist singing.

To every listener-in the Victor broadcast concerts have been an inspiration and an education. To radio fans interested also in the technical marvels these concerts have been a revelation in America's engineering skill. The table below shows the stations, with their power and frequency.

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WEEDING OUT BAD TUBES

Continued from Page 21

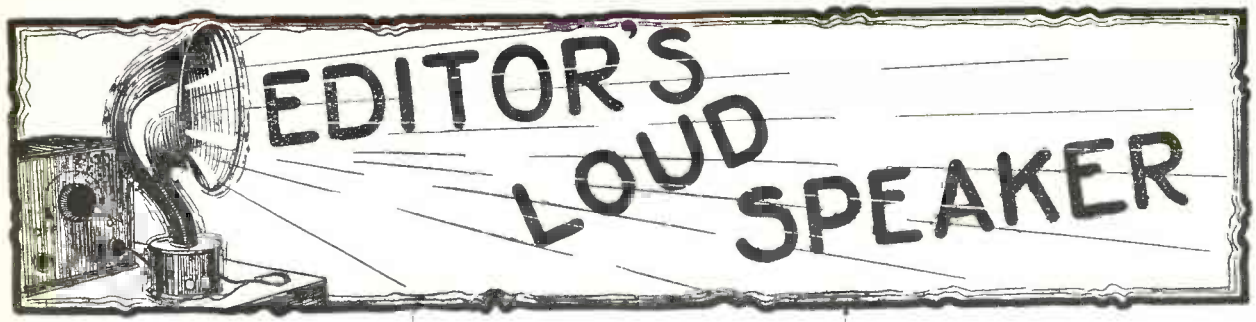
gives the same brightness of filament that you usually use in your set. While this may not be exactly correct still it will be close enough so that a good comparison may be made between various tubes.

You see such a test will not work on a single tube anyway and in checking up two or three tubes you can tell how close they are alike. Thus if one is considerably better than another when the right voltage is applied to the filament it will show up as being a good deal better even though the rheostat be turned too high or too low. That is why it is not necessary to fuss very much about the exact pressure at which such a test is run.

The Tubes Do Not Add

Unlike the boy who said that he got 100% in his examinations—50 in arithmetic and 50 in spelling—the vacuum tubes do not add up. Instead they multiply the loudness from one another. So if one tube gives only half the increase it should while another is one quarter efficient then the final volume is only ½x¼ or ⅛ as much as would be heard if the tubes were all good ones.

Anyone building such a tube tester will find it not only to his own advantage, but he can also help out his friends by weeding out their bad tubes.



ASHAMED OF ONE'S COUNTRY

Some one has said that patriotism is a rather low grade virtue. To be sure it is not as unselfish as some of the others, but even at that it is usually regarded as a good feeling to have.

We Americans ought to be very proud of our country. It leads the world in a great many different things and most of them are very desirable. It is hard to understand the attitude of some well educated Americans who seem to deprecate their country. This was more noticeable before the war and we are glad to see that it is diminishing. Especially in matters of music it used to be the style to think that nothing good came from United States.

As a result of this attitude, notice that so much of our opera music is sung in foreign languages. Probably a good many people think that it is because the words were originally written that way. This is not true. When you travel abroad you will find that countries like France, Germany and Italy have as much or more opera than we do, and it is the general custom to sing at least the greater part of it in the native tongue. When travelling in Italy the writer enjoyed Wagner's operas, but were they sung in the original German? By no means, they were translated into Italian. The people of Paris listen to the Italian classics, but they do not need to know the language to understand as of course, they are translated into French.

Fooling Our Friends

Undoubtedly, a good many of us in the past have affected a love for music as a pose, and it has helped along such a position to have the songs in a language our friends can't understand. It makes us seem a little better than the rest and also helps out in preventing them asking any embarrassing questions.

But radio is pouring good music into almost every household, and as a result the real appreciation of its value is spreading more and more. We ought all to realize that opera *does not* need to be sung in a foreign tongue in order to be opera. It is often said that Italian is such a soft spoken language that it adds to the harmony of song. While this may be true to some slight extent it can't begin to make up for not knowing what is being sung.

Even this objection fades when German music is being discussed. I think that most everyone will agree that English is smoother sounding than German. The harsh, nasal tones which are spoken in Germany are certainly much rougher than anything in America. And yet we hear many such operas sung without being translated into English.

Hard to Hear in English

A striking example of this point has been heard recently in the Victor concerts, which have been broadcast from so many big stations. Some of the artists have sung in English, but more have used Italian. It is not any too easy to catch the words of a ballad heard from a loud speaker even when sung in English. Any one who claims he can understand an Italian song under such conditions must either be a liar or a pretty good student of foreign languages. And anyone who is sincere will admit that a song should have words as well as music.

THE BELLOW OF A BULL

Away back in ancient Greece there was once a man who was a broadcasting station all by himself. His voice was so loud that even when he whispered visitors thought it was thundering. His name was Stentor, and from that we get the phrase "A Stentorian Voice." He was made chief town crier to the army.

In these days a concert singer must always have at least two qualities of voice. Of course, one is that it must be sweet sounding and pleasing. But another, which is equally important, is the requirement that he can be heard all over a large hall. No matter how much applause he may get from the $3.00 seats in front, those who sit in the back of the auditorium will get up and storm the box office to get their $1.00 back if they are not able to hear his flute like tones.

Must Reach Peanut Seats

When a promising young girl was brought to the Conservatory of Music to study with the hope of becoming a concert star, the professor would always have to pay attention to the loudness of her voice. It might be sweet, accurate, and with a good range, but unless it could be heard as far as the rush seats up in the peanut gallery, an honest instruc-

tor would tell the sad truth that she could not hope to become an opera star.

While this requirement is still true for anyone who expects to do stage work, it has been changed considerably by the coming of radio. Nowadays a singer who wants to be heard by millions does not need to have lungs which suggest the blower of a big pipe organ. In every broadcasting studio there is a so-called voice amplifier which takes the output from the microphone and multiplies it by 10, 100 or 1000, as the studio operator decides. If a man starts raving about local traction situation or acts if he thought he were in a nominating convention, right away with a twist of the dial the operator cuts down his bellowing to a moderate volume.

And if, on the other hand, a sweet young thing explains how to banish war forever, in a lady-like tone that can not be heard across the room, another twist of the same dial will bring it up to a degree of loudness which can easily be heard from your loud speaker one thousand miles away. A meter in the output circuit is the guide for this engineer and he keeps the needle reading at about the same point on the scale all the time. That is why you find that all performers have the right volume of tone.

How Far Can You Shout?

This technical development has given the sweet voice an equal chance with the loud voice. The studio director does not have to pay any attention to the distance which the artist can shout. If the voice is good, then no matter how soft it may be, the singer is given a chance at broadcasting. As this fact becomes better appreciated there is no doubt that many good singers will be developed whose work on the air is wonderful but who will never be heard in concert recitals.

Our only regret in this connection is that some sort of electrical device has not been invented to keep a singer on the key. If only the studio director could turn a knob and raise those high notes about half a tone how much better many a soprano would sound.

BLAMING THE BATTERIES

When the doctor came to call last night and wanted to hear the new radio set it was too bad that there was so much noise to disturb the concert. It would never do to blame it on the set so the best thing to do seemed to be to talk about the batteries being low.

This "low battery" stuff has served as an alibi for a great many different kinds of noises. There is one growing objection to it however, your friends are getting to realize that the batteries never cause any such noises, unless there is a broken wire.

Some time ago the Bureau of Standards at Washington decided to run a long series of tests on radio batteries. Of course, they naturally wanted to know the voltage and current of a cell, how long it would last, and the way it would hold up on a long discharge. Another test they had scheduled was that of noise. They thought that an old battery or one poorly made would cause some kind of noise in the head phones.

No Noises Noticed

All sorts of experiments were run on all the popular makes of batteries on the market. This took in both the "A" and "B" styles. They tried them when they were new and when they were old. They short circuited some and grounded others. High temperatures were applied like those at the equator. Then the batteries would be plunged into the cold of the Arctic Circle. And did they get any whisper of noise under any of these conditions? Not a peep.

As result of these findings they decided to discontinue the noise tests. What is the use of running any kind of an experiment if the poorest subject shows up just as well as the best.

That does not mean that noises never come from battery installations. If the wire which connects one cell to another breaks so that the ends sometimes touch and sometimes don't, or if it gets corroded so badly that it no longer makes a good contact then you will have noise which sounds very much like static. But notice that in such a case it is not the battery cells at all but the connections which are responsible. If the same kind of a break should occur at your rheostat or condenser you would get just the same kind of noise.

The cure for such trouble is very simple. All you have to do is to solder up the connection. Sometimes it is hard to do in a "B" battery because you don't find out right away where the bad contact is. Probably the quickest way to locate such a difficulty is to open up the wax on top of the middle of the block. Then use only the first half of the battery by sliding one terminal over to that cell. Of course, this will reduce the voltage on the tubes so you will have to retune the set slightly. If the noise still continues you know that the break is in the first half. But if it stops, test out the other half and you will find it there.

How to Find It

After you have located which part is at fault divide this in two again in the same way. By continuing this treatment of subdividing the bad section you will finally reduce it to a single cell. Then you will find that the wire from carbon to zinc is broken or corroded. A new wire will remedy the trouble.

Of course, an old battery will have lost lots of its voltage and so the set will not operate as well as it should. But this difficulty will show up as loss of loudness in the set or possibly a blurring of the music—never as noise.

Building The "Q-T" Reproducer

A Perfect Tone Receiver for Fans Who Know Good Music

By W. H. H. KNOX, Los Angeles

IN selecting the above title for this article I have been influenced largely by a desire to get away, as far as possible, from the conventional form of headings that appear in practically all of the radio magazines at the present time.

I do not object to the practice of adding an extra coil or two to some ancient hook-up, long since forgotten, and then calling it the "Jones", "Smith" or "Brown" circuit, as the case may be, for I believe this to be a good way of differentiating between the various methods of combining the principles of radio as we know them to-day. However, I do take exception to the practice of trying to juggle the English alphabet in an attempt to pattern a novel word for every new arrangement of these old principles made by the radio experimenter. It is most confusing to say the least, and usually the word selected is as void of meaning as the circuit itself is of any new principles. So I am going to call this the "Q-T", (Quality-Tone) reproducer, as it does "nothing else but".

Distance or Quality

It seems to me that, due to the strenuous efforts now being made for DX (distance) results, the quality of tone is being sacrificed to an alarming degree. I believe this is becoming a grave obstacle in the rapid advancement of this wonderful branch of science, due to the fact that the public care more for good tone reception than for long distance performance, in the majority of cases.

I have always been a firm advocate of the crystal as a detector and I believe that some time in the near future, a real rectifier will be invented that will give as much distance as a tube, and yet far eclipse it as to the quality of tone. Many fans believe to-day that the crystal is best as a detector for the true reproduction of music and voice, and although some distance must be sacrificed in the use of this agent as a rectifier, still I believe that many prefer to accept this sacrifice, until some means of combining the two (tone and DX) is discovered.

No Apology for Crystal

For some reason there seems to be a general feeling among enthusiasts that radio is slipping backwards when a crystal detector is suggested in a circuit. Not long ago I read an article by a well known reflex authority, in which he apologized for advising the use of a crystal instead of a tube detector in his hook-up, explaining that this might look to some like a step backwards in his experimental work. Personally, the judgment of this author rose several points in my estimation, as I felt that he not only was capable of recognizing true tone reception when he heard it, but also had the courage of his convictions, and back-bone enough to tell the world about them.

In presenting the following circuit I do so with the feeling that many who already have built the simple "three circuit" hook-up, will be influenced to change, and realize perhaps for the first

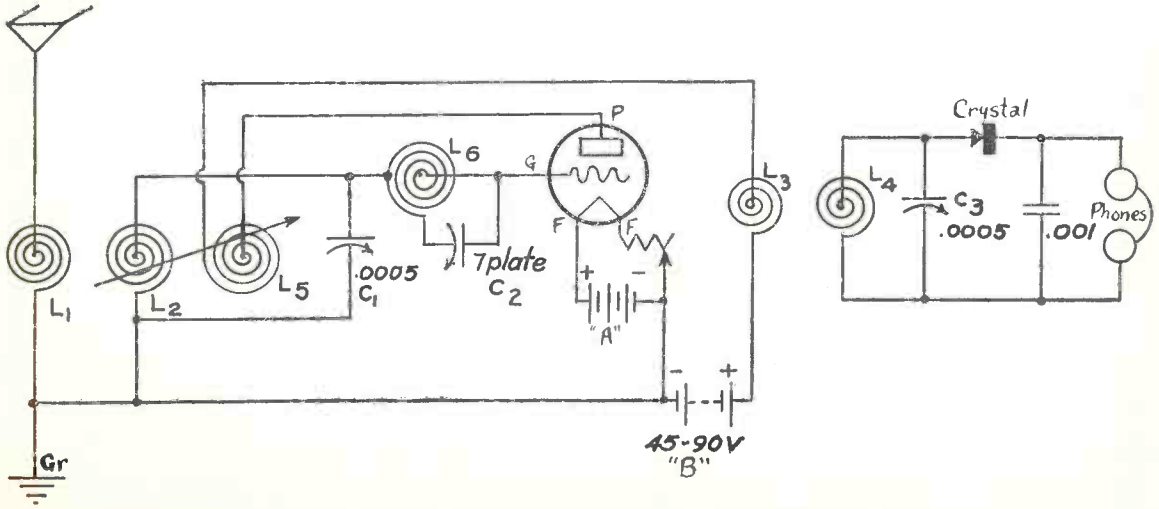


Fig. 1. A Crystal Set with Regeneration and a Built-in Wave Trap

time, what real tone reception actually means. It will cut down a few hundred miles on their DX reception, but what they *do* pick-up will be a true reproduction, less the terrible screeches, groans, and howls they are bound to get with a straight three circuit regenerative hook-up.

Adjusting the Coils

To begin with, I want to say that exceptional care should be taken in the construction of the coils. These are very important in this circuit, and although the very best low-loss condensers one can afford should be used, the coils must be carefully made. I would be ashamed to tell you how many coils I have made in the past two years, but suffice it to say, that I have made a plenty, and have gotten the best results with ones made as follows: Use 5 in. spider-web forms, with about 13 slots (cost 5c or 10c); wind on a few more turns than the directions call for, using 20/38 Litz wire. Then assemble your set and give it a good try out.

Now begin with L1 and remove 2 or 3 turns; if no improvement is noticed, leave this coil and turn your attention to L2. The principle reason for changing the number of turns on this one, is to make C1 register properly in order to cover the necessary band of wave-lengths. Tune in a station of about 800 k.c., and if C1 registers higher than 35 degrees, remove turns (from L2) until about this reading is reached. Now do the same thing with L4, and when you have the correct number, for conditions as they exist in your particular case, remove the coils, and apply plain collodion on both sides, where the wires cross between the spokes.

Put them in the oven (not very hot) for a few minutes, then with a small sharp chisel cut the spokes where they join the hub. Now carefully pull the spokes out and you will have self-supporting coils, of as low loss as it is possible to construct, and you will be well paid for your extra trouble, I feel sure. Some authorities, however, deny that removing the spokes makes any difference at all, except in causing you a lot of unnecessary work.

Wind the coils as follows, passing the wire over one spoke, then under the next:

L1—16 turns
L2—40 turns
L3—26 turns 5″ spider-web forms.
L4—50 turns
L5—36 turns
L6—40 turns tapped at 20th turn.

The above will usually have to be modified for the best results, as there are many factors to be considered, such as the length of aerial, the make of variable condensers used, etc. This is one reason why better results are often obtained by using home-made coils.

New York University

Professor Marshall S. Brown is the Dean of the Faculty of New York University. He is delivering lectures in American history every Monday evening for the "air college" course. If you think this subject is dry just tune in to WJZ.

Those on the market are, of course, made as uniform as possible, a certain number of turns being decided upon by the originator of the circuit and then given to the manufacturer. This system is all right when applied to condensers, for they are variable anyhow, and while this variation will naturally take care of slight discrepancies in the coils, still it is best to have the latter as near right as possible.

Why Some Sets Fail

The above condition is responsible for a large per cent of the failures found even when directions are closely followed, and in many cases these failures could be turned into successes, simply by adding or removing a few turns from some of the coils used.

While on the subject of coils, I wish to mention a somewhat erroneous custom which was quite commonly followed, in giving directions for "winding your own," but which has been corrected quite considerably of late, namely: giving the exact number of turns to be wound, but failing to state just what these were to be wound on. This one thing confused me perhaps more than any other, when I first started to experiment with reflex circuits, some two years ago, and I even went so far as to make a chart of the windings of the corresponding coils, as suggested by the different authors of articles on reflex circuits. At the end of several months I found that I had charted no less than 14 different reflex hook-ups, and when I compared these figures, I found much to my surprise, that in no case did any two of the writers agree as to the number of turns to be employed.

Perhaps this may seem strange to you at first, and as you think it over, no doubt you will come to the conclusion that there is a nigger in the wood-pile somewhere, and so there is. But while they all differed, they were *all* entirely right, since each used a different size of tubing, various makes of condensers, different length aerials and so on down the line.

How to Wire the Set

After having carefully prepared the coils, proceed to mount them on the base-board as follows: Make L1 and L2 parallel, 3/16″ apart, and be sure the windings are in the same direction. Now mount L5 parallel to L2, making it movable in order that the coupling (distance) between this coil and L2 may be varied. Mount L6 at right angles to L2 and at least four inches away from it; then place L4 parallel to L3 and about ¼″ distant from it. This arrangement will prevent inter-capacity

coupling between the groups of coils, thereby increasing the efficiency of the set to a marked degree.

The coils *must be* connected as follows: Beginning (inside end) of L1 to aerial; ending to ground. Beginning of L2 to middle tap of L6, ending to —"B" battery. Beginning of L5 to L3 and ending to plate. (Winding the same direction as L2). Beginning of L6 to grid and ending to condenser C2. Beginning of L3 to L5, ending to "B"+ battery. Beginning of L4 to crystal detector and ending to phone-post. By referring to Fig. 1, the other connections will easily be seen, and as care was taken in preparing the drawing, to show the coils properly connected, you can check up your connections already made, directly from this diagram.

Results to be Expected

Selectivity—being located less than five miles from four powerful stations, I was able to get KGO at Oakland,(350 miles) without the slightest interference from the local broadcasters, and the volume, with No. 199 tube, was plenty strong to operate a Baldwin unit loud speaker using 75 volts on the plate (2 45-volt batteries that had been used several months).

The only claim made for this set is that it is mighty efficient, the quality of tone reception is indeed hard to beat, and under ordinary conditions, it will give a good account of itself on DX work, considering that a crystal is being used as a detector. (I feel obliged to add this last clause, altho it is not in the form of an apology.)

How the Set Works

The aerial waves come in through the primary, L1, to ground. This spider web excites the secondary, L2, which is connected between the filament and grid. This secondary circuit is adjusted to the proper wave speed by condenser C1. As this tube is not a detector, but an amplifier, notice that no grid condenser and leak are used.

In the grid circuit, however, is a spider web, L6, and a seven plate condenser, C2, in parallel. This combination acts as a kind of wave trap and aids a great deal in sharpening the tuning of the set. The output from the plate is conducted through coil L5, which acts as a tickler and causes regeneration. This must be controlled so as not to give too much feedback or the set will break into oscillations. After leaving the tickler, the radio frequency waves (note that they have not yet been reduced to audio frequency) pass through the primary of radio transformer L3 back to the "B" battery.

The secondary of this transformer is tuned by condenser C3. The vibration is impressed on the crystal detector and from there through the phones in the usual way. The .001 mfd. condenser connected across the phones may often be omitted since the capacity of the phone cord is often enough to carry the high frequency oscillation so that it does not have to thread through the high inductance of the phones themselves. This completes the operation of the set.

JOSIAH ZURO, Conductor of the Sunday Symphonic Society, whose concerts are to be a feature of WJY's programs every alternate Sunday for the remainder of the season.

Make Your Own Layout

I shall omit giving the panel layout for this set, leaving this entirely to the ingenuity of the reader, and offer as a suggestion that you first try it out on a board (I do all of my experimenting on a board 12 by 24 inches), and when you are satisfied that you have the right number of turns on your coils, and have the arrangements of the different parts properly made, in order to keep all leads as short as possible, and coils placed to avoid inter-coupling as much as you can, then it is quite a simple matter to lay out and drill the panel.

I shall be glad to answer any questions you may wish to ask concerning this rather simple hook-up, with possibly one exception: Please don't ask me how to substitute a tube detector for crystal, for right then "our ways divide."

I shall be glad to receive any suggestions you may wish to offer in regard to the improvement of this circuit, and only hope you will get as much real enjoyment out of it when completed as I do with mine.

HE SAT ON TOP OF POLE

Quick thinking and courage were recently demonstrated by A. B. Chamberlain, a WGY radio engineer, when for three hours during a cold winter night he sat on a platform erected at the top of a thirty-foot pole and "monitored" a wire carrying music on its way to reach thousands of listeners tuned to WGY.

WGY of Schenectady and WJZ, New York, frequently exchange programs by means of wire connection between the two cities. Sometimes the program originates at Schenectady and sometimes in New York. To keep up the signal strength at the other end, a repeater or amplifier station is maintained at Poughkeepsie, the half-way point between the two cities. This station was burned just when a program by the American Orchestral Society was scheduled for the evening.

William Purcell, engineer in charge of WGY, and two of his assistants went to the scene of the fire with emergency equipment. It was found that the only method by which capacity balance (to prevent distortion) could be secured with the equipment at hand, was to place the amplyfying unit at the top of a telegraph pole. A platform was rigged up at 8 o'clock, just before picking up the New York concert; Mr. Chamberlain took his place on the platform and with headphones monitored the line for three hours until WJZ signed off.

American Radio Relay League

APRIL GOOD NEWS FLASHED ACROSS FOUR STATES

FOR several weeks now Mr. O. Davis of La Junta, Colo., has been receiving daily bulletins by code reporting the condition of his wife, who is in Rochester, Minn., recovering from a serious operation. She has been sick a long time, and because of business reasons Mr. Davis could not stay with her.

While on a visit to the hospital where she is staying, he noticed a radio antenna that he believed must be attached to an amateur code transmitting station. He inquired of some boys who were playing ball in a vacant lot, and learned from them that the station was owned by a Mr. Carl Frank, employed at a local bank. He later called on Mr. Frank and found that the latter had recently installed the set and had a beginner's knowledge of the code.

Fever Up 2 Degrees More

Once the circumstances were explained Frank was eager to do everything in his power to keep Mr. Davis informed of his wife's condition, when he returned to his home in Colorado. The two arranged a definite schedule of operation, and within a few days were able to communicate with one another regularly. Here are two samples of the radio bulletins which Davis received:

"Mrs. Davis not so well since Monday, —her temperature up 2 degrees."

"Mrs. Davis had a good day: doctor says she is doing fine."

Amateur radio has been a hobby with Mr. Davis for some time and he has frequently placed his station at the disposal of railroads when wire communication has been interrupted by bad storms. But this incident is the first time that his station has been of great use in the case of a personal emergency. At the last report Mrs. Davis was said to be improving steadily, but the daily schedule with Rochester was still being maintained. Mr. Davis is a member of the American Radio Relay League.

WHEN IT'S DAYTIME IN ENGLAND

In broad daylight at 10 a. m., Eastern Standard Time, when radio waves are generally feeble and reach out with only a small percentage of their normal strength, on account of the deadening effect of the sun's rays, John L. Reinartz, inventor and radio amateur of South Manchester, Conn., succeeded in sending signals from his code transmitter across the Atlantic ocean to England. He used a wave frequency of 14,300 k.c. (21 meters) further proving his theory that the very short waves can be as effective in daylight as the longer waves are at night.

This feat is the climax of many months of experimenting during which Reinartz has been co-operating with the U. S. Navy and with amateur members of the American Radio Relay League. His success in being heard across the Atlantic in daylight was confirmed by the A. R. R. L. following the receipt of a radiogram from a British operator. His signals were picked up with great reliability by F. A. Mayer, radio amateur of Wickford, Essex, England. At the time, of course, the signals were in broad daylight all of the way.

The A. R. R. L. believes that these experiments by Reinartz have done more than anything else to prove that the high k.c. waves promise eventually complete relief from daylight troubles. A few months ago Reinartz' signals were heard in daylight across our continent by an amateur living near the West coast. His work is regarded as the most important radio development since amateurs in Europe and the United States began to exchange messages across the Atlantic ocean in both directions on fast waves.

STAMFORD STOPS THE LEAKS

For a long time radio fans in Stamford, Conn., were bothered with interference from the high power lines of the local lighting company and the railroad system. As the latter runs by electricity the trouble was believed to be coming mostly from that source. The interference finally got so bad that it was impossible for fans to listen to broadcasts.

Finally, members of the Plate and Grid Club, composed of both listeners and amateurs of the American Radio Relay League, decided to take the matter into their own hands. The co-operation of the "Stamford Sentinel," a morning newspaper, was sought and a committee appointed to interview railroad officials. Although previously unaware that their lines had been causing trouble of this nature, these officials agreed to help the committee even to the extent of cutting off the power temporarily.

The operators of several amateur stations, including the city manager of the A. R. R. L., installed an eight-tube super heterodyne receiver and a loop aerial in an automobile and set out to locate the leaks. They visited first those sections of the city where the interference was the worst. Most of the electric light trouble was found near poles supporting transformers.

About half a dozen bad leaks across insulations were discovered and reported to both companies, with the result that the interference no longer exists.

OUR NEW TRAFFIC MANAGER

F. E. Handy of Orono, Me., has been appointed acting traffic manager of the American Radio Relay League for six months, during which F. H. Schnell, traffic manager, has been called to active duty as a lieutenant in the navy in order that he may accompany the Pacific fleet for its forthcoming maneuvers. Mr. Handy was formerly assistant division manager of the A. R. R. L.'s New England Division and operator of amateur stations 1XAH and 1BDI. He has been highly successful in communication with foreign amateurs.

The traffic department of the League, which has grown tremendously in the last few years provides the only means by which messages may be sent to any part of the United States or Canada without a charge. The membership of the A. R. R. L. at present numbers 20,000 amateurs, most of whom operate transmitting sets. The efficiency of the traffic system has been substantially increased by the appointment of official relay stations, owners of which are bound by promise to forward all messages received.

Rx DR RADIO PRESCRIBES.

NOTE: In this section the Technical Editor will answer questions of general interest on any radio matter. Any of our readers may ask not more than two questions, and if the subjects are of importance to most radio fans they will be answered free of charge in the magazine. If they are of special interest to the questioner alone, or if a personal answer is desired, a charge of fifty cents will be made for each answer. This will entitle the questioner to a personal answer by letter. However, if the question requires considerable experimental work, higher rates will be charged.

Question. What is meant by the expression "the modulation of a sending set is practically complete?"

Answer. When a radio program is given to a microphone it modulates the high frequency energy which is at the instant being fed to the aerial by the oscillator. This consists in periodically reducing the energy to a low value, just as with a valve the amount of water flowing in a pipe can be turned on and off. But notice that a valve, while it can *reduce* the flow through a pipe, can never increase it above the value it had before. In the same way talking into the microphone reduces the RF oscillations and then allows them to come back again at a very rapid rate.

If the valve action is good, the volume of radiation going out at the instant the valve is turned off is small. If the modulation is not so good, then it acts like a leaky valve, which allows a lot of water to flow, even when turned off. Such a condition is inefficient. That is why the designers aim to get as much modulation as possible.

Question. In using a wave meter, some hook-ups call for a lamp indicator and some for a milliameter. Why is this?

Answer. The wave meter is intended to indicate the frequency (or wave length) of the radio waves with which you are experimenting. If you are calibrating the wave length of a sending station, then you have a large amount of power which can be used in the wave meter circuit. This is because it will be located within a few yards of the sending instruments. On the other hand, if you wish to check up on a receiving set which is listening to waves coming from hundreds of miles away, then the amount of power with which you are dealing is almost infinitestimal.

In the first case, since the power is so big it is possible to operate a small lamp as an indicator of when the circuits are in tune. Such a lamp usually will take 1½ volts to make it burn at full brilliancy, and will consume about one watt of power. This amount is furnished by the sending set and the advantage of the lamp is its great simplicity and cheapness. Such a bulb can be bought for about 15 cents. When the waves are coming in from a distance, then there is not enough energy picked up by the aerial to operate such a lamp, even if every bit of the amount caught were fed right to the terminals of the bulb. In such a case it is necessary to use a sensitive meter which will read on a very small fraction of one watt. A satisfactory meter for this service is quite expensive.

Question. What is meant by grounding the batteries, and why is it necessary?

Answer. The batteries in most sets are already grounded in the original hook-up. This is done by connecting one of the "A" battery terminals (usually the A+) to the ground terminal inside the set. If this connection is not made, then it is worthwhile running a wire from the A+ to ground.

The reason for making such a connection is this: The "A" battery is alive to the radio oscillations, since it is connected to the tubes which carry them. If it it is insulated from the ground, then it will have a capacity action—that is, it will act like a small condenser—the battery forming one plate and the ground the other with the air between as a dielectric. So far no trouble is experienced, as this capacity action in itself does no harm. However, as soon as you begin moving any of the "A" battery leads, or even the telephone or loud speaker cable (which is connected to the same circuit) it will alter the amount of this capacity to ground, and such a change will throw the tuning out by a small amount. To hold a distant station in such a case it is necessary to retune every time a change is made in the

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BROADCASTING VICTOR ARTISTS

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Who They Are

Call	Broadcast Cities	Power Watts	Frequency kc.
WEAF	New York	2000	610
WFI	Philadelphia	500	760
WCAE	Pittsburgh	500	650
WJAR	Providence	500	980
WEEI	Boston	500	630
WGR	Buffalo	750	940
WEAR	Cleveland	500	770
WSAI	Cincinnati	1500	920
WWJ	Detroit	500	850
WOC	Davenport	1500	620
WCCO	St. Paul, Minneapolis	500	720
WTIC	Hartford	500	860
WDBH	Worcester	100	1120
WMAQ	Chicago	500	670

Our photograph shows some of the performers who were particularly good

in the last concert. Some people pretend to think that a saxaphone is not a musical instrument. They evidently have not heard Mr. Wiedoeft warble on his instrument. (See Fig. 1). Rudy Wiedoeft is widely known as a master of the saxaphone. He has played in, and led, a number of famous dance organizations, and, of recent years, he has made a number of solo records, besides touring with other Victor Artists.

The International Novelty Orchestra, Fig. 2, under the baton of Nathaniel Shilkret, has achieved its widest fame in the field of the dance. During the last few years it has played a very great number of dance compositions, including those of Latin-America. Some of the finest of these, which include the tango and other dances, are of superb beauty. The members of this organization all have been trained in, or associated with, symphony orchestras, and its recording calls for high qualities of musicianship. The playing of the International Novelty Orchestra, which does not travel, has been accepted by Latin-American musicians and composers themselves, as the perfect type.

The singing of the Peerless Quartet, Fig. 3, has also been accepted as the model for this kind of organization. Albert Campbell has been associated with it for years. He has made solo numbers. duets with Burr, trios with Burr and Meyer, and quartets with these singers and Croxton, who has been a member of several famous singing organizations.

DR. RADIO PRESCRIBES

Continued from Page 29

position of the leads. By grounding the batteries, the capacity is held constant at one value, that is, zero.

Question. Is it possible to add one tube of radio frequency amplification to a single circuit tuner?

Answer. Yes, but it is usually not advisable. Unless you already have two steps of audio frequency amplification, you will find that a tube of RF is not nearly as an efficient addition as the same tube used at audio frequency. If you already use three tubes then by all means change the single circuit to a double circuit tuner before adding another tube. This change in itself will give you greater selectivity and it may increase the range which you can pick up. One step of RF may be added directly to a two-circuit tuner.

In case you wish to put on one such tube ahead of a single circuit tuner as an experiment, it may be done by making one small change in the set. Since the output from the plate of the amplifier is connected through the single circuit tuner coil, to the "B" battery, it puts full "B" battery voltage on the grid condenser, which is also connected to the same coil. If the grid leak is shunted across the grid condenser, as is the usual connection, then it will transmit the full "B" battery voltage to the grid of the detector, which will cause poor operation of the set. Disconnect the grid leak from its old position and run it from the grid to the plus side of the detector filament. This will get around the above difficulty.

Question. Some condensers with 17 plates are called .00025 and others with only 11 plates have the same rating. What capacity should be used when a 13 plate condenser is called for in a hook-up?

Answer. The plates themselves are not important in a condenser, but only the capacity. A two-ton truck will carry the same load whether the machine itself weighs one or three tons, so if the diagram calls for a capacity of, say .00025, then you should use enough plates to get this value. Some condensers have the plates separated farther apart than usual, and so require a larger number to get the same capacity. The ordinary 11 or 13 plate condenser has a value of .00025 mfd. (Microfarad), while the 23 plate condenser usually has a capacity of .0005. When you see either of these specified by plate number it is safe to assume that those values are meant.

Question. The last copy of a radio magazine shows a circuit for a resistance coupled radio frequency amplifier. Will this be satisfactory?

Answer. Resistance coupling is not good for radio frequency. The trouble is that owing to the high speed of oscillation even small capacities rob a great deal of the energy from the amplifiers. In the RF resistance coupled unit the capacities of the tubes themselves act as by-passes to the amplifiers. With transformer coupling the increase, owing to the transformer itself, is more than enough to take care of this leakage. However, in resistance coupling there is no amplification at all due to transformer ratio and so the losses sometimes more than equal the gain of the extra tube.

Even the manufacturers of resistance coupled amplifiers (who naturally favor their own product) recommend that this coupling be used only for audio frequency. Apparently the only reason for showing an RF resistance amplifier is in order to get as many different hook-ups as possible, whether they are good or not.

SHARPEN SINGLE CIRCUIT

Continued from Page 8

ary being separate do not get in each others way, but each vibrates at the particular speed to which they are adjusted.

In conclusion, let us once more suggest as strongly as possible that if you have one of these old types of tuner with a single coil serving as both primary and secondary, then get busy and wind on the single layer of wire on top of the secondary, and you will have a much quicter and more sensitive set at a small cost.

AN IDEAL RADIO ANNOUNCER

Continued from Page 12

ard's call; "AEN" is unfit for use over the air; and "ANN" is awkward. So Brokenshire became "AON." Glover had the same problem; "AGN" and "AHN" were not clearly understandable, and "ABN" was already in use. So he adopted the call "ATN." "ACN" left the twin stations last summer, and the family became "AJN," "ALN," "AON," and "ATN," with "ABN" and "ARN" on the air only on special occasions.

On the first of March the "A-N" family was officially disbanded; and its members are now known to the radio audience by the same names as the rest of the world calls them.

UNITED STATES BROADCASTING STATIONS ARRANGED ALPHABETICALLY BY CALL LETTERS

Abbreviations: W.L., wave length in meters; K.C., frequencies in kilocycles; W.P., wattpower of station.

	K.C.	W.L.	W.P.
KDKA—Westinghouse Elec. & Mfg. Co., E. Pittsburg, Pa.	970-	309-	1000
KDPM—Westinghouse Elec. & Mfg. Co., Cleveland, O.	1200-	250-	500
KDYM—Savoy Theater, San Diego, Cal.	1070-	280-	100
KDZB—Frank E. Siefert, Bakersfield, Cal.	1250-	240-	100
KDZE—Rhodes Dept. Store, Seattle, Wash.	1110-	270-	100
KFAB—Nebraska Buick Auto Co., Lincoln, Neb.	1250-	240-	200
KFAD—McArthur Bros. Mercantile Co., Phoenix, Ariz.	833-	360-	100
KFAE—State College of Washington	900-	333-	500
KFAF—Western Radio Corp., Denver, Colo.	1080-	278-	500
KFAJ—University of Colorado, Boulder, Colo.	1150-	261-	100
KFAU—Boise High School, Boise, Idaho	1090-	275-	500
KFBK—Kimball Upson Co., Sacramento, Cal.	1060-	283-	100
KFCF—Frank A. Moore, Walla Walla, Wash.	1170-	256-	100
KFCL—Leslie E. Rice, Los Angeles, Cal.	1270-	236-	500
KFDM—Magnolia Petroleum Co., Beaumont, Tex.	950-	316-	500
KFDX—First Baptist Church, Shreveport, La.	1200-	250-	100
KFDY—S. Dak. Ste. Col. Ag. & Mech. Arts, Br'kngs., S. Dak.	1100-	273-	100
KFEQ—Scroggin & Co. Bank, Oak, Nebr.	1120-	268-	100
KFEX—Augsburg Seminary, Minneapolis, Minn.	1150-	261-	100
KFFV—Graceland College, Lamoni, Iowa	1200-	250-	100
KFGC—Louisiana State Univ., Baton Rouge, La.	1120-	268-	100
KFGD—Oklahoma College for Women, Chickasha, Okla.	1190-	252-	100
KFGH—Leland Stanford Junior Univ., Stanford Univ., Cal.	1100-	273-	500
KFGX—First Presbyterian Church, Orange, Tex.	1200-	250-	500
KFHJ—Fallon & Co., Santa Barbara, Cal.	833-	360-	100
KFHR—Star Elec. & Radio Co., Seattle, Wash.	1140-	263-	100
KFI—Earl C. Anthony, Los Angeles, Cal.	642-	467-	1500
KFIF—Benson Polytechnic Institute, Portland, Ore.	1210-	248-	100
KFIZ—Daily Com'lth & Seifert Rad. Corp., Fondulac, Wis.	1100-	273-	100
KFJF—National Radio Mfg. Co., Oklahoma, Okla.	1150-	261-	225
KFJM—University of No. Dak., Grand Forks, No. Dak.	1080-	278-	100
KFKB—Brinkley-Jones Hosp. Assoc., Milford, Kans.	1100-	273-	500
KFKQ—Conway Radio Laboratories, Conway, Ark.	1200-	250-	100
KFKU—University of Kansas, Lawrence, Kas.	1090-	275-	100
KFKX—Westinghouse Elec. & Mfg. Co., Hastings, Neb.	1040-	288-	1000
KFLR—University of New Mexico, Albuquerque, N. Mex.	1180-	254-	100
KFLV—Swedish Evangalical Mission Church, Rockford, Ill.	1310-	229-	100
KFLZ—Atlantic Automobile Co., Atlantic, Iowa.	1100-	273-	100
KFMQ—University of Arkansas, Fayetteville, Ark.	1090-	275-	500
KFMT—George W. Young, Minneapolis, Minn.	1140-	263-	100
KFMX—Carleton College, Northfield, Minn.	890-	337-	750
KFNF—Henry Field Seed Co., Shenandoah, Iowa.	1130-	266-	500
KFOA—Rhodes Dept. Store	666-	450-	500
KFOC—First Christian Church, Whittier, Cal.	1270-	236-	100
KFON—Echophone Radio Shop, Long Beach, Cal.	1280-	234-	100
KFOU—Hommel Manufacturing Co., Richmond, Cal.	1180-	254-	100
KFOX—Technical High School, Omaha, Nebr.	1210-	248-	100
KFPR—Los Angeles County Forestry, Los Angeles, Cal.	1300-	231-	500
KFPT—Radio Service Corp. of Utah, Salt Lake City, Utah.	1150-	261-	500
KFPX—First Presbyterian Church, Pine Bluff, Ark.	1240-	242-	100
KFPY—Symons Investment Co., Spokane, Wash.	1130-	266-	100
KFQB—Searchlight Publishing Co., Fort Worth, Tex.	1180-	254-	100
KFQC—Kidd Brothers Radio Shop, Taft, Cal.	1300-	231-	100
KFQD—Chovin Supply Co., Anchorage, Alaska	1070-	280-	100
KFQM—Texas Highway Bulletin, Austin, Tex.	1120-	268-	100
KFQU—W. E. Riker, Holy City, Calif.	1280-	234-	100
KFQX—Alfred H. Hubbard, Seattle, Wash.	1290-	233-	500
KFQZ—Taft Radio Co., Hollywood, Calif.	1250-	240-	250
KFRB—Hall Bros., Beeville, Texas	1210-	248-	250
KFRU—Etherical Studios, Bristow, Okla.	1010-	297-	500
KFRW—United Churches of Olympia, Olympia, Wash.	1360-	220-	100
KFSG—Echo Park Evangelistic Asso., Los Angeles, Calif.	1080-	278-	500
KFUM—W. D. Corley, Colorado Springs, Colo.	1240-	242-	100
KFUO—Concordia College, St. Louis, Mo.	550-	545-	500
KFUT—University of Utah, Salt Lake City, Utah.	1150-	261-	100
KFUU—Colburn Radio Laboratories, San Leandro, Calif.	1340-	224-	100
KFWA—Browning Bros. Co., Ogden, Utah.	1400-	214-	500
KGO—General Electric Co., Oakland, Cal.	1000-	300-	2000
KGU—Marion A. Mulrony, Honolulu, Hawaii.	833-	360-	500
KGW—Portland Morning Oregonian, Portland, Ore.	610-	485-	500
KHJ—Times-Mirror Co., Los Angeles, Cal.	742-	404-	500
KHQ—Excelsior Motorcycle & Bicycle Co., Seattle, Wash.	1100-	273-	100
KJS—Bible Institute of Los Angeles, Los Angeles, Cal.	1020-	294-	500
KLDS—Reorg. Church of Jesus Christ of Latter Day Sts., Ind., Mo.	1120-	268-	250
KLS—Warner Bros. Radio Supplies Co., Oakland, Calif.	833-	360-	250
KLX—Tribune Publishing Co., Oakland, Calif.	588-	510-	500
KLZ—Reynolds Radio Co., Denver Colo.	1060-	283-	250
KNT—Walter Hemrich, Kukak Bay, Alaska	1140-	263-	100
KNX—Los Angeles Express, Los Angeles, Cal.	890-	337-	500
KOA—General Electric Co., Denver, Colo.	930-	322-	1000
KOB—New Mexico Col. of Agriculture, State Col., N. Mex.	860-	349-	500
KOP—Detroit Police Dept., Detroit, Mich.	1090-	278-	500
KPO—Hale Bros., San Francisco, Cal.	698-	430-	500
KQV—Doubleday-Hill Electric Co., Pittsburg, Pa.	1090-	275-	500
KSAC—Kansas State Agric. College	880-	341-	500
KSD—Post-Dispatch, St. Louis, Mo.	550-	545-	500
KTHS—New Arlington Hotel Co., Hot Springs, Ark.	800-	375-	500
KTW—First Presbyterian Church, Seattle, Wash.	833-	360-	750
KUO—Examiner Printing Co., San Francisco, Cal.	1220-	246-	150
KUOM—State Univ. of Montana, Missoula, Mont.	1230-	245-	250
KWH—Los Angeles Examiner, Los Angeles, Cal.	833-	360-	250
KYQ—The Electric Shop, Honolulu, Hawaii	1110-	270-	100
KYW—Westinghouse Elec. & Mfg. Co., Chicago, Ill.	560-	535-	1500
KZKZ—Electrical Supply Co., Manila, P. I.	1110-	270-	100
KZM—Preston D. Allen, Oakland, Cal.	833-	360-	100
KZRQ—Far Eastern Radio, Manila, P. I.	1350-	222-	500
WAAB—Valdemar Jensen, New Orleans, La.	1120-	268-	100
WAAC—Tulane University, New Orleans, La.	1090-	275-	100
WAAF—Chicago Daily Drovers Journal, Chicago, Ill.	1080-	278-	200
WAAM—I. R. Nelson Co., Newark, N. J.	1140-	263-	250
WAAW—Omaha Grain Exchange, Omaha, Neb.	1080-	278-	500
WABA—Lake Forest University, Lake Forest, Ill.	1320-	227-	100
WABI—Bangor Railway & Electric Co., Bangor, Me.	1250-	240-	100
WABL—Connecticut Agric. College, Storrs, Conn.	1090-	275-	100
WABN—Ott Radio (Inc.) La Crosse, Wis.	1230-	244-	500
WABO—Lake Avenue Baptist Church, Rochester, N. Y.	1080-	278-	100
WABX—Henry B. Joy, Mount Clemens, Mich.	1180-	254-	250
WAFD—Albert B. Parfeet Co., Port Huron, Mich.	1290-	233-	250
WAHG—A. H. Grebe Co., Richmond Hill, N. Y.	950-	316-	500
WAMD—Hubbard & Co., Minneapolis, Minn.	1230-	244-	100
WBAA—Purdue University, West Lafayette, Ind.	1100-	273-	250
WBAN—Wireless Phone Corp., Paterson, N. J.	1230-	244-	100
WBAO—James Millikin University, Decatur, Ill.	1090-	275-	100
WBAP—Wortham-Carter Publishing Co., Fort Worth, Tex.	630-	476-	1000
WBAV—Erner & Hopkins Co., Columbus, Ohio	1020-	293-	500
WBBP—Petoskey High School, Petoskey, Mich.	1400-	214-	100
WBBG—Irving Vermilya, Mattapoisett, Mass.	1210-	248-	500
WBBL—Grace Covenant Church, Richmond, Va.	1310-	229-	100
WBBM—H. Leslie Atlas, Chicago, Ill.	1330-	226-	200
WBBR—People's Pulpit Assoc., Rossville, N. Y.	1100-	273-	500
WBES—Bliss Electrical School, Takoma Park, Md.	1350-	222-	100
WBT—Southern Radio Corp., Charlotte, N. C.	1090-	275-	250
WBZ—Westinghouse Elec. & Mfg. Co., Springfield, Mass.	900-	331-	1500
WCAD—St. Lawrence University, Canton, N. Y.	1140-	263-	250
WCAE—Kaufmann & Baer Co., Pittsburg, Pa.	650-	461-	500
WCAH—Entrekin Electric Co., Columbus, O.	1130-	266-	200
WCAI—Nebraska Wesleyan Uni., Uni. Place, Nebr.	1190-	275-	500
WCAL—St. Olaf College, Northfield, Minn.	890-	337-	500
WCAP—Cheaspeake & Potomac Tel. Co., Wash., D. C.	640-	469-	500
WCAR—Southern Radio Corp. of Texas, San Antonio, Tex.	1140-	263-	100
WCAU—Durham & Co., Philadelphia, Pa.	1080-	278-	500
WCAX—University of Vermont, Burlington, Vt.	1200-	250-	100
WCAY—Milwaukee Civic Br'dcstng Assoc., Milwaukee, Wis.	1130-	266-	250
WCBC—University of Michigan, Ann Arbor, Mich.	1310-	229-	200
WCBD—Wilbur G. Voliva, Zion, Ill.	870-	345-	500
WCBI—Nicoll, Duncan & Rush, Bemis, Tenn.	1250-	240-	150
WCBQ—First Baptist Church, Nashville, Tenn.	1270-	236-	100
WCBT—Clark University, Worcester, Mass.	1260-	238-	250
WCCO—Washburn Crosby Co., Minneapolis, Minn.	720-	416-	500

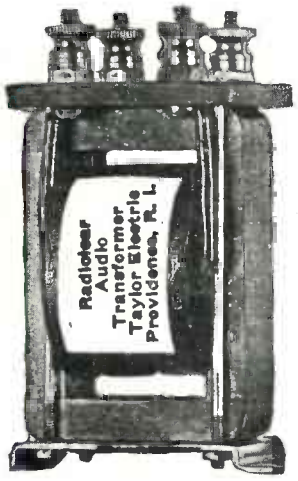
	K.C.	W.L.	W.P.
WCÈE—Charles E. Erbstein, Elgin, Ill	1090-	275-	500
WCK—Stix, Baer & Fuller Dry Goods Co., St. Louis, Mo.	1100-	273-	100
WCM—Texas Markets & Warehouse Dept., Austin, Tex.	1120-	268-	250
WCN—Foster & McDonnell, Chicago, Ill	1130-	266-	500
WCTS—C. T. Sherer Co., Worcester, Mass	1120-	268-	100
WCX—Detroit Free Press, Detroit, Mich	580-	517-	500
WDAE—Tampa Daily News, Tampa, Fla	1100-	273-	250
WDAF—Kansas City Star, Kansas City, Mo	820-	366-	500
WDAG—J. Laurence Martin, Amarillo, Tex	1140-	263-	100
WDBE—Gilham-Schoen Electric Co., Atlanta, Ga	1080-	278-	100
WDBR—Tremont Temple Baptist Church, Boston, Mass.	1170-	256-	100
WDBY—North Shore Congregational Church, Chicago, Ill.	1160-	258-	500
WDWF—Dutee W. Flint, Cranston, R. I	680-	441-	500
WDZ—James L. Bush, Tuscola, Ill	1080-	278-	100
WEAF—American Tel. & Tel. Co., New York, N. Y.	610-	492-	2000
WEAI—Cornell University, Ithaca, N. Y	1180-	254-	500
WEAJ—University of So. Dakota, Vermilion, So. Dak	1080-	278-	100
WEAM—Borough of North Plainfield, No. Plainfield, N. J.	1150-	261-	250
WEAN—Shepard Co., Providence, R. I	1110-	270-	100
WEAO—Ohio State University, Columbus, Ohio	1020-	294-	500
WEAP—Mobile Radio Co., Mobile, Ala	1140-	263-	100
WEAR—Goodyear Tire & Rubber Co., Cleveland, Ohio	770-	389-	1000
WEAU—Davidson Bros. Co., Sioux City, Iowa	1090-	275-	100
WEAY—Iris Theater, Houston, Tex	833-	360-	500
WEBH—Edgewater Beach Hotel Co., Chicago, Ill	810-	370-	1000
WEBJ—Third Avenue Railway Co., New York, N. Y.	1100-	273-	500
WEBL—Radio Corp. of America, United States (portable)	1330-	226-	100
WEBM—Radio Corp. of America, United States (portable)	1330-	226-	100
WEBW—Beloit College, Beloit, Wis	1120-	268-	500
WEEI—Edison Electric Illuminating Co., Boston, Mass.	630-	476-	500
WEMC—Emmanuel Missionary Col., Berrien Springs, Mich.	1050-	286-	500
WEW—St. Louis University, St. Louis, Mo	1210-	248-	100
WFAA—Dallas News & Dallas Journal, Dallas, Tex	630-	476-	500
WFAV—University of Nebraska, Lincoln, Neb	1090-	275-	250
WFBB—Eureka College, Eureka, Ill	1250-	240-	100
WFBG—William F. Gable Co., Altoona, Pa	1080-	278-	100
WFBH—Concourse Radio Corp., New York, N. Y.	1100-	273-	500
WFBI—Galvin Radio Supply Co	1270-	236-	100
WFBK—Dartmouth College, Hanover, N. H	1170-	256-	100
WFBL—Onondoga Hotel, Syracuse, N. Y	1190-	252-	100
WFBM—Merchant Heat & Light Co., Indianapolis, Ind.	1120-	268-	250
WFBN—Radio Sales & Service Co., Bridgewater, Mass.	1330-	226-	200
WFBR—Fifth Infantry Maryland N. G., Baltimore, Md.	1180-	254-	100
WFBY—U. S. Army 5th Corps Area, Ft. Benj. Har'sn, Ind.	1160-	258-	100
WFI—Strawbridge & Clothier, Philadelphia, Pa	760-	395-	500
WGAQ—W. G. Patterson, Shreveport, La	1140-	263-	150
WGAZ—South Bend Tribune, South Bend, Ind	1090-	275-	250
WGBB—Harry H. Carman, Freeport, N. Y	1240-	244-	100
WGBG—Breitenbach's Radio Shop, Thrifton, Va	1330-	226-	100
WGBS—Gimbel Bros., New York	950-	316-	1000
WGI—Amer. Rad. & Research Corp., Medf'd H'lsde, Mass.	1150-	261-	100
WGN—The Tribune, Chicago, Ill	810-	370-	1000
WGR—Federal Telephone Mfg. Corp., Buffalo, N. Y.	940-	319-	750
WGST—Georgia School of Technology, Atlanta, Ga	1110-	270-	500
WGY—General Electric Co., Schenectady, N. Y	760-	380-	1500
WHA—University of Wisconsin, Madison, Wis	560-	535-	500
WHAD—Marquette University, Milwaukee, Wis	1000-	275-	500
WHAG—University of Cincinnati, Cincinnati, O	1290-	233-	100
WHAM—University of Rochester, Rochester, N. Y.	1080-	278-	100
WHAR—Seaside Hotel, Atlantic City, N. J	1090-	275-	100
WHAS—Courier Journal & Louisville Times	750-	400-	500
WHAV—Wilmington Electric Specity Co., Wilmington, Del	1130-	266-	100
WHAZ—Rensselaer Polytechnic Institute, Troy, N. Y.	790-	380-	500
WHB—Sweeney School Co., Kansas City, Mo	820-	366-	500
WHDI—Wm. Hood Dunwoody Ind. Inst., Minneapls, Minn.	1080-	278-	100
WHBF—Beardsley Specialty Co., Rock Island, Ill	1350-	222-	100
WHBH—Culver Military Academy, Culver, Ind	1350-	222-	100
WHK—Radiovox Co., Cleveland, O	1100-	273-	100
WHN—George Schubel, New York, N. Y	830-	361-	500
WHO—Bankers Life Co., Des Moines, Iowa	570-	526-	500
WIAD—Howard R. Miller, Philadelphia, Pa	1200-	250-	100
WIAK—Journal-Stockman Co., Omaha, Nebr	1080-	278-	250
WIAS—Home Electric Co., Burlington, Iowa	1180-	254-	100
WIK—K. & L. Electric Co., McKeesport, Pa	1280-	234-	100
WIL—Benson Radio Co., St. Louis, Mo	1100-	273-	100
WIP—Gimbel Bros., Philadelphia, Pa	590-	508-	500
WJAB—American Electric Co., Lincoln, Neb	1310-	229-	100
WJAD—Jackson's Radio Eng. Laboratories, Waco, Texas.	850-	353-	500
WJAG—Norfolk Daily News, Norfolk, Nebr	1110-	270-	250
WJAN—Peoria Star, Peoria, Ill	1100-	273-	100
WJAR—The Outlet Co., Providence, R. I	980-	306-	500

	K.C.	W.L.	W.P.
WJAS—Pittsburgh Radio Supply House, Pittsburgh, Pa.	1090-	275-	500
WJAZ—Zenith Radio Corp., Chicago, Ill. (portable)	1120-	268-	100
WJJD—Supreme Lodge, L. O. Moose, Mooseheart, Ill	990-	303-	500
WJY—Radio Corporation of America, New York, N. Y.	740-	405-	1000
WJZ—Radio Corporation of America, New York, N. Y.	660-	454-	1000
WKAQ—Radio Corporation of Porto Rico, San Juan, P. R.	880-	341-	500
WKAR—Michigan Agric. Col., E. Lansing, Mich	1050-	286-	500
WKY—WKY Radio Shop, Oklahoma, Okla	1090-	275-	100
WLBL—Wisconsin Dept. of Markets, Stevens Point, Wis.	1080-	278-	500
WLIT—Lit Bros., Philadelphia, Pa	760-	395-	500
WLS—Sears, Roebuck Co., Chicago, Ill	870-	345-	500
WLW—Crosley Radio Corporation, Cincinnati, O	710-	422-	1500
WMAC—Clive B. Meredith, Cazenovia, N. Y	1090-	275-	100
WMAF—Round Hills Radio Corp., Dartmouth, Mass	833-	360-	500
WMAF—Round Hills Radio Corp., Dartmouth, Mass	833-	360-	100
WMAH—General Supply Co., Lincoln, Neb	1180-	254-	100
WMAK—Norton Laboratories, Lockport, N. Y	1130-	466-	500
WMAQ—Chicago Daily News, Chicago, Ill	670-	448-	500
WMAY—Kingshighway Presbyterian Church, St. Louis, Mo.	1210-	248-	100
WMAZ—Mercer University, Macon, Ga	1150-	261-	100
WMBF—Fleetwood Hotel, Miami Beach, Fla	780-	384-	500
WMC—Commercial Appeal, Memphis, Tenn	600-	500-	500
WMH—Ainsworth-Gates Radio Co., Cincinnati, O	710-	422-	750
WMH—Ainsworth-Gates Radio Co., Cincinnati, O	920-	326-	750
WMU—Doubleday Hull Electric Co., Washington, D. C.	1150-	261-	100
WNAC—Shepard Stores, Boston, Mass	1070-	280-	500
WNAD—University of Oklahoma, Norman, Okla	1180-	254-	250
WNAP—Wittenberg College, Springfield, Ohio	1210-	248-	100
WNAT—Lennig Bros. Co., Philadelphia, Pa	1200-	250-	100
WNAX—Dakota Radio Apparatus Co., Yankton, S. Dak.	1230-	244-	100
WNJ—Radio Shop of Newark, Newark, N. J	1290-	233-	150
WNYC—City of New York, New York, N. Y	570-	526-	1000
WOAI—Southern Equipment Co., San Antonio, Texas	760-	395-	500
WOAN—James D. Vaughn, Lawrenceburg, Tenn	1060-	283-	500
WOAW—Woodmen of the World, Omaha, Nebr	570-	526-	1000
WOC—Palmer School of Chiropractic, Davenport, Iowa	620-	484-	1500
WOI—Iowa State College, Ames, Iowa	1110-	270-	500
WOO—John Wanamaker, Philadelphia, Pa	590-	508-	500
WOQ—Unity School of Christianity, Kansas City, Mo	1080-	278-	500
WOR—L. Bamberger & Co., Newark, N. J	740-	405-	500
WORD—People's Pulpit Association, Batavia, Ill	1080-	278-	500
WOS—Missouri State Marketing Bureau, Jefferson City, Mo.	680-	441-	500
WPAJ—Doolittle Radio Corporation, New Haven, Conn.	1120-	268-	100
WPG—Municipality of Atlantic City, Atlantic City, N. J.	1000-	300-	500
WPSC—Pennsylvania State College, State College, Pa.	1150-	261-	500
WQAA—Horace A. Beale, Jr., Parkesburg, Pa	1360-	220-	500
WQAC—Gish Radio Service, Amarillo, Tex	1280-	234-	100
WQAM—Electrical Equipment Co., Miami, Fla	1120-	268-	100
WQAN—Scranton Times, Scranton, Pa	1200-	250-	100
WQAO—Calvary Baptist Church, New York, N. Y	833-	360-	100
WQAS—Prince-Walter Co., Lowell, Mass	1190-	252-	100
WQJ—Calumet Rainbow Broadcasting Co., Chicago, Ill.	670-	448-	500
WRAA—Rice Institute, Houston, Tex	1170-	256-	100
WRAK—Economy Light Co., Escanaba, Mich	1170-	256-	100
WRAL—Northern States Power Co., St. Croix Falls, Wis.	1210-	248-	100
WRAM—Lombard College, Galesburg, Ill	1230-	244-	100
WRAV—Antioch College, Yellow Springs, Ohio	1140-	263-	100
WRAX—Flexon's Garage, Gloucester City, N. J	1120-	268-	100
WRBC—Immanuel Lutheran Church, Valparaiso, Ind.	1080-	278-	500
WRC—Radio Corporation of America, Washington, D. C.	640-	469-	500
WREO—Reo Motor Car Co., Lansing, Mich	1050-	286-	500
WRK—Doron Bros. Electrical Co., Hamilton, O	1110-	270-	200
WRL—Union College, Schenectady, N. Y	833-	360-	500
WRM—University of Illinois, Urbana, Ill	1100-	273-	500
WRR—Dallas Police & Fire Dept., Dallas, Tex	1150-	261-	200
WRW—Tarrytown Radio Research Laboratories	1100-	273-	500
WSAB—S. E. Missouri State Tech's Col., Cape Gir'du	Mo.	1090-	275-	100
WSAC—Clemson Agric. Col., Clemson College, S. C.	890-	337-	500
WSAD—J. A. Foster Co., Providence, R. I	1170-	256-	100
WSAG—Gospel Tabernacle, St. Petersburg, Fla	1130-	266-	500
WSAI—United States Playing Card Co., Cincinnati, O.	920-	326-	500
WSAJ—Grove City College, Grove City, Pa	1310-	229-	250
WSAP—The City Temple, New York, N. Y	1140-	263-	250
WSAR—Doughty & Welch Electric Co., Fall River, Mass.	1180-	254-	100
WSAV—Clifford W. Vick Radio Const. Co., Houston, Tex.	833-	360-	100
WSB—Atlantic Journal, Atlantic, Ga	700-	428-	750
WSL—J. & M. Electric Co., Utica, N. Y	1100-	273-	100
WSOE—School of Engi'rng of Milwaukee, Milwaukee, Wis.	1220-	246-	100
WSUI—State University of Iowa, Iowa City, Iowa	620-	484-	500
WSY—Alabama Polytechnic Institute, Auburn, Ala	1200-	250-	500
WTAB—Fall River Daily Herald Pub. Co., Fall R'vr, Mass.	1130-	266-	100
WTAC—Penn. Traffic Co., Johnstown, Pa	1430-	210-	100
WTAM—Willard Storage Battery Co., Cleveland, O	770-	389-	1500
WTAQ—S. H. Van Gorden & Son, Osseo, Wis	1180-	254-	100
WTAR—Reliance Electric Co., Norfolk, Va	1150-	261-	100
WTAS—Charles E. Erbstein, Elgin, Ill	990-	302-	1000
WTAT—Edison Illum'ting Co., Boston, Mass., (portable)	1230-	302-	100
WTAW—Agric. & Mech. Col. of Texas, Col. Station, Tex.	1110-	270-	250
WTAY—Oak Leaves Broadcasting Station, Oak Park, Ill.	1200-	250-	500
WTIC—Travelers Insurance Co., Hartford, Conn	860-	349-	500
WWAD—Wright & Wright, Philadelphia, Pa	1200-	250-	100
WWAE—Lawrence J. Crowley, Joliet, Ill	1240-	242-	500
WWAO—Michigan College of Mines, Houghton, Mich	1230-	244-	250
WWI—Ford Motor Co., Dearborn, Mich	1130-	266-	250
WWJ—Detroit News, Detroit, Mich	850-	353-	500

It Was Little Ruth's 9th Birthday

Ruth MacDonald already had a radio set. It was a single-tube affair and worked very well, so that she was able to bring in outside stations all by herself. But she wanted more distance and louder music.

Mr. MacDonald had heard about the RADICLEAR kit for adding another tube to a radio set. He had an idea, although his daughter was so young, she ought to be able to follow the easy directions which come with the kit. So for a birthday present he spent $6.00 for the outfit. She was tickled to pieces. With no tools but a screw driver, a pair of pliers and a drill, she was able to hook-up this amplifier complete all by herself.



She was very much pleased with the performance of the set, but the greatest delight came from the fact that she put it together herself.

The hook-up for the RADICLEAR Transformer can easily be followed by any one who is intelligent, even if he has no experience at all with radio. The kit includes the famous RADICLEAR 3½ to 1 ratio audio transformer and also a socket, rheostat, four-spring jack, binding post, wire and instructions.

Of course, the big thing about this kit is the transformer itself. The coils are wound on a Universal machine and the insulation between layers has been especially developed for this use—that is one reason which accounts for the very small losses in the windings. You hear the result as unusually sweet music.

The Taylor Electric Company,
1206 Broad Street,
Providence, R. I.

Please send me the following by parcel post. (Mark which one you want.)
Radiclear Audio Transformer @ $3.95
Amplifier set complete @.....$6.00
(Socket to fit.....tube)
Audion Crystal @ 25c.
Gold Plated Cat Whisker @ 15c.

☐ I enclose $.... to pay for these. (These above prices include the postage.)

☐ Send them to me C. O. D. I will pay the above price plus postage. (Indicate which way you wish to pay.)

Name.....

Address.....

TAYLOR ELECTRIC CO.

1206 Broad Street

Providence, R. I.